

## Depression and Glycemic Control in Type II Diabetic Patients

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### Abstract

**Objective:** Studies reported conflicting results' regarding the status of depression and glycemic control in patients with type II diabetes(T2DM), therefore, this study was performed to determine the relationship between depression and glycemic control in T2DM patients.

**Materials and Methods:** This cross-sectional study was performed on 150 T2DM patients referred to Yazd diabetes research center, 2014. Data were collected by using Beck Depression Inventory. Data collected were analyzed by SPSS-21 with using descriptive statistics and analytical testing at  $\alpha=0.05$ .

**Results** Mean and standard deviation (SD) of age, disease duration and HbA1c levels respectively were;  $58.18\pm 9.63$  years,  $10.83\pm 6.01$  years and  $8.52\pm 1.59$  mg/dl. About 97 patients (64.7%) were women, 88 (58.7%) had hypertension, 57 (38%) hyperlipidemia, 28 (18.7%) good glycemic control. There was no significant relationship between depression status and HbA1c control, hypertension, hyperlipidemia, insulin type and disease duration. Patients with moderate depression status and women had significant relationship with macrovascular complications.

**Conclusion:** Despite the lack of significant relationship between depression status and HbA1c control and given the significant relationship between moderate depression status and HbA1c control with macrovascular complications, it seems are needed more extensive studies.

**Keywords:** Type II diabetes, Depression, Hypertension, Hyperlipidemia, HbA1c.

## Introduction

Type II diabetes (T2DM) is a multifactorial metabolic disorder and identified with chronic hyperglycemia due to impairment of insulin secretion or insulin action, or both (1,2). Diabetes is considered as a major public health problem and responsible for 9% of all deaths worldwide (1-4). Diabetes is the most common

metabolic and endocrine disorder (5). Disabilities due to diabetes are prevalent and one of the main health care problems (6). According to World Health Organization (WHO)-2011 there were 346 million diabetic patients in worldwide, this number will be doubled in 2030 (7). Among people with

diabetes 10 to 15% have type I and 85 to 90% have T2DM (8-10).

According to WHO in 2011 prevalence of diabetes in adult population of Iran was 10.35% (7,11). Prevalence of diabetes in people older than 30 years in Iran, have been reported over than 14% (12). The prevalence of T2DM in population older than 30 years of Yazd was 14.52% (13,14). Costs of diabetes estimated 99 billion dollars annually that including direct costs of health care and indirect costs associated with disability and early mortality (15). Depression is the most common mental disorder and impose too costs as a burden of diseases to health care system. About 10% of the people have experienced at least one period of depression, during their lives. Studies have pointed out 20 to 61% of prevalence depression among student population (17, 16). Prevalence of depression in diabetic patients has mentioned by Mahmodi et al (18) 37% and by Sajadi et al (19) 13.75%. Depression is a mood disorder (20) in depressed person feel; worthless, guilt, loneliness, sadness, hopelessness, inefficiency, dissatisfaction, loss of energy and interest, low self-esteem, changes in appetite and sleep patterns and is unable to feel joy and happiness. Regardless of race, class and social status, depression can occur in any individual (21). According to several studies that has been reported about depression among people with diabetes (24-22). Previous studies reported conflicting results about relationship between depression and glycemic control in T2DM patients (29-25), therefore, this study was performed to determine the relationship between depression and glycemic control in T2DM patients referred to Yazd diabetes research Center in 2014.

## Materials and Methods

This cross-sectional study was performed on 150 patients with T2DM. The systematic random sampling was used. The sample size was determined according to the same study (22) and considered 150 T2DM patients. It should be noted the samples were selected in

such a way that laboratory and clinical variables had done in maximum over a month ago and recorded in their files by physician. Also the complications due to diabetes were examined. The inclusion criteria were; T2DM, having file in diabetes research center, no history of diagnosed mental illness, no history of previous depression due to other factors, no history of other disabling diseases (other than hypertension and hyperlipidemia), if existed one of the following conditions patients were were replaced; imperfect or confound file, dissatisfaction to do research, incomplete, imperfect or confound questionnaire, existed clinical examination and testing finding more than a month. Data were collected by using Beck Depression Inventory (30) ,also the following information was collected; gender (male, female), age (in years), disease duration (in years), type of insulin (oral, NOVO, NPH, LAN), hypertension (yes, no), hyperlipidemia (yes, no) and macrovascular complications (Cardiomyopathy, retinopathy, nephropathy). All laboratory tests were done in one laboratory by the way, kit and similar devices, and clinical examination were done by one specialists (ophthalmologist and endocrinologist in Yazd diabetes research center). Furthermore, with putting a text in the first part of the questionnaire and explaining the purpose of the study, received written consent.

