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Original Article

Diabetes distress and its clinical determinants in patients with type II diabetes

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ABSTRACT

Aim: The present study aimed to determine the status of diabetes distress and its clinical determinants in type II diabetes patients.
Methods: This descriptive-analytical study was performed on 220 patients with t diabetes referred to Diabetes Clinic of Imam Khomeini Hospital in Ardabil, Iran. The samples were selected using convenience sampling method. Data collection tools included demographic and disease form and Diabetes Mellitus Scale (DDS). Data analysis was performed using SPSS software version 22 via descriptive (frequency, mean, standard deviation) and inferential statistics (compare means, Pearson correlation coefficient and stepwise multiple regression).
Results: The average duration of diabetes was 7.64 (SD = 4.68) years. 63.7% of the patients had moderate to severe diabetes-related distress. Emotional burden dimension had the highest score among the subscales of diabetes distress. In addition, there was a correlation between positive family history ($p = 0.017$), duration of diabetes ($p = 0.028$) and type of treatment ($p = 0.47$) and diabetes distress. HemoglobinA1C levels, body mass index and triglyceride were the major predictors of diabetes distress.
Conclusions: Considering the high prevalence of diabetes distress in patients with type II diabetes, it seems that paying attention to clinical predictors of distress and screening of patients with diabetes is a reasonable and accessible method for health care providers and patients to improve their disease management.

1. Introduction

Patients with diabetes face many challenges in managing their disease. Regular doctor visits and self-care activities such as complicated drug adherence, monitoring of blood glucose and blood pressure levels, attention to symptoms associated with disease complications, compliance with dietary recommendations and physical activity, and the advice to avoid unhealthy behaviors including smoking and alcohol are among the factors affecting distress in diabetic patients [1]. Although many studies have been conducted on the problems of diabetes disease management in these patients [2,3], there are little research and information on the psychological effects of disease and its management [1]. Diabetes distress has been defined as patient concerns about disease management, support, emotional burden, and access to care [4]; it is a part of life with diabetes [5], which its understanding plays an important role in adherence to treatment and prevention of psychological problems such as depression [6]. People with diabetes can experience different forms of diabetes distress including emotional distress, interpersonal distress, physician related distress and regime related distress [7]. Diabetes distress is closely linked with diabetes-specific biological and behavioral variables and reflects distress resulting from the burden of illness and treatment [8]. Undesirable and inappropriate management of blood glucose is one of the factors affecting diabetes distress, so that patients with poorly controlled blood sugar levels report higher levels of distress [1]. Increased duration of diabetes has been posited to be another important factor in diabetes distress, which is closely linked to the presence of diabetic complications and insulin therapy [9]. In addition, it seems that elevated body mass index is among the factors associated with diabetes-related distress [10]. In general, self-management requirements [11], burdensome diabetes treatments, and multiple complications of diabetes are among the other important factors affecting the level of distress in diabetic patients

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[12]. Given the importance of diabetes distress in the disease management, and since identifying and evaluating of modifiable determinants of diabetes distress play a key role in implementing the appropriate interventions for achieving the best possible outcomes [13], as well as to our best knowledge, little is known about diabetes-related distress and its predictive factors in Iran, the present study aimed to determine the status of diabetes distress and its clinical determinants in patients with type II diabetes.

2. Materials and methods

2.1. Participants

This was a descriptive-analytical study. The study population consisted of the all patients with type II diabetes referred to the diabetes clinic of Imam Khomeini Hospital in Ardabil, Iran, between November 2016 and September 2017. The sample size was determined using the Cochran formula (n = 220), recommended by Fisher and et al. (2009) [5] and included into the study using convenience sampling method. The inclusion criteria were as follows: diagnosis of type II diabetes, having a medical diagnosis of diabetes for more than one year, non-communicable depression and other mental disorders according to the medical records, visited the diabetes outpatient clinic during the data collection period, and willingness to participate in the study.

2.2. Measures

Demographic and disease form such as age, sex, marital status, monthly income, duration of diabetes, family history of diabetes, complications of diabetes and other chronic conditions such as blood pressure, lipid profile, body mass index and hemoglobin A1c was used to collect data. The standard Diabetes Distress Scale (DDS) was also used to measure the diabetes-related distress. This measure contains 17 items assessing diabetes-related problems during the past 1 month based on a 6-point likert scale (1 = never) to (6 = always). Further, the scale was developed based a priori on four distress-related domains: emotional burden (EB), physician-related distress (PRD), regimen-related distress (RRD), and interpersonal distress (ID), with a mean score under 2 indicating “little or no” diabetes distress, a mean score between 2 and 2.9 indicating “moderate” diabetes distress, and a score of 3 or higher indicating “high”diabetes distress [14]. The validity and reliability of the DDS have been tested and validated in the study by Tol (2012) on diabetic patients [15] and Cronbach's alpha coefficient amounted to 0.88 indicates high reliability in this study. The scale was completed by interviewing patients and using their medical records. Written informed consent was obtained from all participants.

