RESEARCH ARTICLE

Assessing the impact of quality of life and complications on diabetes distress in adults with Type 2 Diabetes

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Abstract

Objective: To evaluate the relationship between f diabetes distress level and quality of life in individuals diagnosed with type 2 diabetes mellitus.

Method: The cross-sectional study was conducted at the Endocrinology Polyclinic of Manisa Celal Bayar University Hafsa Sultan Hospital, Turkiye, fron December 2021 to September 2022, and comprised type 2 diabetes mellitus. Data included Diabetes Distress Score, and the Quality of Life Assessment Survey scores for Physical and Mental component. Complications and comorbidities were also noted. Data was analysed using SPSS 15.

Results: Of the 199 patients wth mean age 56.5±11.27 years, 110(55.3%) were females and 89(44.7%) were males The most common comorbidity were hypertension 94(47.2%), and the most common diabetes-related complication was neuropathy 25(12.6%). The mean total Diabetes Distress Score was 37.46±9.57. Female gender, low income level, abdominal obesity and the presence of microvascular complications were identified as associated factors for diabetes distress ($p<0.05$). A negative correlation existed between the level of diabetes distress and quality of life ($p<0.05$).

Conclusion: Abdominally obese individuals with tye 2 diabetes mellitus were found to have difficulty in diabetes management. Also, as the duration of diabetes increased, the level of diabetes distress increased and the quality of life decreased.

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Introduction

Medical management of diabetes, which is a significant public health problem today, is a chronic condition that involves a demanding treatment programme that the patients must follow. Ensuring compliance and continuity with treatment creates a physical, emotional and social burden on patients.[1] Diabetes distress can be defined as the individuals' feeling of being overwhelmed by the difficulties experienced during self-management of the disease, feeling that they cannot manage diabetes well, concerns about the quality of the healthcare they receive, and feeling that other individuals do not understand the difficulty of living with diabetes.[2]

It has been shown that approximately 36% of individuals diagnosed with type 2 diabetes mellitus (T2DM) experience clinically significant diabetes distress.[3,4] Diabetes distress increases the risk of developing macrovascular and microvascular complications in persons with T2DM. However, there are links between emotional distress and increased morbidity and mortality rates from cardiovascular disease (CVD), as well as poor glycaemic control in persons living with T2DM.[5] A study found a 1.7-fold higher risk of CVD in individuals diagnosed with T2DM who experienced emotional distress.[6]

Diabetes distress is associated with poor glycaemic control, as well as disability, impaired quality of life (QOL), and increased risk of death.[7] The presence of T2DM negatively affects the individual's QOL due to both the nature of the chronic disease and high diabetes distress levels.[8]

It has been recommended that T2DM patients should be regularly monitored for diabetes distress to prevent the development of complications, especially when the treatment goals are not being achieved, because early recognition of diabetes distress and provision of appropriate support positively impact glycaemic control and QOL.[9]

The current study was planned to determine the relationship between diabetes distress level and quality of life in patients T2DM with.

Patients and Methods

The cross-sectional study was conducted at the Endocrinology Polyclinic of Manisa Celal Bayar University Hafsa Sultan Hospital, Turkiye, from December 2021 to September 2022. Data was collected in the form of a face-to-face 3-part survey, comprising sociodemographic data, Diabetes Distress Scale-17 (DDS-17), and 12-item Short

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Form Quality of Life Assessment Survey (SF-12). After taking informed consent from the participants, their height, weight and waist circumference (WC) were recorded, and sociodemographic characteristics, diabetes duration, medications used, abdominal obesity, diabetes-related complications and comorbidities were noted. Body mass index (BMI) values were calculated for each patient.

Polonsky et al. developed the 17-item DDS to assess diabetes distress.[2] The scale identifies four sources of distress: dietary distress, emotional burden, interpersonal distress, and physician-related distress. The total score is calculated by dividing the sum of the responses by 17, with score <2 indicating low-level distress, 2-2.99 reflecting moderate distress, and ≥3 showing high-level distress related to diabetes. The current study used the Turkish version of DDS-17.[10]

Ware et al. developed the SF-12 QOL evaluation questionnaire,[11] which uses a Likert type scale, except for some items. Subscales measure health on a range from 0 to 100, with 0 indicating poor health and 100 indicating good health. Soylu et al. conducted the Turkish validity and reliability study.[12] Physical and mental standardisation values were collected separately based on individuals' responses. Thus, a summary of physical component score (PCS) and mental component score (MCS) was calculated to evaluate overall QOL.

