

# Association between Personality Disorders and Uncontrolled Type 2 Diabetes Mellitus: A Case–Control Study

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## Abstract

**Introduction:** Type 2 diabetes mellitus (T2DM) is one of the most common chronic diseases, with a wide range of complications and comorbidities. Personality disorders can lead to more blood sugar fluctuations in these patients. This study aimed to determine the relationship between personality disorders and increasing the sugar level in T2DM. **Methods:** In this case–control study (March 2016–September 2017), the personality of two groups of patients with T2DM referred to Imam Hossain Hospital in Tehran, Iran, was assessed retrospectively. 36 patients with uncontrolled T2DM, as the case group, were compared with 108 patients with T2DM, who were hospitalized due to other reasons, as the control group. The Iranian short form of Minnesota Multiphasic Personality Inventory was used to distinguish personality disorders. The most prevalent personality disorders were hysteria (HY) and depression in the case group and HY and psychopathic deviancy in the control group. There were significant differences between the groups in most of the personality disorders. **Results:** Results of the logistic regression showed that the patients in the case group compared with those of the control group had psychasthenia 36.5-folds more ( $P < 0.0001$ ), schizophrenia 30.3-folds more ( $P < 0.0001$ ), depression 13-folds more ( $P < 0.0001$ ), hypochondriasis 9.1-folds more ( $P < 0.0001$ ), mania 7.3-folds more ( $P < 0.0001$ ), and paranoia 3.7-folds more ( $P = 0.001$ ). **Conclusion:** The prevalence of personality disorders was very high in adults with T2DM, which can lead to uncontrolled blood sugar (BS). It is suggested that physicians should try to manage and treat personality disorders to better control of BS.

**Key words:** Diabetes mellitus, mental health, Minnesota Multiphasic Personality Inventory, personality disorders

## INTRODUCTION

Diabetes is well known as one of the worldwide chronic diseases defined as a group of metabolic disorders and can be caused by several pathogenic processes. Type 2 diabetes mellitus (T2DM) is the most common type known as non-insulin-dependent diabetes, and about 90%–95% of patients with diabetes are involved in it.<sup>[1]</sup> More than 415 million people have this problem in the world, according to the International Diabetes Federation, and it continues to grow dramatically, especially in the developing countries.<sup>[2]</sup> Over 4.6 million people are involved in Iran,<sup>[2]</sup> and according to the World Health Organization (WHO), its prevalence is 10.3%.<sup>[3]</sup> Diabetes is reported as one of the top 10 causes of death in Iran,<sup>[4]</sup>

and 2% of all non-communicable proportional mortality is allocated to it.<sup>[5]</sup> Although uncontrolled diabetes (hypo-/hyperglycemia) can cause a wide range of micro-/macro-vascular and other complications such as diabetic ketoacidosis (DKA) and hyperosmolar coma (HSC), the disorder accompanies by many comorbidities such as mental disorders including depression (D).<sup>[6,7]</sup> These problems require long-term

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management and treatment, and it costs high health-care expenditure due to the high morbidity and mortality.<sup>[8]</sup>

Personality disorders are a group of mental illnesses with undetermined cause and affect thoughts and behaviors. They can lead to great problems in daily life, human relationships, and work.<sup>[9]</sup> It should be considered that personality disorders continue to grow globally and have a great burden on human's health.<sup>[10]</sup> Previous studies revealed that personality disorders such as depression were more common in patients with diabetes.<sup>[11,12]</sup> On the other hand, some researchers presented strong evidence that the risk of developing diabetes increases by depression.<sup>[13,14]</sup> Moreover, a study stated that diabetes has a higher prevalence in patients with schizophrenia (Sc),<sup>[15]</sup> and it can increase the risk of diabetes incidence.<sup>[16]</sup> Furthermore, hospitalized patients with bipolar disorder are at higher risk for diabetes.<sup>[17]</sup> In addition, hysteria (HY) and hypochondriasis (HS) are associated with uncontrolled T2DM.<sup>[18]</sup> The results of a study showed that using psychiatric drugs can lead to better glycemic control.<sup>[19]</sup>

High prevalence of T2DM in Iran<sup>[3]</sup> and the wide range of complications in such patients due to uncontrolled blood sugar (BS) (both hypo- and hyper-glycemia) and psychiatric disorders are linked to diabetes; they may also occur before diabetes and can lead to more BS fluctuations;<sup>[20]</sup> hence, the current study aimed at determining if the personality disorders (such as depression, HY, paranoia [Pa], mania, and Sc) can lead to uncontrolled T2DM.

