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Anxiety, Depression, and Associated Psychosocial Factors in Individuals with Type 2 Diabetes Attending Family Health Centers

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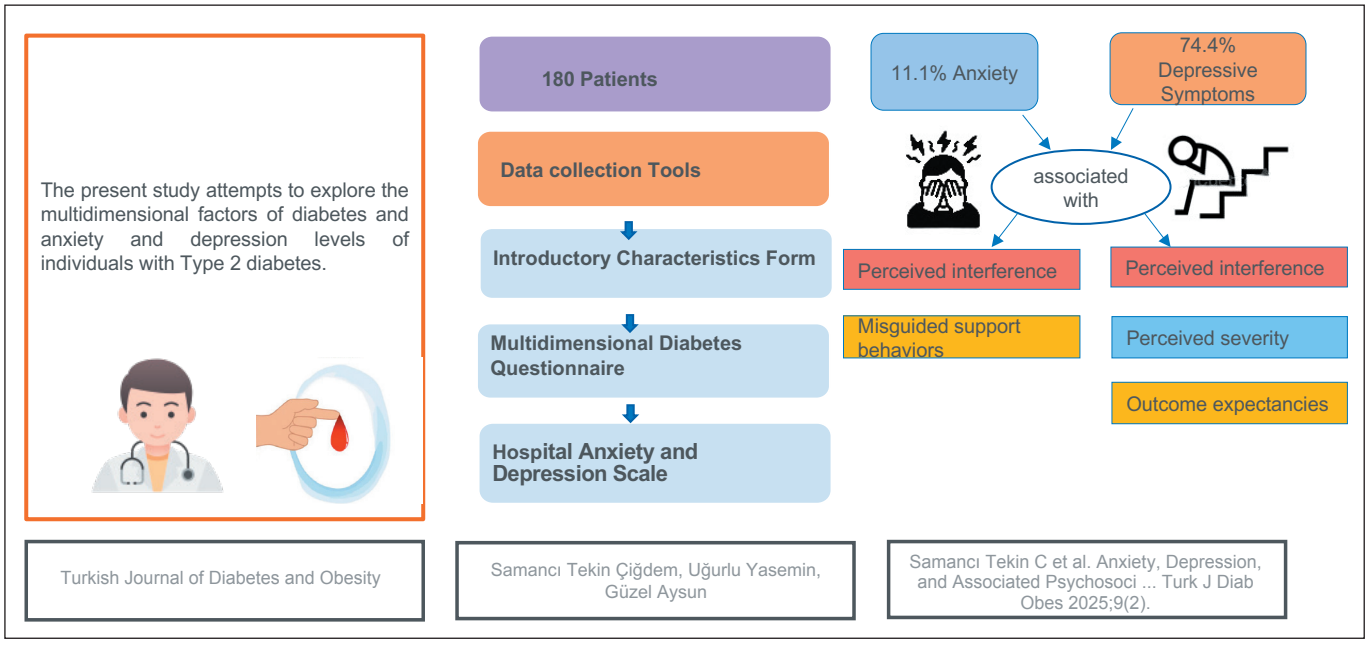
GRAPHICAL ABSTRACT



ABSTRACT

Aim: The present study aims to explore the multidimensional factors of diabetes, as well as the anxiety and depression levels, in individuals with Type 2 diabetes attending family health center.

Material and Methods: This cross-sectional study included 180 patients with Type 2 diabetes registered in three randomly selected family health centers. We collected data using the Multidimensional Diabetes Questionnaire (MDQ) and the Hospital Anxiety and Depression Scale (HADS) between June and November, 2023. The data were then subjected to the Mann-Whitney U test, the Kruskal-Wallis test, and multiple linear regression analysis.

Results: The disease duration was 1-5 years for 63.3% of participants, and 75.6% reported self-monitoring their blood glucose levels. While 11.1% of participants exhibited symptoms of anxiety, 74.4% had depressive symptoms. Our analysis showed the factors associated

