

Journal of Client Care

An International Nursing Journal

ISSN: 2476-6682



Received: 22 January 2016 • Accepted: 19 March 2016

Research

doi:10.15412/J.JCC.02010103

Study of Depression and Anxiety in Type II Diabetic Clients Presenting to Yazd Diabetes Research Center Clinic and Its Correlation with HBA_{1c}



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ABSTRACT

Diabetes is associated with many psychosomatic complications. Depression and anxiety are among the most common psychological disturbances in diabetic patients, affecting both the course of treatment and altering the prognosis of patients. It also may impair metabolic control in diabetics. Unfortunately, the findings of research in this field are controversial, so regarding the significance of this issue, the present study aimed at determining the rates of depression and anxiety among type II diabetic patients and their correlation with HBA_{1c}. This was a descriptive-correlational study conducted on 240 patients visiting the clinic of Yazd Diabetes Research Center using a three-part questionnaire including demographic information, Spielberger's Anxiety Questionnaire, and Beck's Depression Inventory through interview by the researcher and during three months. The data were collected and analyzed using SPSS. The mean scores of anxiety and depression for the subjects were 29.01±13.64 and 22.68±13.79, respectively, indicating high amounts of anxiety and depression in diabetic patients. Finally, a statistically significant correlation was found between anxiety and depression on one hand, and HBA_{1c}, on the other hand (P=0.008). Considering the high frequency of depression and anxiety in diabetic patients and its correlation with HBA_{1c}, psychological consultation for improving the metabolic control of these patients seems to be necessary.

Key words: Anxiety, depression, diabetes, HBA_{1c}.

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Journal of Client Care is published by *Lexis Publisher*; Journal p-ISSN xxxx-xxxx; Journal e-ISSN 2476-6682.

1. INTRODUCTION

Diabetes mellitus is a common chronic metabolic disorder characterized by an increase of blood sugar level due to disturbance in insulin secretion or insulin functioning or both, and some impairment in the metabolism of carbohydrates, fats, and proteins. It is also associated with several macro vascular and micro vascular complications (1, 2). Based on scientific estimations so far, the global incidence of diabetes in individuals aged 20-79 years has been 285 million people in 2010, with a 6.4% increase. It is estimated that it will affect 439 million people in 2030, with a 7.7% increase. The affliction rate will be 69% in the developing and 20% in the developed countries during 2010-2030 (3). A review article

demonstrated that the frequency rate of diabetes has increased by 127% since 1980 and it is speculated that another 54% increase will be observed by 2030 (2, 4). The incidence of diabetes, specifically in the Middle East, will increase considerably till 2030 and Iran, as one of highly populated countries of the region, will rank second after Pakistan regarding the incidence of diabetes (3, 5). Based on the estimations of WHO specialists, the rate of incidence of diabetes in Iran in 2000 and 2025 will be 5.7% and 6.8%, respectively. It will also afflict 1,977,000 and 5,125,000 individuals based on the diabetic population in the country (6). Yazd is considered as one of the provinces with a very high rate of diabetes. The rate of prevalence of type II diabetes in Iran has been 4-4.5% in 2003. This rate was 14% in Yazd in the same year (7). It