## MATERIALS AND METHODS

The current study was approved by the Research Development Center and the Ethics Committee of Imam Hossain Hospital, Tehran, Iran. It was performed in accordance with the latest version of the Declaration of Helsinki.

The current case-control study was conducted on adult patients with T2DM referred to Imam Hossain Hospital (March 2016–September 2017), which is known as one of the general hospitals in Tehran.

Two groups of patients were considered in the current study. All hospitalized adult patients with T2DM within the age range of 18–60 years without any diagnosed medical history of psychological or personality disorders or any use of psychiatric drugs were included in the study. All patients with life-threatening diseases such as cerebrovascular accident, myocardial infarction, cancers, and lung emboli as well as pregnant females were excluded from the study. The case group included patients with T2DM admitted at least once due to uncontrolled BS such as DKA and HSC. Moreover, the control group consisted of patients with T2DM and controlled BS hospitalized due to other reasons. The participants were selected by the simple random sampling method, and both groups were matched by age and gender. The NCSS-PASS

software for Windows, version 11 ( $\beta = 20\%$ , confidence interval [CI] = 95%, effect size = 0.67, degree of freedom = 1), was used to calculate the number of participants in the case ( $n = 36$ ) and the control ( $n = 108$ ) groups.<sup>[21]</sup> It should be noted that the control group size was considered 3 times more than that of the case group to maintain the study power ( $R=3$ ).

A data collecting form including age, gender, marital, educational, and occupational status and other information about the medical and drug history of patients were used in the current study. Furthermore, an Iranian short form of Minnesota Multiphasic Personality Inventory-2 (MMPI-2) was applied after admission; it is known as a brief self-reported questionnaire designed to diagnose and evaluate psychological complications in patients >18 years in medical settings. It separately evaluates personality and psychopathology features in eight fields: HS, depression (D), HY, psychopathic deviancy (Pd), Pa, mania (Ma), psychasthenia (Pt), and schizophrenia (Sc). The patients should answer yes or no to each of the 71 questions. Scores lower than 65 are considered normal.<sup>[22]</sup> The validity and reliability were previously confirmed (the Cronbach's alpha value = 0.8).<sup>[21,23]</sup> After explaining the aim and method of study to the participants and obtaining the written informed consent, available retrospective data were used to fill out the form for each subject. It should be noted that data collection and analysis were conducted by persons who were blinded to study objectives.

All data were analyzed, using Statistical Package for the Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 22.0 for Windows, through descriptive and analytical tests such as independent *t*-test, Chi-square, chi-square for trend, and logistic regression tests. Data were expressed as mean standard deviation (SD) and proportions were appropriate. Odds ratio (OR) with 95% CI were calculated. The two-sided  $P < 0.05$  was considered statistically significant.

## RESULTS

Of 144 patients with T2DM, 36 (25%) patients, as the case group, were compared with 108 (75%) patients with T2DM as the control group. The mean  $\pm$  SD age of the case group was  $50.97 \pm 7.88$  years compared with that of the control group  $52.09 \pm 7.38$  years. Using the independent *t*-test, Chi-square, Chi-square for trend, and their non-parametric tests, no statistically significant differences were observed in age, gender, occupational status, living with others, and duration of T2DM between the groups, which can be attributed to group matching. However, there were significant differences in marital status, using oral and intravenous drugs, and number of admissions to control glucose between the groups [Table 1].