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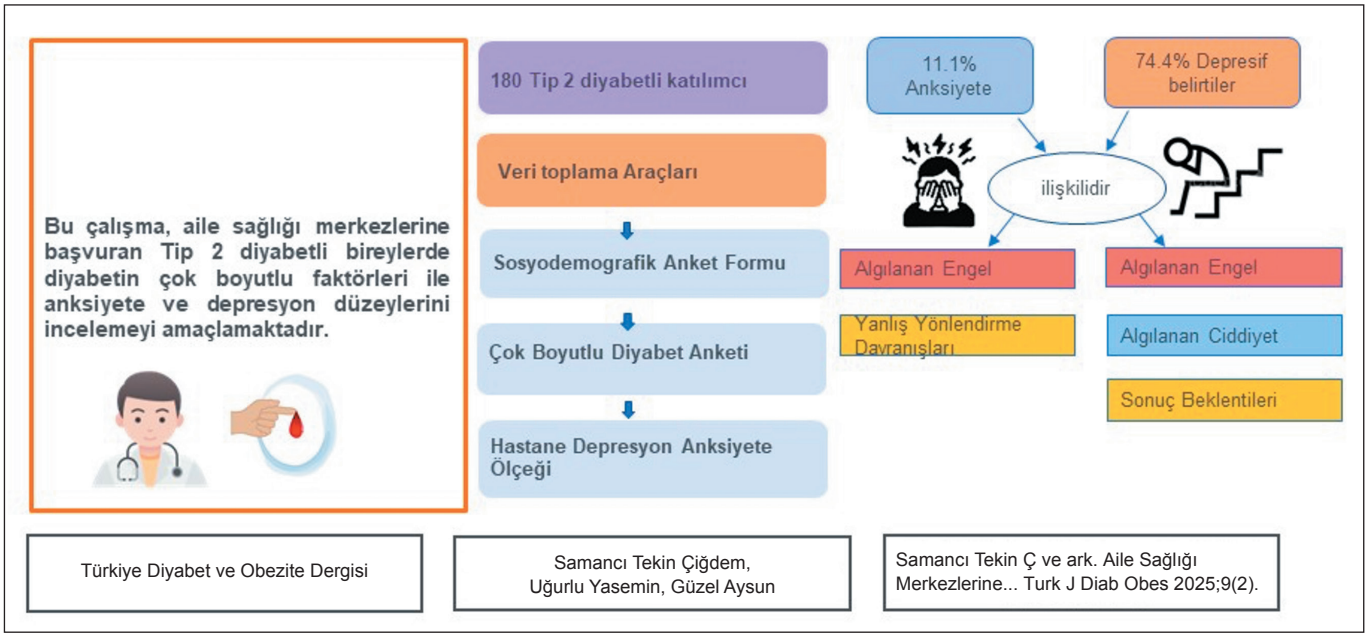
with anxiety symptoms to be perceived interference and misguided support behaviors. Moreover, perceived interference, perceived severity, and outcome expectancies significantly contributed to the manifestation of depressive symptoms ($p<0.05$).

Conclusion: To attain more effective diabetes management, it seems key to reinforcing family health centers and securing comprehensive diabetes-specific services and training in family health centers. Moreover, the multifaceted factors and psychological aspects of diabetes should be considered in the planning of diabetes-oriented services.

Keywords: *Diabetes Mellitus, Type 2, Anxiety, Depression, Adult*

Aile Sağlığı Merkezlerine Başvuran Tip 2 Diyabeti Olan Bireylerde Anksiyete, Depresyon ve İlişkili Psikososyal Faktörler

GRAFİKSEL ÖZET



ÖZ

Amaç: Bu çalışma, aile sağlığı merkezlerine başvuran Tip 2 diyabetli bireylerde diyabetin çok boyutlu faktörlerini ve anksiyete ile depresyon düzeylerini incelemeyi amaçlamaktadır.

Gereç ve Yöntemler: Kesitsel tipteki bu araştırmaya, rastgele seçilen üç aile sağlığı merkezine kayıtlı 180 Tip 2 diyabet hastası dâhil edilmiştir. Veriler, Haziran-Kasım 2023 tarihleri arasında Çok Boyutlu Diyabet Ölçeği (MDQ) ve Hastane Anksiyete ve Depresyon Ölçeği (HADS) kullanılarak toplanmıştır. Elde edilen veriler Mann-Whitney U testi, Kruskal-Wallis testi ve çoklu doğrusal regresyon analizi ile değerlendirilmiştir.

Bulgular: Katılımcıların %63,3'ünde hastalık süresi 1-5 yıl arasında olup %75,6'sı kan şekeri düzeylerini kendi kendine izlediğini belirtmiştir. Katılımcıların %11,1'inde anksiyete semptomları, %74,4'ünde ise depresif semptomlar saptanmıştır. Analizler sonucunda, anksiyete semptomları ile ilişkili faktörlerin algılanan engel ve yanlış yönlendirme davranışları olduğu bulunmuştur. Ayrıca, algılanan engel, algılanan hastalık ciddiyeti ve sonuç beklentilerinin depresif semptomların ortaya çıkmasına anlamlı düzeyde katkıda bulunduğu belirlenmiştir ($p<0,05$).

Sonuç: Daha etkili diyabet yönetimi sağlanabilmesi için aile sağlığı merkezlerinin güçlendirilmesi ve bu merkezlerde kapsamlı diyabete özgü hizmetler ile eğitimlerin güvence altına alınması gereklidir. Ayrıca, diyabete yönelik hizmetlerin planlanmasında hastalığın çok boyutlu faktörleri ve psikolojik yönleri dikkate alınmalıdır.