After approval from the institutional ethics review committee, the sample size was determined in the light of studies showing the prevalence of diabetes distress to be about 50% in T2DM patients.[13] To evaluate whether there was a moderate negative linear relationship (H0: r=-0.30, H1: r=-0.50) between diabetes distress level and QOL scores in T2DM patients, the sample size was calculated with 0.80 power and 0.05 margin of error using G*Power 3.1.9.7.[14] While people living with type 2 diabetes over the age of 18 who applied to the diabetes polyclinic were included in this study according to the convenience sampling method. Those included were T2DM patients of either gender aged at least 18 years. Patients with uncontrolled hypothyroidism, psychotic disorders, or any disease that causes cognitive impairment were excluded.

Data was analysed using SPSS15. Quantitative variables were presented as mean±standard deviation (SD), while categorical variables were reported as frequencies and percentages. Data normality was assessed using Skewness-Kurtosis values (-2 to +2). Normally distributed variables were compared with student's t-test and analysis of variance (ANOVA), whereas non-normally distributed variables were analysed with Mann-Whitney U and Kruskal-Wallis tests. Pearson correlation coefficient analysis was employed to examine the relationship between diabetes distress levels and QOL. Simple and multiple linear regression analyses were performed to assess the impact of demographic factors on diabetes distress levels. In the multiple linear regression analysis, the β-value (regression coefficient) was used to evaluate the explanatory power of the independent variables. Statistical analysis was considered significant at p<0.05.

Results

Of the 243 T2DM patients approached, 199(81.9%) were included. There were 110(55.3%) females and 89(44.7%) males The mean age was 56.5±11.27 years, the mean BMI was 31.23±6.1kg/m^2, and the mean WC was 106.69±14.88 cm.

Abdominal obesity was detected in 158(79.4%)

Table-1: Socio-demographic characteristics of the patients.

Characteristics	n (%)
Gender	
Male	89 (44.7)
Female	110 (55.3)
Income	
Less than expenses	51 (25.6)
Equal to or greater than expenses	148 (74.3)
Marital status	
With a life partner	158 (79.4)
Alone	41 (20.6)
Educational level	
Pre-high school	131 (65.7)
High-school and university	68 (34.2)
Occupation	
Retired	59 (29.6)
Housewife	76 (38.2)
Working	64 (32.2)
BMI (kg/m^2)	
18.5-24.99 Normal	24 (12.1)
25-29.99 Overweight	73 (36.7)
≥30 Obese	102 (51.2)
Duration with T2DM	
0-5 years	71 (35.7)
6-10 years	50 (25.1)
>10 years	78 (39.2)
T2DM Treatment	
Single OAD	74 (37.2)
Multiple OAD	41 (20.6)
Insulin	16 (8.0)
Insulin and OAD	68 (34.2)
Macrovascular Complication	
Yes	26 (13.1)
No	173 (86.9)
Microvascular Complication	
Yes	50 (25.1)
No	149 (74.9)
Total	199 (100)

BMI: Body mass index, DM: Diabetes mellitus, OAD: Oral anti-diabetics.

Table-2: Mean total and subscale score of the Diabetes Distress Scale (DDS).

Domains	Mean±SD
Emotional Burden	12.04±4.03
Physician-related distress	7.97±2.89
Regimen-related distress	13.06±4.67
Interpersonal distress	4.39±2.37
Total DDS-17	37.46±9.57

SD: Standard deviation.

participants, and 140(70.4%) had chronic diseases accompanying T2DM. The most common comorbidities were hypertension 94(47.2%), hypothyroidism 46(23.1%) and coronary artery disease (CAD) 27(13.6%).

The common macrovascular complications were neuropathy 25(12.6%), cardiovascular complications 24(12.1%), retinopathy 24(12.1%) and nephropathy 14(7%) (Table 1).