Based on MMPI-2 questionnaire, the prevalence of personality disorders in the case group was 97.22% HY,

**Table 1:** Demographic characteristics and medical conditions of both the case and the control groups

Variable	Case group (n=36)	Control group (n=108)	P value	95%CI
Gender			0.847	-
Male, n (%)	17 (47.2)	49 (45.4)		
Female, n (%)	19 (52.8)	59 (54.6)		
Age (year)			0.439	-3.98, 1.74
Mean±SD	50.97±7.88	52.09±7.38		
Minimum - maximum	34-60	30-60		
Marital status			0.026**	-
Single, n (%)	14 (38.9)	22 (20.4)		
Married, n (%)	22 (61.1)	86 (79.6)		
Educational status			0.047**	-
Under diploma, n (%)	12 (33.3)	58 (53.7)		
Diploma, n (%)	12 (33.3)	16 (14.8)		
Advanced diploma, n (%)	0 (0)	3 (2.8)		
Bachelor, n (%)	12 (33.3)	31 (28.7)		
Occupational status			0.524	-
Self-employed, n (%)	6 (16.7)	17 (15.7)		
Housewife, n (%)	17 (47.2)	57 (52.8)		
Employee, n (%)	11 (13.6)	32 (29.6)		
Student, n (%)	0 (0)	1 (0.9)		
Unemployed, n (%)	2 (5.6)	1 (0.9)		
Live with others			0.512	-
Yes, n (%)	28 (77.8)	78 (72.2)		
No, n (%)	8 (22.2)	30 (27.8)		
Duration of T2DM (year)			0.472	-0.91, 0.65
Mean±SD	6.72±1.86	6.85±2.1		
Minimum - maximum	4-10	2-10		
Use oral drugs for T2DM			0.015**	-
Yes, n (%)	14 (38.9)	67 (62)		
No, n (%)	22 (61.1)	41 (38)		
Use intravenous drugs (vial) for T2DM			0.004**	-
Yes, n (%)	13 (36.1)	15 (13.9)		
No, n (%)	23 (63.9)	93 (87.1)		
Number of admission for glucose controlling, mean±SD	2.72±1.1	0.88±1.0	<0.0001**	1.45, 2.24

\*\* Statistically significance

88.89% depression, 86.11% Pd, 83.33% psychasthenia, and 80.56% Sc [Table 2]. Statistical analysis showed significant differences in personality disorders between the groups, but both groups were similar in HY and Pd ( $P = 1.0$ ). Results of the logistic regression showed that psychasthenia ( $P < 0.0001$ , OR 95% CI = 36.54 [12.78, 104.50]), Sc ( $P < 0.0001$ , OR 95% CI = 30.28 [11.04, 83.00]), depression ( $P < 0.0001$ , OR 95% CI = 13.07 [4.31, 39.66]), HS ( $P < 0.0001$ , OR 95% CI = 9.14), mania ( $P < 0.0001$ , OR 95% CI = 7.31 [3.05, 17.50]), and Pa ( $P = 0.001$ , OR 95% CI = 3.68 [1.66, 8.18]) were 36.5-, 30.3-, 13-, 9.1-, 7.3-, and 3.7-folds, respectively, more common in patients of the case group, compared with

the control group [Table 2]. All these meant that the patients in the case group had more previous psychological disorders than the control group.

## DISCUSSION

According to the WHO, the prevalence of diabetes is 10.3% in the Iranian population,<sup>[3]</sup> and 2% of all non-communicable proportional mortality is allocated to it.<sup>[5]</sup> The current study aimed at determining if the personality disorders can lead to uncontrolled T2DM (both hypo- and hyper-glycemia).

**Table 2: Cross-tabulation of all personality condition based on MMPI-2 and results of logistic regression of both the case and the control groups**

Psychological Disorder	Case Group (n = 36)		Control Group (n = 108)		Odds ratio	Standard error	P value	95%CI		
	Mean±SD Score	Normal (score ≤ 65) n (%)	Abnormal (score > 65) n (%)	Mean±SD score					Normal (score ≤ 65) n (%)	Abnormal (score > 65) n (%)
Hypochondriasis	68.89±25.94	16 (44.45)	20 (55.56)	35±19.64	95 (87.96)	13 (12.04)	9.14	0.45	<0.0001**	3.80, 21.94
Depression	113.06±29.06	4 (11.11)	32 (88.89)	68.70±26.76	67 (62.04)	41 (37.96)	13.07	0.57	<0.0001**	4.31, 39.66
HY	118.89±29.55	1 (2.78)	35 (97.22)	112.50±15.48	0 (0)	108 (100)	-	-	1	-
Pd	96.94±28.37	5 (13.89)	31 (86.11)	82.69±14.38	0 (0)	108 (100)	-	-	1	-
Pa	76.94±20.68	12 (33.33)	24 (66.67)	63.80±7.94	70 (68.81)	38 (35.19)	3.68	0.41	0.001**	1.66, 8.18
Mania	64.44±25.80	18 (50)	18 (50)	19.35±22.85	95 (87.96)	13 (12.04)	7.31	0.45	<0.0001**	3.05, 17.50
Psychasthenia	101.11±32.05	6 (16.67)	30 (83.33)	39.17±35.34	95 (87.96)	13 (12.04)	36.54	0.54	<0.0001**	12.78, 104.50
Schizophrenia	109.44±37.94	7 (19.44)	29 (80.56)	37.78±20.01	95 (87.96)	13 (12.04)	30.28	0.52	<0.0001**	11.04, 83.00