Anahtar Sözcükler: *Diabetes mellitus, Tip 2, Anksiyete, Depresyon, Erişkin*

INTRODUCTION

Diabetes mellitus is a chronic disease caused by insufficient insulin production or ineffective insulin use, which leads to hyperglycemia and, as a result, causes damage to the nerves, blood vessels, and organs. It is estimated that about 422 million individuals globally, predominantly residing in low- and middle-income countries, are affected by diabetes, which accounts for 1.5 million deaths annually (1). In Türkiye, diabetes is a major public health concern with the highest prevalence in Europe and a rapidly increasing trend (2,3). Type 2 diabetes mellitus (T2DM), the most common form, has risen markedly across all income groups over the past three decades (1). Type 2 diabetes mellitus (T2DM) is heterogeneous, differing in age of onset, obesity, insulin resistance, and risk of complications (4,5). It also affects biological and psychosocial aspects throughout life (6,7), making the assessment and monitoring of psychosocial status in diabetic patients essential (6-8). Diabetes necessitates lifelong self-management and continuous medical care to prevent acute complications and reduce chronic health risks (9). Its management includes multifaceted self-care and lifestyle modifications such as dietary adjustments, physical activity, foot care, medication use, insulin administration, and SMBG (10,11). One should also possess sufficient knowledge, skills, and positive attitudes concerning diabetes to achieve effective diabetes control (12,13). In addition, psychological, cognitive, and social factors facilitate behavioral change in diabetic patients in the treatment process (14-16). Thus, it seems key to delineating the impacts of social-cognitive factors on the achievement of behavioral changes in diabetic patients (17). In these patients, it is postulated that perceived interference, disease severity, support, self-efficacy, and outcome expectancies are associated with self-care behaviors and functional adequacy in achieving diabetes control (14,15,17).

It was previously demonstrated that self-care behaviors are essential for efficient self-management of diabetes and higher quality of life; yet, diabetic patients often exhibit insufficient self-care behaviors that are affected by a multitude of social-cognitive factors (18,19). In consideration of the social learning theory, which underscores the interplay between individual and environmental factors in shaping behavior, Talbot et al. identify several psychosocial variables associated with T2DM self-care behaviors including perceived self-efficacy, perceived interference of diabetes in activities of daily living, perceived diabetes severity, and perceived social support from family and friends (14).

One in eight people, or 970 million individuals, worldwide suffer from a mental disorder, most commonly anxiety and depression (20,21). The COVID-19 pandemic in 2020 significantly increased these disorders, with reports showing 26% and 28% rises in anxiety and depression within a year (21). In Turkey, the 'Mental Health Profile' reported mental illness in 17.2% of the population, mainly anxiety and depression (22). A pandemic-specific study further showed prevalence rates of anxiety and depression symptoms at 25.7% and 30.9%, respectively (23).

As with physical complications, diabetic patients may also experience various psychological problems, most commonly anxiety and depression (19,24-27). A meta-analysis found that depression prevalence is 1.76 times higher in T2DM patients than in healthy individuals (28). While some studies suggest diabetes may contribute to depression and anxiety (29,30), others indicate these conditions are risk factors for T2DM (30,31). Psychological, social, and biological factors precipitate the onset of depression, often co-occurring with chronic illnesses such as diabetes (32,33). Evidence links depressive disorders in T2DM with poor HbA1c control, reduced medication adherence, increased complications, and higher mortality (34,35). Conversely, higher diabetes-related self-efficacy (36) and stronger family support (37) are associated with better glucose control and self-management, whereas lower self-efficacy relates to greater depressive symptoms, poor glycemic control, and reduced self-care (38). Ultimately, patient-centered care that is respectful and responsive to preferences and barriers remains a primary goal in diabetes management (39).

Diabetes is a common condition that imposes a considerable burden on patients and healthcare systems, prompting organizations and guidelines to design screening programs for both patients and the general population (40). These programs aim to prevent symptom onset, ensure earlier diagnosis, reduce organ damage, and address risk factors contributing to hyperglycemia (40). However, despite numerous guidelines (19,41,42), high-quality care is not always achieved; risk factor control (43) and international disparities in meeting clinical targets remain problematic (44-47). While diabetes care is increasingly delivered in primary care near patients' homes and guidelines emphasize psychosocial assessment in follow-up (47), depression screening is inadequate, with nearly 70% of chronic disease patients not screened within the recommended timeframe (48). Similarly, anxiety screening in diabetic patients is suboptimal in many countries (49,50).

Turkey adopts a community-based primary healthcare system (family medicine) offering basic and low-cost services. In 2021, the Ministry of Health introduced the Disease Management Platform to support screening and follow-up of chronic diseases in family health centers based on evidence-based guidelines. However, its use is optional, and effectiveness is limited by physician- and patient-related factors such as workload or reluctance to participate. These centers also manage multiple chronic conditions, making it difficult to focus on diabetes risks, and only physical health

indicators are recorded without mental health assessment (51). Thus, for efficient diabetes management in primary healthcare, attention should be given to factors supporting patients' self-management, including social and familial support, motivation, education, and access to medications/food (52). Ultimately, this study aims to determine the prevalence of anxiety and depression symptoms accompanying diabetes, identify the psychosocial factors that may influence these conditions, and explore the potential relations between these variables to inform and improve diabetes care practices in primary care.

MATERIAL and METHODS

This study employs a cross-sectional design, and the study population consisted of T2DM patients registered in family health centers in the Niğde province. We selected the sample from a pool of voluntary diabetic patients aged 18 years and older who applied to three randomly selected family health centers out of 11 centers located in Nigde. To select the three family health centers required for the sample, we noted 11 centers on slips of paper and randomly drew three of them. To be included in the study, patients had to have been diagnosed with T2DM for at least one year, not have a diagnosed psychiatric condition, and be literate. Participants were initially asked about any psychiatric disorders, and for those who reported not having such conditions, their medical records were checked at the relevant family health centers to confirm the absence of a prior diagnosis. We excluded individuals who were diagnosed with T2DM less than a year ago, had a diagnosed psychiatric disorder, were illiterate, or were unwilling to participate.