has increased by 18% in 2013, according to some informal statistics. This disorder is associated with many physical and somatic complications such as cardiovascular complications, ocular side-effects, and renal untoward sequelae. It is also accompanied by psychological traumata. Based on some recent epidemiological evidence, one-third of diabetic patients suffer from slight to severe psychological complications (8-11). Depression is one of the most common complications of diabetes among these patients and it not only affects the course of treatment, but also alters the prognosis of patients. Two statistical meta-analyses reported that diabetic persons are afflicted with depression by 15-24% more frequently than normal individuals (11, 12). Another study in 2013 investigated 47 countries and found that except for Africa, the global prevalence of an episode of depression symptoms in diabetics is twice greater than in normal individuals (13). Collins et al. (2008) asserted that the frequency of anxiety and depression in diabetics has been 32% and 22.4% respectively (14). The prevalence of depression and anxiety in diabetic patients is significant in Iran. A study conducted in Kashan, Iran, in 2003 revealed that 53.3% of the cases studied suffered from depression (15). Furthermore, a study reported that the prevalences of radical depression (major depression) and anxiety disturbances in diabetic patients in Zahedan, Iran, were 13% and 6.25%, respectively (16). Moreover, based on the results of some studies conducted in Iran, 78% of the cases in Mashhad and 25% of the cases in Isfahan suffered from anxiety (16). According to the results of a study in 2007, the prevalence of depression among diabetic patients was 64% in Yazd (17). The correlation between anxiety, depression, and diabetes has been verified by various studies conducted so far. Based on the results of two meta-analysis papers, it could be said that depression and diabetes are correlated (18, 19). Indeed, depression is considered as one of the risk factors involved in affliction with diabetes mellitus. On the other hand, it is considered as one of the psychological complications of diabetes (20). As consequences of affliction with diabetes, anxiety and depression may be induced in these patients by problems as the necessity for a change in life style and diet, daily measurement of blood sugar level, daily administration of insulin, chronic somatic complications, hospitalization, and reduced life span (21). Also, two other meta analyses showed that diabetic patients are more frequently affected by mental consequences of depression and anxiety by 15-24% (11, 12). On the other hand, depression associated with inappropriate health behaviors like sedentary living and inactivity, bingeing, smoking, etc., can be considered as risk factor of affliction with diabetes (12). Another meta-analysis in 2006 suggested that depressed individuals are affected by diabetes by 37% more frequently than others (22). Mezuk et al. (2008) reported in their study that depression enhances the chance of affliction with diabetes by 60% while diabetes plays a role in the incidence of depression with a moderate risk probability (12).

Additionally, some studies show that there is a relationship between metabolic control in diabetics and anxiety and depression. In fact, depression is correlated with high levels of HBA_{1c} in diabetic patients and the depressed diabetic patients manifest a weaker metabolic control (23-26). However, some other studies did not report such a finding (27, 28). Anxiety and depression lead to a decreased life quality in diabetics and is associated with increased mortality and morbidity rates due to lack of blood sugar level control, inadequacy in self-care, increased incidence of diabetes side-effects, and increased treatment cost (29-32). On the other hand, interventions for treating anxiety and depression in diabetic patients have resulted in improved metabolic control, optimal blood sugar control, and reduced diabetes consequences (23, 33). Considering the significance of this issue, high prevalence of diabetes in Yazd, controversial findings of some present studies on the correlation between depression, anxiety, and metabolic control of diabetics, and also considering that depression is one of the most common psychological disturbances of diabetes, the present study focused on determining the rate of depression and anxiety in type II diabetic patients presenting to Yazd Diabetes Center and finding its correlation with the rate of HBA_{1c}. It is hoped that our findings will be effective in decreasing the psychological consequences of diabetes and improving metabolic status.

2. MATERIALS AND METHODS

This was a descriptive-correlational study carried out using a cross-sectional design. It measured the frequency of depression and anxiety in type II diabetic patients visiting Yazd Diabetes Center and its correlation with HBA_{1c}. Sample volume was determined based on the studies conducted previously, the prevalence of depression in diabetic patients and also the previous data regarding the prevalence of depression in Yazd using the sample volume formula with $P=45\%$, $\alpha=0.05$, and $d=0.06$. In this way, a total of 240 samples were obtained. The population of this study was consisted of all patients visiting diabetes treatment centers in Yazd. Inclusion criteria of the subjects were definite diagnosis of diabetes and use of local diabetes centers, and the exclusion criteria were a positive history of mental disorders, use of psychoneurotic drugs, and being non-local. The instrument included three sections: the first section included demographic information such as age, gender, family history of diabetes, duration of affliction with diabetes, education level, occupation, marital status, place of residence, history of smoking, history of mental disorders, the last FBS test, and the last HBA_{1c} test. The second section of the questionnaire was Beck's Depression Scale which proved to be valid, reliable, culture-free ($r=80\%$), and applicable to different social strata around the world based on many studies conducted on its validity and reliability. It consists of 21 four-choice items each having a range of 0-3 points and the total score of items is 63. In this scale, a score