\*\* Statistically significance

According to authors' best knowledge, it was the first study on this subject in Iran, using Iranian short form of MMPI-2. The two groups of patients with T2DM were matched by age and gender, and no statistical significant difference was observed between the groups in any of these variables, as well as occupational status, living with others, and duration of T2DM.

The previous studies concluded that the prevalence of diabetes was higher in psychosis population (1.26–50%), and the relationship between them was multifactorial and intertwined.<sup>[24]</sup> Furthermore, the current study results showed that the prevalence of personality disorders was very high in the studied population, especially in the case group, and it was more than those of some other studies.<sup>[25]</sup> The most prevalent personality disorders in the case group were HY (97.22%), depression (88.89%), and Pd (83.88%) according to MMPI-2 questionnaire. In the control group, the most prevalent personality disorders were HY (100%), Pd (100%), and depression (37.96%). The higher prevalence in the current study than other studies (more than 50%) might be due to many factors such as sample size, participants' inclusion criteria and selection, as well as poor condition of patients. Furthermore, the current study results revealed very strong significant differences in the personality disorders between the groups, which made them more susceptible to uncontrolled T2DM.

In another study, the personality of patients with T2DM was evaluated by MMPI.<sup>[18]</sup> Furthermore, Behrouz *et al.* assessed psychological disorders in patients with T2DM in a cross-sectional study. They found that the prevalence of psychiatric disorders in patients with T2DM was more than 36% in Iran. The most prevalent disorders were anxiety, depression, and obsession.<sup>[26]</sup> Maia *et al.* found that the prevalence of psychiatric disorders in patients with diabetes was high. In their study, the most prevalent disorders in patients with diabetes were anxiety, dysthymia, social phobia, current depression, lifelong depression, panic, and risk of suicide. They used the Mini International Neuropsychiatric Interview to diagnose the psychiatric disorders, which was different from the current study instrument, because the current study tried to assess previous personality disorders. Finally, they suggested more psychiatric disorders of risk assessment programs and therapeutic protocols designs, which consider whole aspects of the problems of patients with diabetes.<sup>[20]</sup>

According to literature reviews, most of the previous studies were conducted on the relationship between diabetes and depression. The prevalence of depression in patients with diabetes was 2 times more than that of individuals without diabetes, and it was suggested as a risk factor for T2DM.<sup>[14]</sup> Most of the hospitalized patients with diabetes were at higher risk for moderate/severe depression.<sup>[27]</sup> A meta-analysis showed a significant relationship between depression and increased risk of mortality in patients with diabetes,<sup>[24]</sup> and mortality can be 1.5-fold more.<sup>[27,28]</sup> Since 2004, depression

screening and treatment programs were considered in the American Diabetes Association guidelines.<sup>[29]</sup> Although high and poorly controlled BS has a close relationship with depression ( $Z = 5.4$ ,  $P < 0.0001$ ),<sup>[30]</sup> depression increases the risk of developing diabetes up to 37%.<sup>[13,14]</sup> In the current study, depression had higher prevalence in patients with uncontrolled T2DM than the control group ( $P < 0.0001$ , OR 95% CI = 13.07 [4.31, 39.66]).

