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**Original Article**

# Depression among Type 2 Diabetes Mellitus and its Association with Poor Glycemic Control in Patients Visiting Tertiary Care Hospital of Islamabad

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## Abstract

**Background:** Depression among type 2 diabetes mellitus patient results in negative health outcomes.
**Objectives:** To determine the association between depression and glycemic control in patients suffering from type 2 diabetes mellitus.
**Study design, settings and duration:** This comparative cross-sectional study was conducted in the diabetic patients attending diabetic clinic of Capital Hospital, Islamabad which is a tertiary care hospital from 1st September 2015 to 30th November 2015.
**Patients and Methods:** The serum glycosylated hemoglobin levels (HbA1c) were recorded from the medical records of patients while Patient Health Questionnaire (PHQ-9) was used to assess depression in these patients. Poor glycemic control was taken as value of HbA1c $\geq$ 7%. Equal number of depressive and non-depressive type 2 diabetics were recruited. The data was analyzed using SPSS 20.0 and Chi-square was used to find out association between depression and glycemic control among type 2 diabetes mellitus patients.
**Results:** A total of 250 type 2 diabetes patients were enrolled in the study. Their mean HbA1c level was 8.5% (S.D ± 2.15) and the PHQ-9 score was 9.0 (S.D ± 4.11). Almost 83.2% patients had poor glycemic control and were depressed while 57.6% had poor glycemic control but were non-depressed. Depression was strongly associated with poor glycemic control in type 2 diabetes mellitus.
**Conclusion:** Depression among type 2 diabetes patients was significantly associated with poor glycemic control.
**Policy message:** Type 2 diabetic patients should be regularly monitored for their glycemic control and assessed for depression and treated accordingly.
**Key words:** Diabetes mellitus, depression, poor glycemic control, PHQ-9, hemoglobin A1c.

## Introduction

Diabetes mellitus is a metabolic disease characterized by unsuitable hyperglycemia either because of a defective insulin secretion or a reduction in the action of insulin (or both). Type 2 diabetes, is most prevalent form of diabetes.[1] American Diabetes Association (ADA), diabetes mellitus has classified diabetes into type 1 diabetes, type 2 diabetes, gestational diabetes mellitus, and other specific types of diabetes.[2] According to International Diabetes Federation (IDF), 415 million people (prevalence 8.8%) globally are living with diabetes and by 2040 this number will reach 642 million. In the Middle East and North Africa (MENA) region approximately 35.4 million people (9.1%) adults aged 20-79 years, are living with diabetes and by 2040 their number shall reach 72.1 million. Pakistan is included in MENA region and it has about 7.0 million diabetics and by 2040 their number will reach 14.4 million.[3] In 2013, the globally health spending to treat diabetes and management of its related complications was USD 548 billion. Despite the escalating estimates of diabetes prevalence throughout MENA, Health expenditure on diabetes is 2.5% of the global spending in this region.[4]

Depression is a common but under recognized mental health condition that presents with low mood, lack of interest and pleasure, low appetite and sleep disturbances, lethargy, loss of concentration,

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**Authors Contribution**

JS and SS have done the conceptualization of project. Data collection was done by JS. JS, SS, IA did the literature search. Statistical analysis was done by JS, RK and SS. JS and RK has also participated in drafting, writing and revision of the manuscript.

helplessness, hopelessness and in severe cases recurrent thoughts of deaths and suicide.[5] Thus people with depression become less productive, and everyone around them also get affected. According to WHO 350 million people of all ages globally have depression and by 2020 it will be ranked second in Disability Adjusted Life Years (DALY).[6] The data from the Global Burden of Disease (GBD-2010) shows 4.4% prevalence of depression, 5.5% in males and 3.2% in females.[7] The global approximate spending on mental health illness was about $2.5Trillion (two-thirds in indirect costs) in 2010, with a expected increase to over $6Trillion by 2030.[8] In 2010 it was estimated that depression costed €92 billion to European economy, out of which about €54 billion (59%) was indirect costs like absence from work.[9] Depressives have greater risk of attempting suicide and it was estimated that those who commit suicide, due to premature mortality this accounts for the loss of 74.5 million years of disability-adjusted life-years (DALYs).[10]