Given the national diabetes rate (12.1%) and the current population of Nigde (362,861), the sample size was calculated as 164 people with a 95% confidence interval (CI) using the OpenEpi 3.01 program (53). We initially administered the data collection tools to 20 diabetic patients and finalized them in a pilot study; yet, the data from these participants were not considered in the main analyses.

Upon necessary permissions from the family health center administrations, we initially identified the days and hours of dense patient visits with the help of physicians and other staff in the centers. We then collected the data face-to-face from 180 patients in the selected centers in June-November 2023. The data set was free of any instances of missing data, and there were no instances of participants dropping out of the study during the data collection phase.

Data Collection Tools

We collected the data through a questionnaire booklet covering an introductory characteristics form, the Multidimensional Diabetes Questionnaire (MDQ), and the Hospital Anxiety and Depression Scale (HADS).

Introductory Characteristics Form: The form comprises 17 questions designed to elicit participants' sociodemographic and diabetes-related characteristics.

Multidimensional Diabetes Questionnaire: The MDQ was developed by Talbot et al.(14) and was adapted into Turkish by Coşansu and Erdogan (54). The 41-item original version is comprised of six subscales within three components. The sub-scales are designed to assess various aspects of participants' perceptions of social-cognitive factors of diabetes, including perceived interference, condition severity, support, misguided support behaviors, self-efficacy, and outcome expectancies. The scale does not yield a total score; rather, each sub-scale can be deployed separately. The Cronbach's alpha reliability coefficients calculated for the MDQ were .90 for perceived interference, .91 for perceived support, .77 for perceived severity, .58 for misguided support behaviors, .82 for self-efficacy, and .86 for outcome expectancies (54). We calculated the internal consistency coefficients (Cronbach's alpha) to be .90 for perceived interference, .90 for perceived support, .85 for perceived severity, .92 for misguided support behaviors, .83 for perceived self-efficacy, and .96 for outcome expectancies and the results are similar.

Hospital Anxiety and Depression Scale: The four-point Likert-type HADS was initially designed by Zigmond and Snaith (55) to assess the likelihood of anxiety and depression and quantify the extent and severity of these conditions in patients. The scale comprises a total of 14 items, with odd numbers measuring anxiety and even numbers measuring depression. In the Turkish context, Aydemir (56) established the validity and reliability of the HADS in screening depression and anxiety symptoms in individuals with physical disorders. The scale consists of the anxiety (HAD-A) and depression (HAD-D) subscales. In the adaptation study, the optimal cut-off scores were found to be 10 for the anxiety subscale and 7 for the depression subscale, suggesting that individuals scoring above these thresholds are considered to be at risk for the mentioned disorders. The lowest and highest possible scores for both subscales are 0 and 21, respectively.

Statistic Analysis

We analyzed the data using the IBM SPSS 29.0 program (IBM Corp., Armonk, New York, USA). Descriptive statistics are presented as number (n), percentage (%), mean±standard deviation (M±SD), median (Mdn), minimum (min), maximum (max), and interquartile range (IQR). The normality of the data distribution was checked using the Shapiro-Wilk test. While using the Mann-Whitney U test pairwise comparisons of the participants' scores, we performed the Kruskal-Wallis test with Dunn-Bonferroni correction for multiple-group comparisons. We calculated Spearman's rank-order correlation coefficients to explore

the relationships between participants' scores. Moreover, we sought the impacts of social-cognitive factors of diabetes (MDQ) on anxiety and depression (HADS) through multiple linear regression analysis. In the regression model, we also considered confounding variables and employed backward elimination to achieve the final model. A p-value < 0.05 was accepted as statistically significant.

RESULTS

Participants' mean age was 52.2±11.3 years. More than half of them (61.7%) were females, and 86.7% were married. While 52.2% were primary school graduates, 60.0% were not employed. About a quarter of them (25.6%) identified themselves as experiencing financial difficulties and struggling to make ends meet. About half of them (49.4%) lived with their spouses, and 72.2% were city dwellers. The majority (70%) had a disease other than diabetes, and 29.4% used medication other than those for diabetes. The disease duration was 1-5 years for 63.3% of participants. Oral antidiabetic medication was the most commonly utilized treatment modality (36.7%), and retinopathy represented the most prevalent complication of their condition (10.0%). The prevalence of a family history of diabetes was 46.7%, with first-degree relatives exhibiting the highest incidence (65.5%). Self monitoring of blood glucose (SMBG) was a prevalent practice, with 75.6% of participants engaging in this self-management strategy (Table 1).