Previous studies stated that diabetes had a high prevalence in patients with Sc compared to the normal population (15.8%; 95% CI = 12.1%, 19.5%).<sup>[15]</sup> However, the results of the current study showed higher prevalence (80.56%) as well as high association with uncontrolled BS compared to those of the population with controlled BS ( $P < 0.0001$ , OR 95% CI = 30.28 [11.04, 83.00]). It should be considered that the possibility of acute consequences of diabetes was higher in patients with Sc.<sup>[31]</sup> Furthermore, a great relationship was observed between psychasthenia (obsessive compulsive) and poorly controlled BS ( $P < 0.0001$ , OR 95% CI = 36.54 [12.78, 104.50]) with high prevalence in the case group (83.33%). In addition, in the study by Behrouz *et al.*, obsession was one of the most prevalent personality disorders in patients with T2DM.<sup>[26]</sup>

In addition, HS was more prevalent in patients with T2DM,<sup>[32]</sup> and there was an association between hypochondriasis and uncontrolled BS.<sup>[18]</sup> The results showed that hypochondriasis in uncontrolled patients with T2DM was 9.1 times ( $P < 0.0001$ , OR 95% CI = 9.14) more than that of the ones with controlled T2DM. In addition, HY was associated with uncontrolled T2DM, and it had high prevalence in patients with diabetes (74%).<sup>[18]</sup> Although the current study results showed a higher prevalence of HY in both case and control groups (97.22% and 100%, respectively), no statistical difference was observed between them ( $P = 1.0$ ).

As mentioned above, hospitalized patients with bipolar disorder had a higher risk for diabetes.<sup>[7]</sup> Bipolar disorder type I is identified as a lifelong periodic mood fluctuation, with episode of mania with/without depression. The patients have higher body mass index score due to their lifestyle factors; therefore, they are more susceptible to T2DM.<sup>[33]</sup> The current study found that mania was more prevalent in patients with T2DM and uncontrolled BS ( $P < 0.0001$ , OR 95% CI = 7.31 [3.05, 17.50]). Furthermore, it was indicated that Pa can be a cause of failure to control BS [ $P = 0.001$ , OR 95% CI = 3.68 [1.66, 8.18]], with 66.67% prevalence in case group of the current study, but Behrouz *et al.* reported 15.32% in their patients with T2DM.<sup>[26]</sup>

It is noteworthy that a very large OR was observed in some personality disorders such as psychasthenia and Sc (36.54 and 30.28), but it cannot be said that these relationships were 36- and 30-folds in the case group, due to a wide CI and small sample size. These only showed a great statistical difference between the case and control groups in personality disorders.

Moreover, both in the case and control groups, almost all participants were abnormal in HY and Pd categories ( $P = 1.0$ ); hence, they were eliminated from calculating OR, and no relationship could be obtained.

Physiological changes in diabetes affect the patients' emotional status.<sup>[20]</sup> On the other hand, based on the current study, if the patients have personality disorders, they have uncontrolled BS, because the psychological symptoms and reactions lead to BS fluctuations<sup>[20]</sup> linked to more complications.<sup>[6]</sup>

Despite all efforts, the sample size was small, especially in the case group, as some of the patients refused to participate in the study and many of them used psychiatric drugs or had other chronic diseases, which were part of the exclusion criteria. Hence, the control group was considered 3 times larger than the case group. In few cases (<5), authors had to ask the participants' families to answer the MMPI-2 retrospectively because they refused to answer due to their poor conditions. It was noteworthy that authors had to consider information bias due to limitation in recall, during filling out of MMPI-2 questionnaire. Furthermore, a very large OR was observed in some personality disorders, which should be judged based on 95% CI. On the other hand, in both categories (HY and Pd), almost all participants had abnormalities and no relationship was obtained. Therefore, further studies, especially RCT and cohort, with larger sample sizes are suggested to prevent such biases and examine if personality disorders prevention and treatment programs can decrease the risk of uncontrolled T2DM.

It was concluded that personality disorders can lead to uncontrolled BS in adult patients with T2DM. Since T2DM is one of the most prevalent chronic diseases in the Iranian population, the current study results suggested physicians to use MMPI-2 questionnaire to find personality disorders in patients with T2DM, and manage it to have better BS control and prevent some of the T2DM complications. Furthermore, the current study recommended more personality disorders screening programs for such patients.

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