2.3. Data analysis

Data were analyzed by SPSS software version 22 using descriptive (mean, standard deviation and frequency), and inferential statistics (independent *t*-test, ANOVA, chi-square, Pearson correlation coefficient and stepwise multiple regression).

3. Results

In this study, 220 patients with type II diabetes were evaluated for the status of diabetes distress and its relationship with the socio-demographic characteristics and disease. Out of the 220 patients recruited for this study, 123(55.9%) were females. Mean and standard deviation of age of participants were 58.82 ± 9.41 and the duration of diabetes was 7.64 ± 4.68 years. 143 (65%) patients had a family history of diabetes. The mean and standard deviation values for systolic and diastolic blood pressure were 130.5 ± 16.68 and 81.99 ± 9.18 mmHg, high-density cholesterol 48.51 ± 15.53, low-density cholesterol 89.73 ± 31.61, total cholesterol 184.21 ± 53.16, triglyceride level 191.78 ± 93.74 mg/dl, hemoglobin A1C 8.35 ± 1.37, and body mass index 29.29 ± 35.4 (Tables 1 and 2).

According to the results of the study, the mean and standard deviation of total scores for diabetes distress were 42.13 ± 13.92. Among the subscales of diabetes distress, emotional burden (15.79 ± 5.79) and regimen-related distress (12.07 ± 3.60) had the highest and lowest scores, respectively (Table 3).

In addition, chi-square test was used to determine the relationship between diabetes distress and demographic data. There was a significant correlation between the family history of disease (p = 0.017), the duration of diabetes (p = 0.028) and the type of treatment (p = 0.47) with diabetes distress (Table 4).

Correlation between clinical indices with diabetes distress and its subscales were also measured by Pearson correlation coefficient. The results indicated a correlation between BMI, hemoglobin A1C, triglyceride, total cholesterol, low-density lipoprotein, and systolic blood pressure with diabetes distress and its subscales. Afterwards, the variables correlated with diabetes distress, along with the family history of disease, type of treatment and duration of diabetes were entered into stepwise regression analysis and the results showed that body mass index, hemoglobin A1C and triglyceride were the three main predictors of diabetes distress (Table 5).

4. Discussion

The present study aimed to determine the status of diabetes

Table 1
Demographic and disease characteristics of participants.

Variable	Number	Percent
Age (years)		
<40	4	1.8
40–49	25	11.4
50–59	84	38.2
>60	107	48.6
Gender		
Female	123	55.9
Male	97	44.1
Marital Status		
Married	216	98.2
Widowed	4	1.8
Level of Education		
Illiterate	136	61.8
Elementary	38	17.3
Secondary	16	7.3
High school	30	13.7
Monthly Income(Million)		
<1	67	30.5
1–2	123	55.9
2–3	30	13.6
Treatment Type		
Oral agents	130	59.1
Insulin	27	12.3
Oral agents plus Insulin	63	28.6
Diabetes Duration (years)		
<5	61	27.7
5–10	89	40.5
10–15	59	26.8
>15	11	5
Presence of Comorbidities		
Yes	119	54.1
No	101	45.9
Body mass index(BMI)		
<18.5	–	–
18.5–24.9	39	17.7
25–29.9	90	40.9
>30	91	41.4

Table 2
Clinical characteristics of participants.

Variable	Number	Percent
Hemoglobin A1c(%)		
<6	8	3.6
6–8	117	53.2
8–10	108	38.2
>10	5	11
Triglyceride (mg/dl)		
<150	82	7.3
150–199	61	27.7
200–499	74	33.6
Cholesterol(mg/dl)		
<200	146	66.4
201–239	44	20
>240	30	13.6
Low Density Lipoprotein(LDL)(mg/dl)		
<100	156	70.9
100–129	33	15
130–159	25	11.4
160–189	6	2.7
High Density Lipoprotein(HDL) (mg/dl)		
40–50	136	61.8
50–59	45	20.5
>60	39	17.7
Blood Pressure(mmHg)		
$<\frac{120}{80}$	71	32.3
$\frac{120}{80}-\frac{139}{89}$	72	32.7
$\frac{140}{90}-\frac{159}{99}$	63	28.6
$>\frac{160}{100}$	14	6.4
Retinopathy		
Yes	30	13.6
No	190	86.4
Nephropathy		
Yes	1	0.5
No	219	99.5
Diabetic Foot		
Yes	11	5
No	209	95

Table 3
Mean (SD) of Diabetes Distress and its Subscales in Participants.