Table 1: Participants' Introductory Characteristics

Characteristics	Findings (n=180)	
Age, (years±SD) (min-max)	52.2±11.3 (30-83)	
Gender, n (%)		
Female	111	(61.7)
Male	69	(38.3)
Marital status, n (%)		
Married	156	(86.7)
Single	24	(13.3)
Health insurance, n (%)		
Yes	163	(90.6)
Education, n (%)		
Literate	11	(6.1)
Primary school	94	(52.2)
Middle school	46	(25.6)
High school and above	29	(16.1)
Employment, n (%)		
Retired	55	(30.6)
No	108	(60.0)
Yes	17	(9.4)
Financial status, n (%)		
Needy/economically disadvantaged	46	(25.6)
Middle-high income	134	(74.4)
Cohabitants, n (%)		
Alone	19	(10.6)
Spouse	89	(49.4)
Spouse and children	57	(31.7)
Other (relatives, friends, etc.)	15	(8.3)
Place of residence, n (%)		
City center	130	(72.2)
District	19	(10.6)
Town	15	(8.3)
Village	16	(8.9)
Comorbidities, n (%)		
Yes	54	(30.0)
Medication other than for diabetes, n (%)		
Yes	53	(29.4)
Disease duration, n (%)		
1-5 years	115	(63.9)
6 years and over	65	(36.1)
Diabetes treatment modality, n (%)		
Dietary regimen	44	(24.4)
Oral diabetes medication	66	(36.7)
Insulin	52	(28.9)
Insulin and oral diabetes medication	18	(10.0)
Diabetes complications, n (%)		
No	151	(83.9)
Yes	29	(16.1)
Retinopathy	18	(10.0)
Neuropathy	4	(2.2)
Nephropathy	7	(3.9)
Diabetic family members, n (%)		
No	96	(53.3)
Yes	84	(46.7)
Degree of relationship with diabetic family members, n (%)		
First-degree relative(s)	55	(65.5)
Second-degree relative(s)	20	(23.8)
Spouse	9	(10.7)
SMBG, n (%)		
Yes	136	(75.6)
No	44	(24.4)
If yes, the frequency per week M (min-max)	3 (1-21)	
Total	180	(100)

n: Number of patients, **%:** Column percentage, **SMBG:** Self Monitoring of Blood Glucose

Participants' HADS scores uncovered that while 11.1% exhibited anxiety symptoms (≥ 11 points), 74.4% demonstrated depressive symptoms (≥ 8 points). Perceived severity scores of females were significantly higher than those of males. Patients with health insurance had significantly lower misguided support behaviors and higher outcome expectancies scores than those without health insurance. Misguided support behaviors scores were also significantly lower among literate patients, while middle school graduates had significantly higher outcome expectancies scores. Perceived support scores of retirees were found to be significantly higher than those of unemployed participants. Patients living with their spouses and children had significantly lower perceived anxiety and perceived interference scores and higher outcome expectancies scores than those living alone and with their spouses. Patients living with their spouses had significantly higher misguided support behaviors scores than those living with their spouses and children. Individuals with comorbidities and those utilizing medications other than those for diabetes obtained significantly lower anxiety, depression, perceived interference, perceived support, and misguided support behaviors and higher outcome expectancies scores compared to those without. Those diagnosed with diabetes for a period of six years or longer had significantly lower anxiety, depression, and misguided support behaviors and higher perceived self-efficacy and outcome expectancies scores compared to patients diagnosed for a period of one to five years. Participants with another diabetic person in their family had significantly lower anxiety, depression, perceived interference, perceived support, and misguided support behaviors and higher self-efficacy and outcome expectancies scores. Finally, patients with SMBG had significantly higher anxiety, depression, perceived interference, and misguided support behaviors and lower outcome expectancies scores than patients without (Table 2).