### *Beck Depression Inventory-II*

Beck Depression Inventory-II (31) is new version of Beck Depression Inventory-I (30), that developed after 35 years of experience and research on version I. This questionnaire is self-report. Each part of the questionnaire consists of four phrases that each shows one of the symptoms of depression, low (score was 0) to high (score was 3). Total score is between 0-63. The score zero to 13 considered as no depression, 14 to 19 mild depression, 20 to 28 moderate depression, 29 to 63 severe depression (30). The questionnaire has been used in several studies about examining depression among diabetic's patients (39-32).

This questionnaire is valid and reliable for measuring depression (18,40-42).

After collecting the data and entering them in statistical software SPSS-21 were analyzed by descriptive statistics such as frequency, mean, standard deviation and analytical tests such as the chi-square, ANOVA, independent t-test and correlation at  $\alpha=0.05$ .

## Results

The mean ( $\pm$  SD) of age, disease duration, and HbA1c levels in patients respectively were; 58.18 $\pm$ 9.63 years, 10.83 $\pm$ 6.01 years and 8.52 $\pm$ 1.59 mg/dl. About 53 patients (35.3%) were male and 97 (64.7%) were female. Table 1 showed type of insulin, hypertension, hyperlipidemia, macrovascular complications, HbA1c and depression status.

Analytical results showed that there were no significant relationship between depression and HbA1c control ( $P=0.918$ ), hypertension ( $P=0.54$ ), hyperlipidemia ( $P=0.94$ ), type of insulin ( $P=0.089$ ) and disease duration ( $P=0.089$ ). But there was a significant relationship between depression and macrovascular complications, ( $P<0.001$ ). Patient with moderate depression had more complications (Table 2).

There were no significant relationship between HbA1c control and Hypertension ( $P=0.55$ ), gender ( $P=0.56$ ), age ( $P=0.31$ ) and disease duration ( $P=0.89$ ) but there were significant relationship with type of insulin ( $P=0.005$ ), and macrovascular complications ( $P=0.009$ ) (table 3).

Mean of HbA1c in depressed and non-depressed patients were respectively; 8.49 $\pm$ 1.55 and 8.53 $\pm$ 1.61 ( $P=0.425$ ).

## Discussion

In the present study, there was no significant relationship between depression and HbA1c control. Also in other studies did not report significant relationship, including Parham et al (22), Nejati Safa et al (24), Taziki et al (27), Georgiades et al (25), de Groot et al (26), Kaholokula et al (43). But, Richardson et al (44), Sepehrmanesh et al (34) reported

**Table 1. Studied variables in T2DM patients**

Variable	Frequency	%	
Type of insulin	Oral medication	76	50.7
	NOVO	35	23.3
	NPH	19	12.7
	LAN	20	13.3
Hypertension	Yes	88	58.7
	No	62	41.3
Hyperlipidemia	Yes	57	38
	No	93	62
	No	93	62
Macrovascular complications	Retinopathy	45	30
	Nephropathy	2	1.3
	Cardiomyopathy	10	6.7
HbA1c control	<7	28	18.7
	>7	122	81.3
	No	48	32
Depression Status	Mild	38	25.3
	Moderate	56	37.3
	Severe	8	5.3

significant relationship. The prevalence of depression among diabetics is most common, but it's not considered as important factor in the control of HbA1c.

It should be noted, In other studies, such as Lustman et al (48) depression was related with poor HbA1c control, in Gonzalez et al study (49) Depression was as a risk factor for non-adherence to diabetes self-care and in Hassan et al study (50) depression increased the likelihood of worse glycemic control.

In present study, there was no significant relationship between depression and disease duration. But in other studies Behnam and Ghorbani (23), Taziki et al (27), Salehi et al (36) and Sepehrmanesh et al (34) reported a significant relationship. It seems, these differences can be due to disease prevalence in different populations.

In present study, there was significant relationship between depression and complications which is against mazloomi et al study (45).

In our study, depression was significantly higher in women than men, which was according Anderson et al (46), Sevincok et al (47), Behnam and Ghorbani (23), Mahmodi and Sharifi (18), Sepehrmanesh et al (34), and mazloomi et al (45).