Variables	Mean (SD)	Low	Moderate	High
		Number(%)	Number(%)	Number (%)
Diabetes Distress	42.1(13.9)	80(36.4)	93(42.3)	47(21.4)
Emotional Burden	15.7(5.7)	57(25.9)	86(39.1)	77(35)
Physician Related Distress	8.4(3.3)	79(35.9)	103(46.8)	38(17.3)
Regimen Related Distress	12.0(3.0)	54(24.5)	111(50.5)	55(25)
Interpersonal Distress	5.7(3.4)	108(49.1)	61(27.7)	51(23.2)

distress and its clinical determinants in patients with type II diabetes referred to Imam Khomeini Hospital in Ardabil, Iran. According to the findings, the prevalence of distress in this study was 21.4%, which is consistent with the study by Tan (2017), showing a high incidence of diabetes distress (21%) [16]. A number of studies have been conducted to investigate the status of diabetes distress in diabetic patients, indicating diabetes distress levels ranging between 2.4 and 87.6% [17–19]. Such variability in diabetes distress levels can be attributed to the minority differences [20], discrepancy in the comorbid depression and anxiety [21], demographic and clinical variables and different sampling methods and sample sizes.

The current study found that the dimensions of emotional burden and regime-related distress had the highest scores, which can be due to the stressful conditions and difficulties related to the self-management and dietary adherence, care and psychological aspects of dealing with chronic diseases such as diabetes [22,23]. These results are in agreement with the study by Gahlan (2017) [22]. Further analysis showed a significant relationship between diabetes distress and family history of diabetes. Similarly, Tol (2012) revealed that people with a positive history of diabetes tend to experience higher level of distress and emotional burden [15]. A possible explanation for this is that living with diabetes that are required to adhere to their daily healthy lifestyle, regular use of medication and physical activity to prevent diabetes complications will increase stress and anxiety levels in other family members. It was also shown that people with long-term diabetes might be at increased risk for the development of diabetes distress due to the high exposure to the difficulties associated with self-management, treatment and disabling complications [9]. A significant correlation was found between type of treatment, total diabetes mellitus and emotional burden distress, showing that patients treated with insulin had higher distress compared with patients who used only oral medications to manage their diabetes; however, there was no significant difference between the insulin group and the insulin group along with oral medications. Furthermore, a significant difference was found between the mean scores of diabetes distress in insulin-treated patients with oral medications compared to patients treated with oral medications alone, which was congruent with the results of the study by Delahanty (2007), indicating that people treated with insulin experience more diabetes-related distress compared with patients treated with oral medications [24]. This result may be explained by the fact that initiation of insulin therapy can make the patient know that his/her disease is getting worse; therefore, it's inappropriate management may lead to high levels of stress and anxiety [25]. The results also showed a significant relationship between sex with interpersonal distress and emotional burden, suggesting that women experience higher levels of emotional burden and interpersonal distress than do men. The majorities of the females in our study were housewives and received less monthly income than men. The mean scores of hemoglobin A1C and BMI were higher in women than in men due to low self-care measurements in females supporting the high levels of distress in women. Additionally, no significant relationship was observed between the monthly income level, emotional burden and interpersonal distress, suggesting that people with an income of less than 1 million (Rials/Month)can hardly afford to pay the care costs associated with the disease resulting in high level of distress [3]. The results of the study suggested no correlation between other demographic data, diabetes complications, hypertension and high-density lipoprotein cholesterol with total diabetes. Regression analysis results revealed that elevated hemoglobin A1Clevels, high BMI and high triglycerides were important predictors of diabetes distress. Poor blood glucose level control (high hemoglobin A1C level) indicates poorer control of diabetes than levels in the normal range resulting in excessive worry or anxiety for the patient, which is consistent with the results of Chin's study [26]. Likewise, the results of the study by Wardian (2014) showed that high BMI was associated with higher distress in diabetic patients. Therefore, successful weight loss in these patients can lower their diabetes distress, affect their physical activity and healthy eating and improve their self-efficacy [10]. In another studies, it was found that people with high triglycerides are more likely to have elevated body mass index and hemoglobin A1C due to their unhealthy eating habits [27,28]. High triglyceride is a reflection poor disease control, which, in turn, can increase distress in diabetic patients.

4.1. Conclusion

According to the findings, the prevalence of diabetes distress in type 2 diabetic patients in Ardabil city was reported at a moderate to high levels and elevated hemoglobin A1C, body mass index and

Table 4
Association between demographic-disease factors and diabetes distress.