Table 2: Participants' HADS and MDQ Scores by Their Sociodemographics

Sociodemographic characteristics	HADS		MDQ					
	Anxiety (HAD-A)	Depression (HAD-D)	Perceived Interference	Perceived Severity	Perceived Support	Misguided support behaviors	Perceived Self-efficacy	Outcome Expectancies
Gender								
Female	8.0 (3.0)	10.0 (5.0)	2.8 (1.9)	3.3 (1.7)	3.0 (1.5)	1.0 (2.8)	43.3 (26.0)	61.7 (57.7)
Male	7.0 (3.5)	10.0 (5.0)	2.8 (1.1)	3.0 (1.7)	3.0 (0.7)	2.8 (3.0)	40.0 (20.0)	48.3 (52.5)
Test statistic[&]	0.969	0.124	0.452	2.311	1.735	1.882	1.035	1.294
p	0.333	0.901	0.651	0.021	0.083	0.060	0.301	0.196
Health insurance								
No	7.0 (3.0)	10.0 (2.5)	2.9 (0.9)	3.3 (0.8)	3.0 (1.0)	3.0 (1.8)	37.1 (17.1)	40.0 (20.0
Yes	8.0 (3.0)	10.0 (5.0)	2.8 (1.8)	3.3 (1.7)	3.0 (0.8)	1.8 (3.0)	42.9 (26.0)	60.0 (57.7)
Test statistic[&]	0.162	1.261	1.826	0.465	0.171	2.769	1.669	2.539
p	0.871	0.207	0.068	0.642	0.864	0.006	0.095	0.011
Education								
Literate	7.0 (5.0)ab	8.0 (5.0)	2.3 (3.4)	3.0 (3.7)	1.9 (1.5)	0.0 (0.0)[a]	67.1 (41.4)	78.3 (40.0)[a]
Primary school	6.5 (4.0)a	10.0 (5.0)	2.7 (1.6)	3.3 (1.7)	3.0 (1.1)	0.9 (3.0)[b]	40.7 (22.0)	58.3 (57.8)[ab]
Middle school	9.0 (3.0)b	11.0 (3.0)	2.9 (0.8)	3.3 (1.0)	3.1 (0.5)	2.8 (1.8)[b]	40.0 (20.7)	41.7 (41.7)[b]
High school and above	7.0 (4.0)ab	10.0 (6.0)	2.8 (1.9)	3.7 (1.8)	3.0 (0.7)	2.3 (3.0)[b]	48.6 (37.0)	65.0 (59.2)[ab]
Test statistic[‡]	8.966	4.492	2.776	3.639	5.285	18.711	4.969	7.978
p	0.030	0.213	0.428	0.303	0.152	<0.001	0.174	0.046
Employment								
Retired	7.0 (5.0)	11.0 (5.0)	2.9 (1.2)	3.3 (1.3)	3.2 (1.1)[a]	2.5 (3.0)	41.4 (20.0)	46.7 (53.7)
No	8.0 (4.0)	10.0 (4.8)	2.8 (2.1)	3.3 (1.7)	3.0 (1.2)[b]	1.5 (2.9)	42.1 (27.2)	59.2 (58.3)
Yes	7.0 (3.5)	10.0 (4.0)	2.7 (1.7)	3.7 (2.0)	3.1 (0.8)[ab]	2.5 (3.0)	50.0 (23.7)	58.3 (47.2)
Test statistic[‡]	5.594	0.637	0.507	1.346	6.320	1.787	0.342	0.748
p	0.061	0.727	0.776	0.510	0.042	0.409	0.843	0.688
Cohabitants								
Alone	8.0 (4.0)a	10.0 (3.0)	3.0(0.4)[a]	3.0 (1.0)	-	-	40.0 (10.0)	38.3 (10.0)[a]
Spouse	8.0 (4.0)a	11.0 (5.0)	2.9(0.8)[a]	3.3 (1.3)	3.0 (0.6)	2.5(2.5)[a]	40.0(18.6)	45.0 (54.2)[a]
Spouse and children	7.0 (2.5)b	10.0 (7.0)	2.0(2.2)[b]	3.7 (2.2)	2.9 (2.0)	0.0 (1.9)[b]	48.6 (34.3)	84.0 (44.8)[b]
Other	7.5 (4.0)ab	10.0 (5.0)	2.1(2.1)[ab]	4.0 (3.0)	2.9 (3.4)	0.0 (2.5)[b]	60.0 (40.0)	80.0 (41.7)[b]
Test statistic[‡]	12.253	1.515	11.505	4.885	1.108	36.075	5.976	20.853
p	0.007	0.679	0.009	0.180	0.775	0.001	0.113	0.001

Table 2 continue

Comorbidities								
No	8.0 (4.0)	11.0 (3.0)	2.9 (0.8)	3.3 (1.0)	3.1 (0.6)	2.8 (2.3)	41.4 (17.1)	44.2 (48.8)
Yes	6.0 (5.0)	7.0 (6.3)	1.8 (2.9)	3.5 (3.8)	2.7 (2.0)	0.0 (1.0)	51.5 (43.6)	90.0 (45.0)
Test statistic[&]	2.954	4.623	3.845	0.331	3.352	6.219	0.475	3.980
p	0.003	<0.001	<0.001	0.741	<0.001	<0.001	0.635	<0.001
Medication other than for diabetes								
No	8.0 (4.0)	11.0 (3.0)	2.9 (0.8)	3.3 (1.0)	3.1 (0.7)	2.8 (2.3)	41.4 (17.1)	45.0 (48.3)
Yes	6.0 (5.0)	7.0 (6.0)	1.9 (2.9)	3.3 (3.8)	2.8 (1.9)	0.0 (1.0)	51.4 (45.9)	91.7 (45.0)
Test statistic[&]	2.535	5.020	3.484	0.197	2.771	6.112	0.520	4.286
p	0.011	<0.001	<0.001	0.844	0.006	<0.001	0.603	<0.001
Disease duration								
1-5 years	8.0 (4.0)	11.0 (3.0)	2.9 (1.2)	3.3 (1.3)	3.0 (0.5)	2.8 (2.5)	40.0 (17.1)	41.7 (51.7)
6 years and over	7.0 (3.5)	9.0 (5.0)	2.4 (1.9)	3.7 (2.7)	3.1 (2.4)	0.0 (2.0)	54.3 (37.1)	85.0 (45.8)
Test statistic[&]	2.523	2.601	1.338	1.352	0.923	4.920	3.134	4.520
p	0.012	0.009	0.181	0.176	0.356	<0.001	0.002	<0.001
Diabetic family members								
No	8.0 (2.0)	10.5 (3.0)	3.0 (0.7)	3.3 (1.0)	3.0 (0.7)	2.8 (2.3)	40.0 (17.1)	43.3 (44.2)
Yes	6.0 (5.0)	9.0 (8.0)	2.3 (2.6)	3.3 (2.7)	2.9 (1.6)	0.3 (2.7)	47.9 (35.7)	82.5 (59.6)
Test statistic[&]	3.200	2.563	4.345	0.770	2.372	4.506	2.296	3.971
p	0.001	0.010	<0.001	0.442	0.018	<0.001	0.022	<0.001
SMBG								
Yes	6.0 (5.0)	7.5 (8.0)	2.0 (2.8)	3.2 (3.0)	2.9 (2.2)	0.0 (1.7)	50.7 (45.5)	95.5 (44.2)
No	8.0 (3.0)	10.5 (3.0)	2.9 (1.1)	3.3 (1.3)	3.0 (0.7)	2.5 (3.0)	40.0 (19.6)	45.8 (50.0)
Test statistic[&]	2.317	3.787	2.566	0.301	1.879	3.758	1.124	4.097
p	0.020	<0.001	0.010	0.763	0.060	<0.001	0.261	<0.001