Prevalence of depression in diabetic population in other studies such as Parham et al (22), mazloomi et al (45), Nejati Safa et al

**Table 2. Relationship between depression and macrovascular complications**

Macrovascular complications	Status depression								P-value
	No		Mild		Moderate		Severe		
	n	%	n	%	n	%	n	%	
No	30	62.5	25	65.8	35	62.5	3	37.5	<0.001
Retinopathy	14	29.2	11	28.9	17	30.4	3	37.5	
Nephropathy	0	0	0	0	0	0	2	25	
Cardiomyopathy	4	8.3	2	5.3	4	7.1	0	0	
Total	48	100	38	100	56	100	8	100	

**Table 3. Relationship between HbA1c control with macrovascular complications**

Macrovascular complications	HbA1c control								P-value
	No		Retinopathy		Nephropathy		Cardiomyopathy		
	n	%	n	%	n	%	n	%	
Yes	19	20.4	7	15.6	2	100	0	0	0.009
No	74	79.6	38	84.4	0	0	10	100	
Total	93	100	45	100	2	100	10	100	

(24) Behnam and Ghorbani (23) respectively were 70.7, 64, 28 and 71.6 percent. There was not significant relationship between level of HbA1c control and depressed and non-depressed patients with HbA1c control that it same with results of Parham et al. (22), Nejati Safa et al. (24), Taziki et al. (27), Georgiades et al. (25), Salehi et al. (36).

## Conclusion

Despite the lack of significant relationship between depression status and HbA1c control and the significant relationship between moderate depression status and HbA1c control

with macrovascular complications, more extensive studies are needed.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

## References

- Mazloomi Mahmoodabad SS, Hajizadeh A, Alaei MR, Mirzaei Alavijeh M, Afkhami AM, Fatahi M. Status of Preventive Behavioral in at Risk Persons Type II Diabetes: Application of the Health Belief Model. *Journal of Diabetes & Lipid Iran* 2012;11(6):544-50.
- Jalilian F, Mirzaei Alavijeh M, Emdadi Sh, Nasirzadeh M, Barati M, Hatam-Zadeh N. Quality of life in women diabetics' patients: the study of self efficacy. *J Health Syst Res*, 2012;7(6):1013-9.
- Jalilian F, Zinat Motlagh F, Solhi M. Effectiveness of Education Program on Increasing Self Management among Patients with Type II Diabetes. *Scientific Journal of Ilam University of Medical Sciences*, 2012;20(1):26-34.
- Ahmadi A, Hasanzadeh J, Rajaefard A. Metabolic Control and Care Assessment in Patients with Type 2 Diabetes In Chaharmahal & Bakhtiyari Province 2008. *Iranian journal of endocrinology and metabolism (IJEM)* 2009;11(1):33-9.
- Azizi F, Hatemi H, Janghorbani M. *Epidemiology and Communicable disease control in Iran*. Tehran: Eshtiagh publication 2000;32.
- Morowatisharifabad M, Rouhanitonekaboni N. Perceived Severity and Susceptibility of Diabetes Complications and its Relation to Self-care Behaviors among Diabetic Patients. *Journal of Armaghane danesh*, 2007;12(3):59-68.
- Diabetes. World Health Organization Media center. Geneva; 2011 [cited27may2012]. Available From: <http://www.who.int/media center/ fact sheets/ Fs312/en/index.html>.
- Mazloomi S, Mirzaei A, Afkhami M, Baghiani Moghadam M, Falahzadeh H. The Role of Health Belief Model in Preventive Behaviors of Individuals High- Risk of Type 2 Diabetis Mellitus. *Journal of Shheed Sadughi University of Medical Sciences & Health Services* 2010;18(1):24-31.