smaller than 10 indicates lack of depression, a score of 10-19 indicates mild depression, a score of 20-25 indicates moderate depression, and a score greater than 26 shows major or severe depression (34). The third section of the questionnaire was Spielberger's Anxiety Scale which consisted of 20 four-choice items. Each item could be assigned 1-4 points and the total possible score is 80. In this scale, a score smaller than 20 indicates absence of anxiety, a score of 20-40 shows slight anxiety, a score of 40-60 displays moderate anxiety, and a score of 60-80 suggests acute or severe anxiety. In Nazemian's study, the reliability coefficient of this test was 89% (35). To carry out the sampling of the subjects, regarding the volume of the patients visiting the center and the ability and possibility of weekly filling of the questionnaires, three days of the week were selected randomly for the whole period of the study. In these days, all the qualified patients in the center whose numbers ended in an even digit were interviewed. The questionnaires were completed by an interviewer through interviewing the subjects after explaining the study design and course of research to the subjects and obtaining their informed written consent. To measure the FBS and HBA_{1c} of the patients, 2 ml of the patients' blood was sent to the laboratory of Yazd Diabetes Center located at the Center itself and the results of the tests were recorded in the questionnaire after the required follow-up. At the completion of the procedures, the data were collected and analyzed using SPSS via Chi-square and Pearson Correlation Coefficient tests.

3. RESULTS AND DISCUSSION

In this study, a total of 240 patients with definite diagnosis of type II diabetes visiting Yazd Diabetic Center were studied. 10 patients were excluded from the study for lacking the inclusion criteria. Of the 240 qualified patients, 140 cases were female and 100 cases were male. The mean age of the samples was 55.60±9.55 years. Most of the subjects, i.e., 103 patients (43%), were aged 50-59 years. All the subjects were married and almost 60% (59.2) of them were illiterate. Regarding occupation, 8.8% of the participants were employed in offices and 5.5% were manual laborers. Also, 79.2% of the patients had free jobs. 173 (72%) patients had a positive history of familial

diabetes. Regarding the duration of affliction with diabetes, 32% of the patients had a history of affliction of less than 5 years. Overall, 56.7% of the patients had an affliction history of less than 10 years. The history of smoking and drug addiction was less than 10% among the patients. The mean FBS of the patients was 167.35±48.94mg/dl. Furthermore, 156 (65%) patients had an FBS value between 126 and 200 mg/dl. Also, the FBS of 47 (19.5%) patients was reported to be greater than 200 mg/dl. Regarding Glycolyzed hemoglobin (HBA_{1c}), 54 patients showed hemoglobin a value of less than 7, 138 (57.5%) patients had a value between 7 and 10, and 48 patients had a value greater than 10 indicating that more than 70% of the subjects had high HBA_{1c} (mean= 8.46±1.88). The anxiety score of the patients was 20-40 (mild anxiety) in 55% of the cases and less than 20 in 24.5% of the cases. The mean score of anxiety was 29.01±13.64. Also, the mean score of depression was 22.68±13.79. The depression score was less than 10 for 18% of the subjects, 10-19 for 30.5% of the subjects, and 20-25 for 15.5% of the subjects. Additionally, 87 (36.5%) patients had the highest depression score, i.e., greater than 25. Using the chi-square test, the correlations between anxiety and age, and depression and age were not statistically significant with P=0.635 and P=0.634, respectively. Yet, the correlations between anxiety and gender, and depression and gender were significant at P=0.0001. Moreover, the frequency of anxiety was 30% for females and 7% for males. Also, the frequency of depression was 46% for females and 22% for males indicating that the frequency of anxiety and depression was greater among female diabetics compared to males. Based on chi-square test results, the correlations between anxiety and diabetes affliction time and between depression and diabetes affliction time were not statistically significant at P=0.336 and P=0.237, respectively. Using chi-square test, there was no significant correlation between anxiety and FBS, and depression and FBS; yet, there was a significant correlation between anxiety and HBA_{1c} (P=0.001) and depression and HBA_{1c} (P=0.002). Using Pearson Correlation Coefficient, a statistically significant correlation was found between anxiety and depression (P=0.001), FBS and HBA_{1c} (P=0.0001), HBA_{1c} and anxiety (P=0.01), and HBA_{1c} and depression (P=0.001) (Table 1 and Table 2).