Data are presented as median (IQR). [&]: Mann-Whitney U test, [‡]: Kruskal-Wallis H test, [a,b] indicates group differences in each row. Groups with the same superscripts yield no significant differences.

We found a significant moderate positive correlation between participants' anxiety and misguided support behaviors scores (r=0.419, p<0.001) . It is also the case between their depression scores and perceived interference (r=0.405, p < 0.001) and misguided support behaviors scores (r = 0.443, p < 0.001).

We sought the impacts of participants' perceived social-cognitive factors of diabetes (MDQ subscale scores) on their anxiety (HADS-A scores) through multiple linear regression analysis. In the univariate analyses, variables with a p-value < 0.20 in comparisons involving anxiety or the Multidimensional Diabetes Questionnaire subscales were considered as confounding factors (57). We considered confounding variables (gender, age, health insurance, education, employment, cohabitants, comorbidities, medication other than for diabetes, disease duration, family history of diabetes, SMBG) in the regression model and concluded the final model using backward elimination. Our findings showed that a one-point increase in participants' perceived interference scores led to a 0.602-point increase in their anxiety scores, while a one-point increase in their misguided support behaviors scores was associated with a 0.378-point increase in their anxiety scores. The variables in the model explained 25.2% of anxiety among participants (Table 3).

The relationships between the mentioned factors and depression were also explored using the multiple linear regression analysis. We also considered confounding variables (gender, age, health insurance, education, employment, cohabitants, comorbidities, medication other than for diabetes, disease duration, family history of diabetes, SMBG) in the analysis and obtained the final model through backward elimination. The results demonstrated that a one-point increase in participants' perceived interference and perceived severity scores led to an increase of 0.644 points and 0.612 points in their depression scores, respectively. Yet, a one-point increase in their outcome expectancies scores was linked with a 0.040-point decrease in their depression scores. The variables in the model explained 37.5% of depression among participants (Table 4).

Table 3: Regression Analysis of the Relationships Between Social-Cognitive Factors of Diabetes and Anxiety

	Regression Coefficients*						
	β	se	zβ	t	p	95.0% Confidence Interval for β	
						Lower Bound	Upper Bound
Model							
Constant	3.542	1.779		1.991	0.048	0.029	7.054
Perceived Interference	0.602	0.171	0.285	3.514	<0.001	0.264	0.940
Misguided Support Behaviors	0.378	0.172	0.206	2.195	0.030	0.038	0.718

Variables entered in step 1: outcome expectancies, perceived interference, perceived self-efficacy, misguided support behaviors
Confounding factors: gender, age, health insurance, education, employment, cohabitants, comorbidities, medication other than for diabetes, disease duration, family history of diabetes, SMBG
Elimination method: Backward
Model Statistics
Model Summary: F=4.343; p<0.001; R^2=0.327; Adj R^2=0.252, Power=0.999
Collinearity Statistics: Tolerance=0.155-0.831; Variance inflation factor= 1.204-6.471
Normality for standardized residuals: Shapiro-Wilk test statistic: 0.944; p=0.725

Table 4: Regression Analysis of the Relationships Between Social-Cognitive Factors of Diabetes and Depression

	Regression Coefficients*						
	β	se	zβ	t	p	95.0% Confidence Interval for β	
						Lower Bound	Upper Bound
Model							
Constant	7.339	2.484		2.955	0.004	2.434	12.244
Perceived Interference	0.644	0.215	0.24	3.003	0.003	0.221	1.068
Perceived Severity	0.612	0.177	0.258	3.459	<0.001	0.262	0.961
Outcome Expectancies	-0.040	0.011	-0.309	-3.571	<0.001	-0.062	-0.018

Variables entered in Step 1: outcome expectancies, perceived interference, perceived self-efficacy, misguided support behaviors
Confounding factors: gender, age, health insurance, education, employment, cohabitants, comorbidities, medication other than for diabetes, disease duration, family history of diabetes, SMBG
Elimination method: Backward
Model Statistics
Model Summary: F=6.648; p<0.001; R^2=0.441; Adj R^2=0.375, Power=0.999
Collinearity Statistics: Tolerance=0.151-0.831; Variance inflation factor= 1.204-6.829
Normality for standardized residuals: Shapiro-Wilk test statistic: 0.989; p=0.195

DISCUSSION

This study focuses on two key objectives in the primary healthcare setting: 1) to identify the prevalence of anxiety and depression symptoms, which are not typically included in routine diabetes screening programs and 2) to examine the psychosocial factors that not only contribute to the presence of anxiety and depression—often seen as comorbidities in diabetes—but also adversely affect diabetes management and increase the risk of complications. Over half of our participants were in the early stages of diabetes, with a diagnosis of less than five years. While three-quarters of them exhibited depressive symptoms, one in ten had anxiety symptoms, which aligns with the findings of previous research (25,58). The incidence of diabetes complications was less than one in five patients. Similarly, the observational DISCOVER study identified a global prevalence of 18.8% for microvascular complications and 12.7% for macrovascular complications among diabetic patients (59).