Depression and diabetes can often co-exist with a bi-directional relationship in which either could initiate the other condition.[11] In a systemic review the prevalence of depression in patients with type 1 diabetes was more than three-times higher (12%, range 5.8-43.3% vs. 3.2%, range 2.7-11.4%) and in patients with type 2 diabetes approximately twice as high (19.1%, range 6.5-33% vs. 10.7%, range 3.8-19.4%) compared to those without diabetes.[12] A meta-analysis concluded that depression was significantly associated with poor glycemic control in individuals with type 1 and type 2 diabetes.[13] Some behavioral factors of diabetics that results in poor glycemic control may include poor adherence to physical activity, diet, weight control, glucose monitoring, and medication as shown in Figure-1.[14] Depressed diabetics had more likely to have poor glycemic control in comparison with non-depressed patients.[15]

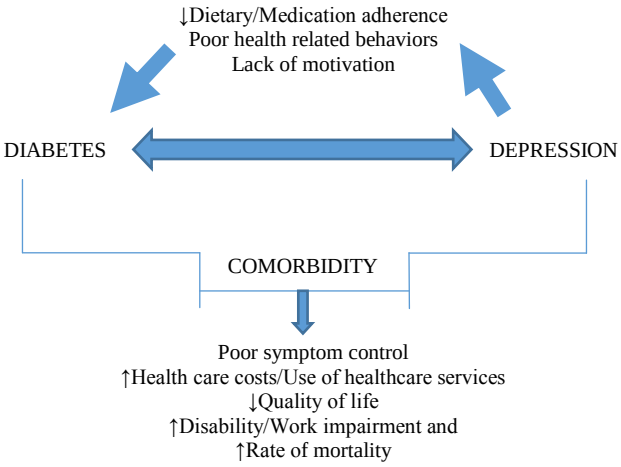


**Figure 1: Comorbid depression and diabetes.**

Both depression and type 2 diabetes are non-communicable disease and because of their high prevalence, high economic burden on society, increased risk of mortality and disability, they are considered as significant public health problems.

There is lack of data in our setting and about association of depression with glycemic control and its negative health outcomes in type 2 diabetes mellitus patients therefore this study will establish the relation of poor glycemic control in depressed type 2 diabetic patients and guide for its early detection and prompt treatment.

## Patients and Methods

This comparative cross sectional study was conducted at Diabetes Clinic Outpatient department (OPD) of Capital Hospital, Islamabad for three months from 1st September 2015 to 30th November 2015. All patients of type 2 diabetes mellitus who were visiting the diabetes clinic were enrolled for the study after taking informed written consent. Patients with past history of psychiatric disorders, end stage renal disease, cerebrovascular disorders and those who were on psychotropic medications were excluded from study.

Total of 250 type 2 diabetes patients were enrolled in two groups i.e. 125 with depression and 125 without depression using a non-probability sampling technique. The sample size was calculated on Open Epi, Version 3 sample size calculator. With the frequency of poor glycemic control in the diabetic population taken as 86.7% [16] and confidence limits of 95% and margin of error 5%, the sample size came as 250.Data was collected on a standardized questionnaire comprising of questions related to patient's socioeconomic characteristics, information on type 2 diabetes mellitus and its related complication/co-morbidities, the glycemic control and depressive symptoms. The most recent HbA1clevel was taken from patient's medical record to check glycemic control. The patient health questionnaire-9 (PHQ-9) was translated in Urdu (local language) was administered for assessing depression.[17] PHQ-9 total score was calculated from response categories of not at all, several days, more than half the days, and nearly every day, and their assigned scores of 0, 1, 2, and 3, respectively. PHQ-9 total score for the nine items ranges from 0 to 27 and score between 0-9 was labeled as non-depressed and score 10-27 as depressed. PHQ score ten and more than ten ≥10 has sensitivity of 88% and Specificity of 88% for major depression.[18]

The patients who had severe depression (PHQ-9 scored 20 or more) or had active suicidal ideations (rated 3 on question no 9 of PHQ),were referred to psychiatry OPD for further management of illness and the patients with poor glycemic control were referred to the Medical specialist, diabetes educator and dietician of Capital

Hospital, Islamabad. All the information was collected using questionnaire, and Quantitative statistical analysis of variables was done using SPSS version 20. Descriptive analytic component comprised of percentages and frequencies of various categorical variables. Inferential analytic component was carried out using chi square with cross tabulation to show association between exposure of interest i.e. depression and outcome of interest i.e. poor glycemic control (HbA1c ≥ 7%).

Ethical Clearance: The ethical clearance was taken from the Ethical committee of Health Services Academy, Islamabad.

## Results

Total two hundred fifty type 2 diabetics with or without depression were selected for the study. Out of these 60% were females and 40% males, whose ages ranged between 35 to 76 years with a mean of 54.14years (SD 7.40 years) (Table-1).