Table 1. Correlation between anxiety and HBA_{1c}

Anxiety	Less than 20	21-40	41-60	61-80	Total
HBA_{1c}					
Less than 7	21 (35.6)	30 (22.7)	2 (6.2)	1 (5.8)	54 (32.5)
7-10	30 (50.8)	74 (56.1)	25 (78.1)	9 (52.6)	138 (57.5)
Greater than 10	8 (13.6)	28 (21.2)	5 (15.6)	7 (41.1)	48 (20)
Total	59	132	32	17	240

Table 2. Correlation between depression and HBA_{1c}

Depression	HBA _{1c}				
	Less than 10	10-19	20-25	Greater than 25	Total
Less than 7	12 (27.9)	22 (30.1)	12 (32.4)	8 (9.2)	54 (22.5)
7-10	27 (62.8)	37 (50.7)	17 (45.9)	57 (65.5)	138 (57.5)
Greater than 7	4 (9.3)	14 (19.2)	8 (21.6)	22 (25.3)	48 (20)
Total	43	73	37	87	240

Based on the results of the present study 36.7% of the patients had a depression score greater than 25 including 22% males and 46.6% females. This finding shows the high rate of prevalence of depression in type II diabetic patients compared to the common population where the depression rate is 5-12% for males and 10-25% for females (7). This finding is consistent with similar studies conducted in this field. Collins et al. (2009) reported the prevalence rate of depression among diabetic patients to be 22% (14). Anderson et al. (2001) concluded in their study that the prevalence of depression among diabetics was twice greater than non-diabetics (21). Nouwen and co-workers (2010) reported in a meta-analysis that diabetic individuals are afflicted with depression by 15-24% greater frequency compared to other healthy individuals (11). The study by Mazloomi et al. (2007) demonstrated that the prevalence of depression among diabetics was 64% (17). Also, the study by Mahmoodi et al. (2007) conducted in Urmia to compare the prevalence of depression-related risk factors among diabetics and non-diabetics, reported the prevalence of depression to be 77% among the diabetic group (36). In this study, 55% of the samples showed an anxiety score of 21-40, indicating slight anxiety and 20.5% of the samples showed an anxiety score greater than 41, displaying moderate to severe anxiety. In the study by Lee et al. (2008), the diabetic patients were anxious 20% more than non-diabetics (37). The study by Collins et al. (2008) revealed that 32% of the patients suffered from mild to severe anxiety (14). Taheri et al. (2011) announced in their study that 56.9% of the subjects were had moderate anxiety (38). The present study demonstrated that the prevalence of anxiety and depression among female diabetics is greater than the male diabetics which is consistent with the findings of similar researches. In a similar study, the prevalence of depression among diabetic women was 1.4 times greater than in diabetic men (17). In Salehi et al.'s study, the prevalence of depression in females was 7.5 times greater than in males (28). The study by Holt et al. reported the prevalence of depression among diabetic women to be greater than diabetic men (39). Furthermore, the study by Taheri et al. (2012) showed that the prevalence of anxiety in women was greater than in men (38). Moreover, the study by Anderson et al. (2001) showed that the prevalence of depression in women was greater than in men (19). These findings collectively indicate that diabetic females with higher risks of affliction with anxiety and depression suffer more

