ORIGINAL ARTICLE

Correlation of HbA1c and Major Depressive Disorder in Type 2 Diabetic Patients

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ABSTRACT

OBJECTIVE: To evaluate the relation between major depressions and glucose control index in type 2 diabetes mellitus.

MATERIALS AND METHODS: One- hundred thirty four patients with type 2 diabetes were enrolled in this study. Hamilton Rating Scale for Depression (HAM-D) and HbA1c were measured in patients. Linear mixed-model analysis was applied to determine the relation between HbA1c levels and depressive symptoms.

RESULTS: Groups of patients with and without depression were similar in age and BMI. Correlation analysis revealed no significant relationship between HAM-D scores and HbA1c level. Depressive scores were significantly higher in diabetic patients with hypertension (P = 0.0001) and on insulin treatment (P = 0.005). There was a significant positive relationship between HAM-D scores and disease duration. ($P < 0.01$).

CONCLUSION: The findings of this study showed that there was no significant association between the level of depressive symptoms and HbA1c in patients with type 2 diabetes.

KEYWORDS: Major Depression, Glycemic control, Type 2 diabetes, HbA1c.

INTRODUCTION

Diabetes mellitus is a significant risk factor for depression. Recent prevalence studies suggested that approximately 15% of all patients with diabetes suffer from clinical depression, and even a greater percentage (about 30%) suffer from some sort of psychiatric disturbances (1). However, there is significant controversy over if depression in patients with diabetes is associated with poor glycemic control.

Some investigators have found moderate to strong associations (2,3) between depressive symptoms and hemoglobin (HbA1c), although others have found no relationship (4,5). A study found that there is statistically significant correlation between depression and hyperglycemia in both type 1 and type 2 diabetes (6).

Some other cross-sectional studies have found a significant positive correlation between depressive symptoms and HbA1c in patients with Type 1 diabetes but not in type 2 diabetes (7,8).

Since there are few reports about the association between a well-standardized measure of depressive symptoms and an established index of glycemic control in Iran, this study was conducted to examine the rate of current depressive symptoms in a sample of individuals with type 2 diabetes.

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MATERIALS AND METHODS

Patients with Type 2 diabetes presenting for routine care at the Endocrinology Clinic were asked to participate in this study.

All patients gave informed consent. We excluded the following patients: 1) current or prior history of psychiatric diagnosis because the use of psychoactive medication could not be determined; 2) history of thyroid disease, malignancy, liver insufficiency, renal failure, coronary artery disease, cerebrovascular disease, dementia, pregnancy, recent infection or illness that could have affected glucose control. The final sample contained 134 patients with type 2 diabetes. Demographic characteristics of the patients are presented in Table 1.

Glycemic control was assessed by HbA1c, a generally accepted index of the average blood glucose level over the last 12 to 16 weeks. HbA1c was measured by use of ion-exchange high-performance liquid chromatography, a methodology that measures only the A1c fraction of glycohemoglobin (reference range 4.3%–6.0%).

Demographic information, height, weight, drug and medical history as well as results of the routine measurement of HbA1c performed during the clinical visit, were obtained from the medical record after visiting the patients. Depression was screened by Hamilton Rating Scale for Depression (HAM-D), by a well-trained research interviewer (9). Scores above 17 have been assigned as depression.

All values were presented as a mean ± standard deviation (SD) and differences were compared using T-test and also linear regression for other variables.

The study was conducted in accordance with the declaration of Helsinki and subsequent revision and was approved by both Ethics and Research Steering Committee at the Research Deputy of Arak University of Medical Sciences. Statistical significance was declared for $P < 0.05$

RESULTS

134 patients from 252 participants provided informed consent and completed the study survey. Patient characteristics are presented in Table 1. Only 15 patients (11.2%) met the HAM-D criteria for a diagnosis of major depression (HAM-D score >17).

The relationship between the depression screening result and other variables are presented in Table1.

