Original Article

Depression among Adults with Diabetes in Fasa Diabetes Registry System: Risk Factors and Relationship to Blood Sugar Control

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Abstract

Background & Objective: Diabetes Mellitus is a chronic disorder that affects patients physically and mentally. It is a co-existing disorder that can impact disease management adversely and trigger diabetes-related complications. However, it seems that the role of factors associated with depression are underestimated by both patients and physicians. We examined the associations between depression and blood sugar control and the role of associated factors such as demographic features, Glycated hemoglobin (HbA1c), Fasting Blood Sugar, lifestyle and diabetes-related complications on depression in adults with diabetes mellitus.

Materials & Methods: We conducted a cross-sectional study among 219 adults diagnosed with diabetes. Participants completed a questionnaire measuring depressive symptoms and demographic backgrounds. Laboratory values and data from physical examination were also collected.

Results: The prevalence of depression was 12.3% in our population. The mean level of HbA1c and FBS was also higher among depressed patients. however, it was not significantly different among patients with and without depression. There was no statistically significant correlation between the Beck Depression Scale mean scores and the mean of FBS, HbA1c and BMI ($p<0.01$).

Conclusion: Our findings reveal that depression rate among diabetes patients is considerable. In fact, mental status should be noticed as well as pathological status in clinical practice.

Keywords: Depression, Diabetes, Blood Glucose control

Introduction

Diabetes mellitus (DM) is a disease of major concern globally that can give rise to considerable health challenges. Its prevalence has been rising more rapidly in both low and middle income countries. According to the reports of Centers for Disease Control and Prevention (CDC) in 2020, over 10% of the US population was affected by diabetes (1). Devastating complications of Diabetes mellitus such as cardiovascular diseases, neuropathy, nephropathy, retinopathy can contribute to high rates of morbidity and mortality, infections, foot ulcers and amputations, loss of hearing, blindness, skin changes and substantially affect patient's quality of life and mental status (2, 3). Impaired mental status can result in depression and have detrimental effect on disease management

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thus co-existence of depression and diabetes could trigger the complications (4).

Depression is a co-occurring mental disorder in diabetic patients and it is remarkably more common in diabetic patients than in non-diabetic individuals (5). Due to the results of a cross-sectional study, 31% of patients with diabetes were reported to suffer from depressive symptoms and almost 11% had major depression regardless of diabetes type (6). The prevalence of depression among patients with chronic medical condition is a serious concern as it is associated with emotional distress along with poorer management of the disease thus, higher demand for care. It is demonstrated that depression is associated with inadequate self-care as it can lead to impaired quality of life, poorer self-care (7), and poorer medication adherence (8). A study found that depression in type 2 diabetes is linked to increased risk of chronic and long term diabetes-related complications (9).

Glycemic control is a crucial part of diabetes management. It is well stablished that glycemic control lowers diabetes-related complications. Hence, a better understanding of factors affecting glycemic control can help us reduce related complications. A study by Egbuonu et al. found that depression in adults with type1 diabetes can lead to poorer blood glucose self-monitoring and inadequate glycemic control leading to increased possibility of developing complications (10).

Although previous studies have mostly focused on mental implications of diabetes, the association between glycemic control and presentation of depression is poorly studied. It seems that psychological burden of diabetes is neglected. A better understanding of the association between depression and glycemic control in diabetic patients might result in a better management of emotional condition of diabetic patients along with an effective control of the disease and enhancement of the outcomes.

Hence, the main aim of this study was to document the association between depression and blood sugar control in patients with diabetes mellitus in order to prepare supportive plans for diabetic patients developing depression.

Materials & Methods

This cross-sectional study was approved by research ethics committee at Fasa University of Medical Sciences, Iran. Our study, the population consisted of 219 individuals diagnosed with diabetes mellitus. Patients characterized by criteria such as HbA1c levels higher or equal to 6.5% or Fasting Plasma Glucose higher or equal to 126 mg/dL or glucose tolerance test higher or equal to 200 mg/dL during an oral glucose tolerance test or existence of Hyperglycemia symptoms and random plasma glucose higher or equal to 200 mg/dL were entered into our study.

We collected data of physical examination, demographic features, Body Mass Index (BMI), insulin use, Glycated hemoglobin (HbA1c), lifestyle (Opioid consumption, smoking condition), history of complications such as weight loss, fatigue, double vision, hair loss, polyuria and weakness through an existing medical records database, Fasa Registry on Diabetes mellitus system. Fasa Registry on Diabetes mellitus (FaRD) is a population-based registry for DM in Iran that presents detailed data of patient's social, mental, clinical status, and laboratory values, along with the disease management patterns and the degree of adherence to medical treatments (11). We asked patients to answer the Beck Depression Inventory Second Edition (BDI-II) electronically. BDI-II consists of 21 questionnaires scored from zero to three measuring the intensity of depression and assessing depressive symptoms. All scores sum up together and scores ranging from 0 to 13 are categorized as minimal depression, 14 to 19 are categorized as mild depression, 20 to 28 are categorized as moderate depression, and 29 to 63 are categorized as severe depression.

For data analysis we used SPSS software version 25 via descriptive (frequency, mean, standard deviation) and inferential statistics (compare means, Pearson correlation coefficient and stepwise multiple regression).

Assessing and analyzing the amounts of FBS and HbA1c was performed using independent t-test, paired t-test, Mann–Whitney U-test, and Chi-square. The association between independent

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variables and BDI-II items was evaluated using One-way ANOVA test. Demographic features of the population were assessed by calculating Descriptive statistics, mean standard deviation for continuous data and frequency and percentage of discrete variables.