frequently from diabetes complications and require higher amounts of psychological consultation and guidance. The results of the present study showed that 59.2% of the samples were illiterate, having a higher score of anxiety and depression compared to literate individuals, which is consistent with the findings of similar studies. The study by Fisher et al. (2001) suggested that the education level of diabetic patients affected the incidence of depression in these patients so that the literate persons were less frequently affected by anxiety and depression (40). Another research showed that the frequency of depression was greater in the illiterate diabetic patients compared to the literate diabetics (17). Sajjadi et al. also reported that 71% of the illiterate samples were suffering from psychological disorders including anxiety and depression (16). It seems that educated individuals are more able to cope with the diabetes-induced stress. The present study showed a significant correlation among anxiety, depression, and HBA_{1c} levels meaning that diabetics with weaker metabolic control with HBA_{1c} level of 7-10 or more were greatly affected with anxiety and depression. Also, diabetics with a better metabolic control had a smaller score of anxiety and depression. The study by Engum et al. conducted during 1995-1997 showed that as HBA_{1c} level decreased, the risk of affliction with depression decreased (41). Lustman et al. reported, in two separate studies conducted in 2000 and 2005, that there is a direct correlation between weak metabolic control and the probability of affliction with depression (23, 25). Another study by Bot et al. (2013) demonstrated that symptoms of depression are correlated with higher levels of HBA_{1c} (26). Baumeister et al. (2014) reported that treatment of psychological disorders such as depression can improve metabolic control in diabetic patients (33). The findings of this study are consistent with ours. However, some other studies did not report such a correlation between HBA_{1c} levels, anxiety, and depression. Astle (2007) reported, in a review article, that there is no correlation between weak metabolic control and increased risk of depression in diabetic patients (27). Also, Salehi et al. (2007) investigated the correlation between HBA_{1c} levels and depression in Arak, Iran, and found no significant correlation between the two variables (28). Trief (2003) found no significant correlation between HBA_{1c} level and depression in New York (42). Taziki et al. (2000) also did not find any significant correlation between HBA_{1c} level and depression in Gorgan (43). Nejati Safa et al. (2007)

also reported that there was no correlation between depression and metabolic control (44). One of the reason for differences in findings is the use of different assessment tools in different studies. Fisher et al. (2014) state in their review article that according to some studies, some depression symptoms are significantly correlated with weak metabolic control, while other studies couldn't approve these results. Additionally, some of the interventions performed to treat anxiety and depression in diabetic patients leading to reduced anxiety and depression, were not effective in improving metabolic control. In Fisher's opinion, these controversial results may be attributed to lack of appropriate operational definition of depression, unsuitable use of the term and consideration of its severity and acuity in diabetic patients. In fact, Fisher uses the innovative term "diabetic distress" which includes anxieties and stresses related to treatment and the chronic nature of the disease (45). Although many researches have been conducted in this field so far, it seems that far more research with similar methodology is required to reach consistent uncontroversial results.

4. CONCLUSION

Based on the findings of the present study, it could be asserted that diabetic patients are at high risk of affliction with anxiety and depression correlated with HBA_{1c} level. So, it seems to be essential to plan for psychological counseling and care for anxiety and depression and metabolic control in diabetic patients.

FUNDING/SUPPORT

This project received grant number (id: 1511) by Yazd Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

ACKNOWLEDGMENT

We should thank the staff at the clinic of Yazd Diabetes Research Center specially Mrs. Khoshkam, the nurse of the center, and Mrs. Azodi, manager of the laboratory of this center in Yazd who helped us greatly in collecting the required data.

AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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doi: 10.15412/J.JCC.02010103



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