9. Kara M, Van der Bijl JJ, Shortridge-baggett LM, Asti T, Erguney S. Cross-cultural adaption of the diabetes management self efficacy for patent white type 2 diabetes mellitus. *Int J Nurse Stud*, 2006;43(5):611-21.
10. Tover JH, Skelly AH, Holdich-davis D, Dunn PF. Perceptions of health and their relationship to symptoms in African American women with type 2 diabetes. *Applied Nursing Research* 2001;14(2):78-80.
11. Shirinzadeh M, Shakerhosseini R, Hoshiyar rad A. Nutritional Value Assessment and Adequacy of Dietary Intake in Type 2 Diabetic Patients. *Iranian journal of endocrinology and metabolism (IJEM)* 2009;11(1):25-32.
12. Delavari AR, Mahdavi AR, Norozinejad A, Yarahmadi SH. *Country Program of prevention and control of diabetes., Second Edition*. Tehran: Center publishing Seda; 2004;2.
13. Mohammadi m, Rashidei m, Afkhani M. risk factors of type 2 diabetes. *Journal of Shahid Sadoughi University of Medical Sciences* 2011;19(2):266-80.
14. Zinat Motlagh F, Sharifirad Gh, Jalilian F, Mirzaei Alavijeh M, Aghaei A, Ahmadi Jouibari T. Effectiveness of Educational Programs to Promote Nutritional Knowledge in Type II Diabetes Patients based on Health Belief Model. *J Health Syst Res* 2013;9(4):412-20.
15. Smeltzer SC, Bare BG. *Brunner and Suddarth's textbook of medical-surgical nursing*, 9th edition. Lippincott Williams & Wilkins, 2000.
16. Zarepoor F, Kamali M, Alagheband M, Gheisari M, Sarlak SH. Evaluation of depression and its relationship to exercise in women over 20 years. *J Shahid Sadoughi Univ Med Sci* 2012;20(1):64-72.
17. Mohammad Beigi A, Mohammad Salehi N, Ghamari F, Salehi B. Depression symptoms prevalence general health status and its risk factors in dormitory students of Arak Universities in 2008. *Arak Medical University Journal* 2009;12(3):116-23.
18. Mahmodi A, Sharifi A. Comparison Frequency and Factors Associated with Depression in Diabetics and Non Diabetics Patients, 2008;6(2):88-93.
19. Sajjadi SA, Bakhshani NM, Lashkaripoor K, Baghban-Haghighi M, Samadi R, Safarzai M. Prevalence of psychiatric disorders in patients with diabetes type 2. *Zahedan J Res Med Sci (ZJRMS)* 2012;14(1):82-5.
20. Jalilian F, Emdadi Sh, Karimi M, Barati M, Gharibnavaz H. Depression among College Students; The Role of General Self-Efficacy and Perceived Social Support. *Sci J Hamadan Univ Med Sci* 2012;18(4):60-6.
21. Sharifi KH, Sooki Z, Khademi Z, Hosseynian M, Tagharrobi Z. Prevalence of depression and its contributing factors among Kashan medical university students. *Journal of Kashan University of Medical Sciences* 2000;4(4):54-8.
22. Parham M, Hosseinzadeh F, Hajizadeh J, Norouzinezhad GhH. Depressive Symptoms and Glycemic Control in Patients with Type 2 Diabetes: Is There Any Relationship? *J Isfahan Med Sch* 2013;31(256):1649-56.
23. Behnam B, Ghorbani R. Epidemiologic features of depression in non-insulin dependent diabetic patients in Semnan. *Pejouhesh*, 2005;29(1):45-49.
24. Nejati Safa AA, Larijani B, Shariati B, Amini H, Rezagholizadeh A. Depression, quality of life and Glycemic control in patients with diabetes. *Iran J Diabetes Lipid Disorder*, 2007;7(2):195-204.
25. Georgiades A, Zucker N, Friedman KE, Mosunic CJ, Applegate K, Lane JD, et al. Changes in depressive symptoms and Glycemic control in diabetes mellitus. *Psychosom Med*, 2007;69(3):235-41.
26. de Groot M, Jacobson AM, Samson JA, Welch G. Glycemic control and major depression in patients with type 1 and type 2 diabetes mellitus. *J Psychosom Res* 1999;46(5):425-35.
27. Taziki SA, Bazrafsan HR, Behnampour N, Paviz M. Relationship between depressive's symptoms and diabetes. *J Gorgan Uni Med Sci* 2001;3(2):59-64.
28. Richardson LK, Egede LE, Mueller M, Echols CL, Gebregziabher M. Longitudinal effects of depression on glycemic control in veterans with Type 2 diabetes. *Gen Hosp Psychiatry* 2008;30(6):509-14.
29. Beck AT, Steer RA, Brown G.K. *Manual for the Beck Depression Inventory- II*. The Psychological Corporation. Harcourt Brace & Company San Antonio. 1996.
30. Beck AT, Ward CH, Mendelson M, Mock JD, Erbaugh J. An inventory for measuring depression. *Arch General Psychiatr* 1961;4:53-63.
31. Lustman PJ, Griffith LS, Clouse RE, Freedland KE, Carney RM. Screening for Depression in diabetes using the Beck Depression Inventory. *Psychosomatic Medicine* 1997;59:24-31.
32. Sevincok L, Guney E, Uslu A, Baklaci F. Depression in a sample of Turkish type 2 diabetes patients. *European Psychiatry* 2001;16:229-31.
33. Larijani B, Khoramshahi B, Khalili M, Bandariyan F, Akhondzadeh SH. Determining the the relationship between diabetes and depression in diabetic patients referred to diabetes clinic of Shariati Hospital and Diabetes associations. *Iranian Journal of Diabetes and Lipid Disorders*, 2003;3(1):77-82.
34. Sepehrmanesh Z, Sarmast H, Sadr S, Sarbolouki S. Prevalence and severity of depression in diabetic subjects. *KAUMS Journal (FEYZ)*, 2003;7(3):69-75.