Table 1- Sociodemographic characteristics by major depression grouping

	Major depression *n = 15 (%)*	***No Depression (%)*** *n = 119 (%)*	***Statistic***	***P Value***
Age (mean year ± SD)	54 ± 10.39	50.7 ± 8.56	Unpaired T-test; t = 0.82	0.123
BMI (kg/h²)	25.43 ± 8.15	27.97 ± 5.7	Unpaired T-test; t = 1.08	0.29
Sex			$X^2 = 44$	0.0001
Male	1 (6.6)	41 (34.4)		
Female	14 (93.4)	78 (65.6)		
Marital status			$X^2 = 14.26$	0.003
Single	1 (6.6)	1 (0.8)		
Married	8 (53.4)	106 (89)		
Divorced	1 (6.6)	3 (2.6)		
Widowed	5 (33.4)	9 (7.6)		
Income			$X^2 = 5.96$	0.051
Poor	2 (13.3)	3 (2.5)		
Average	10 (66.7)	67 (56.3)		
Good	3 (20)	49 (41.2)		
Education (year± SD)	2.73 ± 3.88	7 ± 5.22	Unpaired T-test; t = 3.84	0.0001
Residency			Fisher Exact test; $X^2 = 1.63$	0.193
Urban	12 (80)	108 (90.8)		
Rural	3 (20)	11 (9.2)		

Table 2 - Glucose control and Medical history characteristics by major depression grouping

	Major depression n = 15 (%)	No Depression (%) n = 119 (%)	Statistic	P Value
Glucose control Index			$X^2 = 008$	0.58
Hb A1c < 7	6 (40)	49 (41.2		
HbA1c ≥ 7	9 (60)	70 (58.8)		
Insulin therapy	7 (46.7)	17 (14.3)	$X^2 = 10.47$	0.005
Diabetes duration			$X^2 = 10.20$	0.005
>5 year	7 (46.7)	35(29)		
Hyperlipidemic	4 (26.7)	36(30.2)	$X^2 = 25.6$	0.0001
Hypertensive	8 (53.3)	32(26.9)	$X^2 = 14.44$	0.0001

Major depression was significantly associated with marital status (P = 0.003), lower education level (P = 0.0001), longer duration of diabetes mellitus (P = 0.005), insulin injection (P = 0.005), uncontrolled hypertension (P = 0.0001) and hyperlipidemia (P = 0.001), but it was not significantly associated with the age of patient, BMI and places of residence. Depression was more prevalent among women with diabetes than men (P = 0.0001).

To explore the relation between HAM-D criteria and glucose control, we compared subsamples of patients with high (≥7%) and low (<7%) baseline HbA1c (Table 2). The high HbA1c subgroup (total n = 79) had a mean baseline HbA1c of 8.9% ± 0.78% compared with 6.4% ± 0.58% for the low subgroup (total n = 55). Of 15 patients with major depression, 6 (40%) had low HbA1c and 9 (60%) had high HbA1c. There was no significant relation between major depression and glucose control index.

DISCUSSION

The results of the present study show that major depression as measured by the HAM-D score is significantly correlated with duration of type 2 diabetes and mean values of insulin injection, but there is no significant correlation between depression and HbA1c. These results contradict the findings of some earlier studies and raise questions about the link between depressive mood and glycemic control in diabetes.

Although prior evidence for a link between depressive symptoms and metabolic control has been provided primarily by cross-sectional studies, several prospective studies have examined the effects of treatment-related improvement of depressive symptoms on diabetes control, but results were mixed. Some of these studies were complicated by the fact that patients were treated with pharmacologic agents that may have had direct effects on metabolic control (6,10).

A study of patients with type 2 diabetes reported a difference in effects of cognitive behavior therapy between treatment and control at 6-month follow-up that was due as much to deterioration in the control group as to improvements with treatment (11). Thus, the evidence of a link between depression and glycemic control has been modest at best, and our current findings raise further doubts about this hypothesized relationship.

Although it was not the focus of the present study to test any possible mechanisms by which depression and glycemic control could be related, we observed that patients with longer duration of diabetes, especially those on insulin therapy had higher HAM-D score. Diabetes mellitus could affect the mood through at least two mechanisms; either through biochemical changes due to hyperglycemia or through psychosocial problem of chronicity of disease. (12)

It is well known that depression is more common in women than men. Our sample included a larger proportion of women (68.6%) consistent with the gender distribution for lifetime prevalence of major depression, which is almost twice as high in women as in men (13).

CONCLUSION

In conclusion, depression has been widely assumed to adversely affect patients with diabetes (14), although the experimental literature has not shown a consistent relationship between depressive symptoms and measures of glycemic control. Our evidence argues against the existence of a link between depressive mood and glycemic control, and raises questions about the importance of depressive symptoms for the management of glucose metabolism in treatment of diabetes.

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