Variable	N	Diabetes Distress	Low	Moderate	High	P value
			Number (%)	Number (%)	Number (%)	
Gender						
Female	123	44.0(15.2)	41(33.3)	50(40.7)	32(26)	$X^2 = 3.70$
Male	96	39.7(11.6)	39(40.2)	43(44.3)	15(15.5)	P = 0.157
Age (years)						
<40	4	44.0(13.5)	1(25)	2(50)	1(25)	
40–49	25	43.0(13.6)	8(32)	8(32)	9(36)	$X^2 = 5.72$
50–59	84	41.7(14.0)	30(35.7)	34(40.5)	20(23.8)	P = 0.455
>60	107	42.1(14.0)	41(38.3)	49(45.8)	17(15.9)	
Marital Status						
Married	216	42.0(13.9)	79(36.6)	92(42.6)	45(20.8)	$X^2 = 1.99$
Widow	4	47.0(12.3)	1(25)	1(25)	2(50)	P = 0.369
Level of Education						
Illiterate	136	(14.1)42.6	(35.3)48	58(42.6)	30(22.1)	
Elementary	38	(13.8)41.9	(39.5)15	(36.8)14	(23.7)9	
Secondary	16	(13.2)43.8	(25)4	(56.3)9	(25)3	$X^2 = 3.85$
High school	23	(14.0)39.1	(47.8)11	(34.8)8	(17.4)4	P = 0.870
Higher Education	7	(12.7)39.8	(28.6)2	(57.1)4	(14.3)1	
Monthly Income(million)						
<1	67	(15.7)47.0	(23.9)16	(47.8)32	(28.4)19	$X^2 = 8.91$
1–2	123	(12.4)40.8	(39.8)49	(39.8)49	(20.3)25	P = 0.063
2–3	30	(12.4)36.4	(50)15	(40)12	(10)3	
Diabetes Duration (years)						
<5	61	(13.4)41.4	(37.7)23	(42.6)26	(19.7)12	
5–10	89	(12.3)41.0	(36)32	(47.2)42	(16.9)15	$X^2 = 14.17^*$
10–15	59	(14.8)41.7	(40.7)24	(37.3)22	(22)13	P = 0.028
>15	11	(17.2)56.8	(9.1)1	(27.3)3	(63.6)7	
Family History of Diabetes						
Yes	145	(14.4)42.9	(35.2)51	(37.9)55	(26.9)39	$X^2 = 8.15^*$
No	75	40.6(12.7)	(38.7)29	(50.7)38	(10.7)8	P = 0.017
Presence of Comorbidities						
Yes	119	43.0(14.2)	43(36.1)	49(41.2)	27(22.7)	
No	109	41.0(13.5)	(36.6)37	(43.6)44	(19.8)20	
Treatment Type						
Oral agents	130	39.0(12.3)	53(40.8)	56(43.1)	21(16.2)	$X^2 = 9.63^*$
Insulin	27	49.2(15.1)	4(14.8)	14(51.9)	9(33.3)	P = 0.047
Oral agents plus Insulin	63	44.0(15.1)	23(36.5)	23(36.5)	17(27)	
Retinopathy						
Yes	30	43.5(11.9)	9(30)	16(53.3)	5(16.7)	$X^2 = 1.75$
No	190	41.0(14.2)	71(37.4)	77(40.5)	42(22.1)	P = 0.417
Diabetic Foot						
Yes	11	43.1(9.7)	4(36.4)	5(45.5)	2(18.2)	$X^2 = 0.08$
No	209	42.0(14.1)	76(36.4)	88(42.1)	45(21.5)	P = 0.960

$^*p < 0.05$.

Table 5
Results of hierarchical multiple linear regression analysis for diabetes distress and related factors.

Model	Variables	Beta	R^2	Adjusted R^2	F	P value
1	BMI	0.393	0.154	0.150	39.707	<0.001
	BMI	0.375				
2	Hb A1c	0.276	0.230	0.223	32.401	<0.001
	BMI	0.340				
3	Hb A1c	0.227	0.262	0.252	25.574	<0.001
	Triglyceride	0.190				

triglyceride were identified as the main predictors for diabetes distress. Therefore, given the major impact of psychological factors including diabetes distress on the outcome of diabetes, it seems that the use of regular and appropriate screening to alleviate these distresses and managing its predictive factors will help the diabetic patients to better control their blood sugar level, prevent its complications as well as reduce its related healthcare costs.

4.2. Limitations

The findings of the study are subject to two limitations. First, with a small sample size and use of a convenience sampling method, the findings may not be transferrable to total population of patients with diabetes and second, the study used a descriptive cross-sectional design; therefore, the causal-causality relationship between the variables cannot be considered.

Conflicts of interest

The authors declare no conflict of interest.

Authorship statement

We confirm that all listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.

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