The mean total DDS-17 score was 37.46±9.57. Mean subscale scores indicated moderate emotional burden and diet-related distress (Table 2).

Diabetes distress level was higher in women (p=0.042), individuals with lower incomes (p=0.004), individuals with abdominal obesity (*p*=0.002) and individuals with microvascular complications (*p*=0.019). While the diabetes distress level was lower in individuals with T2DM duration five years or less (*p*=0.039), it was higher in individuals receiving insulin treatment in addition to oral antidiabetics (OADs) (*p*=0.037) (Table 3).

cThe diabetes distress status had a negative correlation with PCS (*p*<0.001) and MCS (*p*=0.012) levels (Table 4).

The presence of abdominal obesity was found to increase diabetes distress by 4.186 units, and PCS and MCS levels significantly predicted diabetes distress (*p*<0.05) (Table 5).

Discussion

This study investigated the predictive role of QOL on diabetes distress in T2DM patients. The results revealed 63.8% moderate to severe diabetes distress in the study population, which was higher than those reported in Pakistan (66.4),[15] Bangladesh (52.5%),[16] Jordan (53%)[17] and Hong Kong (59.4%).[18]

The differences in the prevalence of diabetes distress can be explained by sociodemographic variables, like education level and economic status, and health conditions, like type of diabetes, glycated haemoglobin (HbA1c) level and comorbidities. They may also vary depending on the distress scale used. A study in Iran using the same assessment tool found a distress level close to the

Table-3: Comparison of diabetes distress level with sociodemographic data.

	Emotional Burden	Physician-related Distress	Regimen-related Distress	Interpersonal Distress	Diabetes Distress Level
Gender					
Male	11.10±4.04	7.52±2.74	12.86±4.89	4.43±2.58	35.93±10.28
Female	12.80±3.87	8.33±2.97	13.21±4.50	4.35±2.20	38.70±8.81
p-value	0.003	0.050	0.598	0.806	0.042
Age (years)					
<65 years	11.93±4.08	7.93±2.95	12.97±4.51	4.33±2.30	37.17 ± 9.45
≥65 years	12.41±3.87	8.11±2.69	13.37±5.28	4.60±2.64	38.51±10.04
p-value	0.517	0.494	0.323	0.378	0.897
Household Income					
< expenses	12.98±4.01	8.47±2.92	14.05±4.59	5.27±2.85	40.78±9.62
≥ expenses	11.71±4.00	7.80±2.87	12.71±4.67	4.08±2.11	36.32±9.31
p-value	0.053	0.157	0.077	0.002	0.004
Marital status					
Whit a life partner	11.93±4.08	7.97±2.85	12.99±4.78	4.53±2.53	37.43±10.03
Alone	12.46±3.84	7.79±3.08	13.31±4.30	3.82±1.49	37.58±7.65
p-value	0.452	0.999	0.694	0.089	0.918
Occupation					
Retired	12.52±3.69	7.30±2.84	13.42±4.48	4.38±2.43	37.64±8.10
Housewife	12.56±3.78	8.50±2.83	13.47±4.38	4.26±2.18	38.80±8.89
Active	10.9± 4.44	7.96±2.93	122± 5.13	4.54±2.55	35.71±11.32
p-value	0.035	0.058	0.230	0.782	0.163
BMI-(kg/m^2)					
Normal	10.91 ±4.00	7.08±3.11	11.79±4.79	4.20±2.32	34.00±9.38
Overweight	12.23 ±3.99	7.71±2.77	12.87±4.95	4.24±2.36	37.06±10.05
Light obesity	12.12 ±4.30	7.75±2.86	12.98±4.77	4.82±2.69	37.67 ± 9.28
Middle/morbid/super obesity	12.21 ±3.80	9.13±2.76	14.10±3.92	4.19±1.98	39.65 ± 8.92
p-value	0.547	0.014	0.241	0.467	0.127
Abdominal obesity					
No	10.85 ±3.71	6.80±2.65	11.43±4.31	4.26±2.19	33.36 ± 8.42
Yes	12.34 ±4.06	1.70±2.06	13.48±4.68	4.42±2.42	38.53 ± 9.59
p-value	0.034	0.003	0.012	0.709	0.002
Duration with T2DM					
≤5 years	11.19±4.07	8.09±3.09	12.70±4.58	4.36±2.17	36.36±9.63
6-10 years	13.08±4.00	7.84±2.55	13.28±4.55	4.02±2.16	38.22±8.38
>10 years	12.14±3.89	7.94±2.94	13.24±4.87	4.65±2.65	37.98±10.24
p-value	0.039	0.886	0.728	0.338	0.480
T2DM Treatment					
Single OAD	11.91±3.85	8.20±3.08	12.87±4.25	4.10±1.91	37.10±8.40
Multiple OAD	10.75±4.06	8.34±2.93	12.92±4.74	4.31±2.55	36.34±10.63
Insulin	11.68±4.23	7.37±2.65	13.12±4.95	4.25±1.98	36.43±10.06
Insulin and OAD	13.09±3.99	7.64±2.71	13.23±5.09	4.77±2.76	38.77±10.04
p-value	0.037	0.448	0.949	0.400	0.549
Macrovascular Complication					
Yes	12.26±3.76	7.34±2.72	12.65±5.07	5.76±3.43	38.03±10.75
No	12.00±4.08	8.06±2.91	13.12±4.62	4.18±2.11	37.38±9.41
p-value	0.886	0.260	0.439	0.010	0.949
Microvascular Complication					
Yes	13.70±3.62	8.14±2.68	13.70±5.17	4.54±2.32	40.08±9.88
No	11.48±4.02	7.91±2.96	12.84±4.49	4.34±2.39	36.59±9.34
p-value	<0.001	0.641	0.310	0.403	0.019