Our study did not bring any additional costs to patients or the health system.

Results

Two hundred nineteen patients including 72 (32.9%) men and 147 (67.1%) women with mean age of 56.31 ± 13.16 years (minimum and maximum of 12 to 88) participated in the study. There was no significant difference between the two groups in terms of demographic and baseline characteristics. BMI was calculated as 28.18 ± 5.61. The demographic and baseline data are shown in table 1. Most of the patients were nonsmokers, non-coffee consumers and non-insulin users. Two hundred nineteen patients completed the BDI-II questionnaire correctly. Table 1 discusses the demographic characteristics of the diabetic population.

Table 1. Demographic characteristics of the diabetic population

	Depressed		Normal	
Characteristic [N=219]	mean	SD	mean	SD
Age	56.22	15.27	56.32	12.89
BMI	30.28	7.64	27.89	5.24
Diabetes Management				
HbA1c	9.37	1.66	8.42	1.92
FBS	197.88	75.85	181.39	74.34

BMI, Body Mass Index; HbA1c, Glycated hemoglobin; FBS, Fasting Blood Sugar

Among the 219 participants, 27 (12.3%) were classified as depressed and the remaining 192 (87.7%) were categorized as having no depression. The frequencies of mild, moderate and severe depression were 14 (6.4%), 9 (4.1%) and 4 (1.8%) respectively. The occurrence of depression was Among the 219 participants, 27 (12.3%) were classified as depressed and the remaining 192 (87.7%) were categorized as having no depression. The frequencies of mild, moderate and severe depression were 14 (6.4%), 9 (4.1%) and 4 (1.8%) respectively. The occurrence of depression was correlation was not detected between the Beck Depression Scale mean scores and the mean of FBS, HbA1c and BMI ($p<0.01$)(Table 2).

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Table 2. Prevalence of complications related to diabetes in the studied population

Complication	Normal	Depressed
Hair loss	8	0
polyuria	93	8
fatigue	29	7
weak	47	13
weightloss	54	11
bivision	8	5

Discussion

Diabetes mellitus is a chronic disease that not only affects the body physically, but also mentally. Co-existence of depression and diabetes could trigger the complications and affect disease management. Enhancing knowledge about depression among diabetic patients can help physicians take related risk factors into consideration. The present study identifies depression condition and associated factors among individuals with diabetes mellitus. In this study 219 patients were studied. We found a depression rate of 12.3% and most (6.4%) of the participants had mild depression which is almost similar to the prevalence (12%) of depression reported in a Canadian population (12). However, our result is lower than the prevalence rate of 22.06% reported by Noman et al. (13) and depression prevalence rate of 18.04% in patients with type 2 diabetes by Parsa et al. (14).

Our study also includes characteristics such as History of related complications (hair loss, weight loss, weakness, double vision, fatigue, polyuria), lifestyle patterns (coffee or opium consumption and smoking status) that shows no significant relationship with depression in diabetic patients.

We found that FBS mean was higher in patients with depression than in patients categorized as having no depression. Patients with depression had higher FBS (197.88 ± 75.85). Although higher levels of Fasting Blood Sugar in patients with depression is reported in numerous studies including current study, our results revealed that FBS levels are not significantly associated with depression in diabetic patients. This is contrary to the results of a study conducted by Tusa et al. (15) that indicated higher levels of fasting blood sugar is significantly associated with depression in diabetic patients.

The mean level of HbA1c was also higher among depressed patients. However, it was not significantly different among patients with and without depression. This is consistent with the finding of a study conducted by Lustman et al. (16). Although these results are contrary to the

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findings of studies conducted by Nanayakkara et al (17) that showed higher HbA1c is significantly associated with depression in adults with type 2 diabetes. Alzughbi et al. (18) also found that HbA1c levels are significantly higher in diabetic patients with distress and depression.

Our results revealed that BMI is higher in patients with depression than in individuals categorized as having no depression although it did not show any significant relationship with depression. Moreover, higher BMI mean scores were seen in patients with severe depression. According to the literature, characteristics such as marital status and BMI are not significantly correlated with diabetes mellitus depression. Raval et al. (19) also found that the presence of depression in patients with diabetes has no significant correlation with BMI.

We found that mean FBS and HbA1c is higher in patients with severe depression. This finding suggests that inadequate blood glucose management in patients with diabetes may trigger the intensity of depression in diabetic patients. Moreover, a relationship between BDI severity and FBS levels, and HbA1c was detected although it was not significant indicating that glycemic control may lower the risk of depression in diabetic patients.

American diabetes association also indicated that women are more likely to confront with depression that may be due to hormonal factors and various stressors (20). According to the results of our study, prevalence of depression was higher in women which is consistent with the literature.

Prevalence of depression in married individuals was higher in the current study. However, this finding may be due to the fact that the majority of our sample were married individuals. This finding disagrees with a study conducted by Asefa et al. (21) concentrating on depression and its associated factors among diabetes mellitus patients in which participants with single marital status were more likely to develop depression than their married counterparts. Table 2 discusses the prevalence of complications related to diabetes in the studied population.

Majority of patients classified as depressed had mild depression (6.4%). Similarly, a study conducted by Noman et al. involving 712 patients with type 2 diabetes revealed that the majority of patients with depression had mild depression (43.75%).

Conclusion

Depression in diabetes can often be neglected although it can affect the management of the disease. In fact, mental status should be noticed as well as pathological status in clinical practice. Appropriate screening of depression and its associated factors in diabetes mellitus can help patients confront depression and consequently improve management of the disease.

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Conflict of Interest

The authors report no conflicts of interest in this research.

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