35. Ranjbar KH, Sharif F, Dejbakhsh T. Frequency and severity of depression in adult patients with diabetes Pills and insulin Consumer. *Hormozgan Medical Journal*, 2005;10(4):363-9.
36. Salehi B, Rezvanfar M, Shirian F. The relation of HbA1C Levels and major depression in patients with type 2 diabetes mellitus, referring to endocrine clinic of Arak. *Arak University of Medical Sciences Journal*, 2007;10(3):58-65.
37. Aghaei E, Bakhtiyari A, Jamali S. Stress management group therapy on depression and blood pressure in women with hypertension. *Journal of Health Psychology*, 2014;2(2).
38. Taziki SA, Bazrafshan HR, Behnampour N, Paviz M. Relationship between depressive's symptoms and diabetes. *J Gorgan Uni Med Sci*. 2001;3(2):59-64.
39. Azkhosh M. Application of psychological tests and clinical diagnosis. Tehran, Iran: Ravan Publication; 3rd ed. 2008;26-224.
40. Dabson KS, Mohammadkhani P, Massah Choolabi O. Psychometric the Beck Depression Inventory-2 in a large sample of patients with major depressive disorder. *Quarterly Journal of Rehabilitation*, 2007;8(2):82.
41. Spitzer R.L, Williams JB, Gibbon M, First M.B Structured Clinical Interview for DSMIV, Clinical version (SCID-CV) New Yourk 1994.
42. Kaviyani H. Study of validity and reliability of hospital scale on anxiety and depression (HADS) 'general health questionnaire (GHQ28) 'mood adjectives checklist and Beck depression inventory in clinical and nonclinical populations 'Research Report, Tehran University of Medical Sciences, Roozbeh Hospita 2009.
43. Kaholokula JK, Haynes SN, Grandinetti A, Chang HK. Biological, psychosocial, and sociodemographic variables associated with depressive symptoms in persons with type 2 diabetes. *J Behav Med*, 2003;26(5):435-58.
44. Richardson LK, Egede LE, Mueller M, Echols CL, Gebregziabher M. Longitudinal effects of depression on glycemic control in veterans with Type 2 diabetes. *Gen Hosp Psychiatry*, 2008;30(6):509-14.
45. Mazloomi S, Mirzaei A, Mohammadi S. Study of Depression Prevalence in the Patients with Type II Diabetes Referring to Yazd Diabetes Research Centers. *Toloo e behdasht*, 2008;7(1,2):30-6.
46. Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes a meta-analysis. *Diabetes care*, 2001;24(6):1069-78.
47. Sevincok L, Guney E, Uslu A, Baklaci F. Depression in a sample of Turkish type 2 diabetes patients. *European psychiatry*, 2001;16(4):229-31.
48. Lustman PJ, Clouse RE. Depression in diabetic patients: the relationship between mood and glycemic control. *Journal of Diabetes and its Complications*, 2005;19(2):113-22.
49. Gonzalez JS, Safren SA, Cagliero E, Wexler DJ, Delahanty L, Wittenberg E, Grant RW. Depression, Self-Care, and Medication Adherence in Type 2 Diabetes Relationships across the full range of symptom severity. *Diabetes care*, 2007;30(9):2222-7.
50. Hassan K, Loar R, Anderson BJ, Heptulla RA. The role of socioeconomic status, depression, quality of life, and glycemic control in type 1 diabetes mellitus. *The Journal of pediatrics*, 2006;149(4):526-31.