BMI: Body mass index, DM: Diabetes mellitus, OAD: Oral anti-diabetics.

Table-4: Evaluation of the relationship between diabetes distress level and quality of life.

Variables	PCS		MCS	
	r-value	*p*-value	*r*-value	*p*-value
Emotional Burden	-0.382	<0.001	-0.271	<0.001
Physician-related distress	-0.220	0.002	-0.173	0.014
Regimen-related distress	-0.158	0.025	-0.225	0.001
Interpersonal distress	-0.215	0.002	-0.094	0.185
Total DDS-17	-0.358	<0.001	-0.300	<0.001

PCS: Physical components scale, MCS: Mental components scale.

Table-5: Simple and multiple linear regression analysis regarding effects of variables on the diabetes distress level.

Variables	Simple		Multiple	
	ß (95 %CI)	*p*-value	ß (95 %CI)	*p*-value
Gender (0= man, 1 = woman)	2.777 (0.105-5.448)	0.042	1.053 (-1.403-3.510)	0.399
Income (≤ expenses)	4.460 (1.450-7.470)	0.004	1.068 (-1.856-3.992)	0.472
Occupation (0= others, Housewife 1)	2,160 (-0.585-4.906)	0.122	-0.456 (-3.698-2.787)	0.782
Marital status	0.149 (-3.170-3.467)	0.930		
BMI (each unit increase) kg/m^2	0.273 (0.056-0.490)	0.014		
Abdominal obesity (0=no, 1 yes)	5.166 (1.928-8.404)	0.002	4.186 (1.252-7.253)	0.005
Macrovascular complication (0=no, 1 yes)	0.657 (-3.325-4.638)	0.745		
Microvascular complication (0=no, 1 yes)	3.489 (0.434-6.545)	0.025	1.829 (-0.953-4.611)	0.196
PCS (each 1-unit increase)	-0.357 (-0.488-0.226)	<0.00 1	-0.330 (-0.454-0.206)	<0.001
MCS (each 1-unit increase)	-0.348 (-0.504 -0.192)	<0.00 1	-0.302 (-0.446-0.157)	<0.0 01

BMI: Body mass index, PCS: Physical components scale, MCS: Mental components scale.

current results (63.7%).[19] In studies conducted in China and Germany,[19,20] the level of distress was higher in patients using insulin, as was noted in the current study.