**Table 1: Frequency of study participants in different age groups and both genders.**

| *Gender* | *Frequency* | *Percentage* |
|---|---|---|
| Male | 101 | 40.4 |
| Female | 149 | 59.6 |
| Total | 250 | 100.0 |
| *Age (years)* | | |
| 35-45 | 22 | 8.8 |
| 46-55 | 145 | 58.0 |
| 56-65 | 62 | 24.8 |
| 66-75 | 19 | 7.6 |
| 76-85 | 2 | 0.8 |
| Total | 250 | 100.0 |

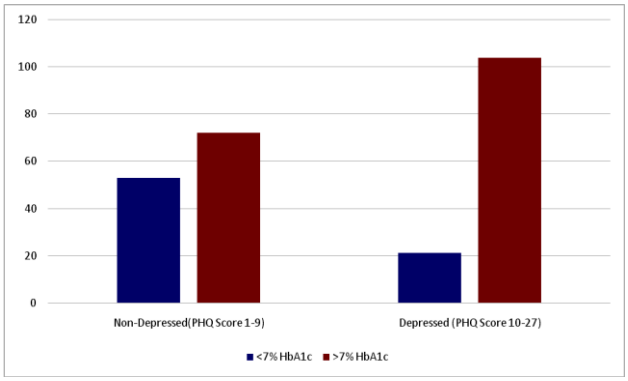


**Figure 2: Frequency of poor glycemic control among depressed and non-depressed diabetics.**

Among all the patients mean HbA1c level was 8.5% (S.D ± 2.15) and the PHQ-9 score was 9.0 (S.D ± 4.11). Poor glycemic control was seen in 70.4%. Almost 83.2% patients with poor glycemic control were depressed while 57.6% with poor glycemic control were non-depressed (Figure-2). Within the gender, 64% females had depression. Patients having diabetes for ≥ 5 year had higher frequency of depression. Most of diabetes related complications/co-morbidities i.e. hypertension, heart disease, neuropathy, and dyslipidemia were common among depressed cases. Among depressed diabetics 44.0% were on combination therapy i.e. insulin and oral hypoglycemic agents.

Most of the patients (70.4%) with poor glycemic control were not following doctor's advice ($p < 0.001$). Almost 41.6% patients who were taking oral hypoglycemic agents had poor glycemic control while only 27.2% who were on combination therapy insulin and oral hypoglycemic agents had poor glycemic control. Majority of depressed patients had poor glycemic control as compared to non-depressed patients and this difference was significant (Table-2).

**Table 2: Comparison of glycemic control with sociodemographic and clinical variables.**

| | | *HbA1c Level* | | *p-value* |
|---|---|---|---|---|
| | | *Less than 7%* | *More than 7%* | |
| Gender | Male | 42(16.8%) | 59(23.6%) | 0.001* |
| | Female | 32(12.8%) | 117(46.8%) | |
| Duration of illness | Less than 1 year | 5(2.0%) | 16(6.4%) | |
| | 1-5 years | 52(20.8%) | 91(36.4%) | 0.024* |
| | More than 5 year | 17(6.8%) | 69(27.6%) | |
| Follow Doctor's Advice | Yes | 12(4.8%) | 14(5.6%) | |
| | No | 10(4.0%) | 64(25.6%) | 0.001* |
| | Sometimes | 52(20.8%) | 98(39.2%) | |
| Management of Diabetes | Diabetes Tablets | 55(22.0%) | 104(41.6%) | |
| | Insulin | 2(0.8%) | 4(1.6%) | 0.058 |
| | Combination | 17(6.8%) | 68(27.2%) | |
| PHQ-9 | Non-Depressed | 53(21.2%) | 72(28.8%) | <0.001* |
| | Depressed | 21(8.4%) | 104(41.6%) | |

## Discussion

The present study showed depression among type 2 diabetes is associated with poor glycemic control and majority of female respondents had poor glycemic control and depression. Results of our study are consistent with a previous study that also showed that both diabetic and non-diabeticfemales had higher prevalence of depression than men.[12]

The present study showed that (70.4%) diabetics had poor glycemic control and this is in line with a previous study from Pakistan that showed 78% had poor glycemic control who were diabetics.[16] The present study also showed that depression among type 2 diabetes is associated with poor glycemic control and this finding is also similar to many studies done in the past along with a meta-analysis.[13,19,20] Another study results explained that the presence of depressive symptoms leading to a

significant worsening of glycemic control among diabetics.[21] This study showed that there is an association of depression with poor glycemic control but whether depression is the cause or a result of hyperglycemia is not known. Further research is required to explore the direction of association between depression among type 2 diabetes and poor glycemic control.

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**Conflict of interest:** None declared.

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