In this study, similar to a study conducted in Pakistan,[15] income status was observed to be a critical associated factor for diabetes distress. Like all chronic diseases, T2DM is an economic burden due to the cost of treatment, medications and transportation fees. Coping with socioeconomic inequalities is a psychological stress factor for individuals with low income.[21] The current study also found that the level of diabetes distress was lower in individuals actively involved in business life. When the variables of both income status and being actively involved in business life due to the chance of having a higher income level are evaluated together, the findings of the study are in line with the literature[15,21] and the economic burden in the treatment of T2DM is thought to be an essential factor in the disease management process.

A study in the United States identified five elements associated with diabetes distress. These included a younger age, a higher BMI, lower self-efficacy, less support from healthcare providers, and fewer days per week of following a healthy diet.[22] Hazem et al.[23] found a significant relationship between WC and diabetes distress level. In the current study, higher levels of diabetes distress we noted in individuals with abdominal obesity, and abdominal obesity was more prevalent among women who also had higher distress levels than men.

In a study comparing T2DM treatment methods, patients treated with insulin injection alone were found to experience higher distress than those treated with OADs, or OADs plus insulin.[24] In the current study, although no relationship was found between the duration of diabetes and the type of treatment used or diabetes distress, it was associated with the emotional burden subscale. Studies have shown that a longer duration of diabetes poses a risk for increased diabetes distress levels.[19,25] This is explained by the fact that people with long-term diabetes are at increased risk of diabetes distress due to their greater exposure to difficulties associated with self-management, treatment and the development of complications.[25]

The current study found no significant difference between patients using only OADs and those using insulin, but individuals receiving insulin therapy in addition to OADs had a higher emotional burden than other individuals.

It is known that chronic complications caused by diabetes are one of the factors associated with diabetes distress.[24] In this study, the presence of microvascular complications was associated with diabetes distress. In contrast, macrovascular complications were compatible only with the subscale related to interpersonal relationships. The presence of complications creates an economic burden for T2DM patients, can cause many concerns as it can affect their daily lifestyle and social relationships, and negatively affects their QOL.[20,24,25]

Studies conducted in the past five years have highlighted a significant negative correlation between diabetes distress and QOL in T2DM patients,[26,27] suggesting that diabetes distress is not only a psychological symptom, but also a vital determinant of diabetes self-management, risk of depression, and overall QOL. Therefore, regular assessment of diabetes distress and the integration of culturally adapted measurement tools are critically important, especially for immigrant and disadvantaged populations.

According to multivariate analysis, the level of diabetes distress in the current study negatively correlated with both the physical and mental components of QOL. As the

physical and mental QOL increased, diabetes distress decreased. Studies involving T2DM patients have yielded similar results.[28,29] The findings indicated that abdominal obesity and PCS impacted diabetes distress.

The current study also showed that individuals with a long-term diagnosis of T2DM had a worse level of physical QOL. Ealier studies have reported that the time since diagnosis plays a predictive role with respect to QOL.[29] As the duration of diabetes increases, the risk of developing complications, advancing age, the patient's loss of diabetes management motivation, and the occurrence of additional chronic diseases contribute to this situation.

In the light of the current findings, it is essential to develop screening programmes to detect diabetes distress early, particularly among disadvantaged groups, to address the psychosocial effects of complex treatments, such as insulin, and to utilise culturally appropriate measurement tools.

The strengths of the current study include examining the impact of diabetes distress on the QOL of T2DM patients from a comprehensive perspective, and evaluating both physical and mental QOL components.

The current study has limitations as it was conducted at a single centre, which limits the generalisability of the results. Also, psychosocial factors, such as depression and anxiety, were not taken into account. Since a cross-sectional design was used, changes in diabetes distress over time could not be observed. Longitudinal, multicenter studies with larger sample sizes are needed to validate the current findings. Additionally, studies with socioculturally diverse groups may lead to better understanding of the effects of cultural differences on diabetes distress.

Conclusions

Diabetes distress increased particularly due to abdominal obesity, low socioeconomic status, comorbidities and insulin usage, and the duration of diabetes. In addition, diabetes distress increased with lower QOL. A holistic approach is needed to reduce diabetes distress.

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