The Health Belief Model (HBM) states that perceived susceptibility and severity determine perceived threat, which predicts self-management behaviors (60). Consistent with prior studies, females reported greater perceived severity (61). Among diabetic patients, higher socioeconomic status (SES) was linked to more favorable outcome expectancies and self-efficacy, whereas lower SES was associated with negative expectancies (62). In this study, health insurance was related to enhanced outcome expectancies and reduced misguided support, while retirees reported higher perceived support than unemployed participants. Educational attainment also influenced perceptions; literate participants

showed lower misguided support behaviors, possibly due to greater understanding of such behaviors.

Family members and close acquaintances of individuals with diabetes play a critical role in disease management, as the condition affects not only the patient but also their family (63). Family support has been shown to enhance self-care and treatment adherence, reduce morbidity, and improve quality of life (64-66). In this study, participants living with their families exhibited lower anxiety, perceived interference, and misguided support behaviors, along with higher outcome expectancies. Interestingly, contrary to previous reports linking comorbidities to poorer quality of life (65,67), our findings indicated that patients with comorbidities, a family history of diabetes, multiple medication use, and cohabitation with diabetic family members reported lower anxiety, depression, perceived interference, and misguided support behaviors. This may reflect a greater acceptance of the disease due to recognition of genetic predisposition and prior adaptation through observing diabetic relatives' management practices. Supporting this, 75% of Saudi patients perceived diabetes as hereditary (68), and adolescents with a family history of T2DM were found to emphasize non-modifiable over modifiable risk factors (69). However, comorbidities and the use of non-diabetes medications were associated with lower perceived social support, while longer disease duration and living with diabetic relatives correlated with higher self-efficacy and outcome expectancies, consistent with literature suggesting that prolonged disease experience fosters greater understanding and fewer negative emotional representations (70,71).

Self monitoring of blood glucose (SMBG) is a pivotal strategy for diabetes management (72). In this study, three-quarters of patients practiced SMBG weekly; however, they were more prone to anxiety and depression, greater perceived interference and misguided support, and poorer outcome expectancies. Systematic reviews confirmed both benefits of SMBG and its link to higher anxiety and depression. Notably, the DiGEM and ESMON trials (73,74) showed a negative effect on anxiety and/or depression, likely due to its invasive nature evoking undesirable experiences. SMBG may also reduce quality of life (75), though qualitative studies reported that limited daily SMBG led some patients to feel well (76).

Social-cognitive factors of diabetes assessed with the subscales of the MDQ explained 25.2% of participants' anxiety scores (perceived interference) and 37.5% of their depression scores (perceived interference, perceived severity, and outcome expectancies). In the fields of social sciences and psychology, considering the challenges of studying human behavior, even values between 0.10 and 0.30 are often regarded as acceptable (77,78).

Perceived interference refers to one's estimation of the difficulty of various social, economic, and personal challenges to a specific behavioral goal. It is therefore key to identifying these barriers to minimize the adverse impacts on adherence to self-management programs (79). Perceived interference was also a significant factor contributing to the anxiety and depressive symptoms of our patients. The perception of the disease as an interference with life may have increased patients' anxiety and depression symptoms. Similarly, a study with diabetic patients reported depression to be positively associated with perceived barriers, perceived severity of diabetes, and misguided support behaviors from family members but negatively linked to self-efficacy (80). In another qualitative study, diabetic participants reported being challenged to adapt to every domain of life while suffering from diabetes (81). It was also demonstrated that diabetic patients perceive a multitude of interferences in physical activities, dietary restrictions, pharmacological treatment, and adherence to self-care activities (82,83). In this study, misguided support behaviors-a type of negative social support- contributed to participants' anxiety. Previous research also found anxiety symptoms to be positively related to misguided support behaviors from family members, which is consistent with our findings (80). Despite a non-significant relationship between perceived support and anxiety/depression, misguided support behaviors were significantly associated with anxiety, suggesting that reducing negative social support rather than increasing positive support may better enhance the psychosocial status of diabetic patients.

The perceived severity of a disease—whether controllable, understandable, treatable, cyclical, or severe—is a risk factor for depression (84,85). Outcome expectancy, another social-cognitive factor, reflects one's perception of self-care behaviors on metabolic control and complication prevention; high outcome expectancy reduces depression risk, whereas low expectancy increases it (14,86). Outcome expectancy, intention, and self-efficacy are critical in early behavioral modification for diabetes adaptation (86). Prior research shows higher outcome expectancies reinforce self-management behaviors such as diet and exercise (14,86), while depressive symptoms impair self-management and treatment adherence, further hindering outcome expectancies (87). This study is not free of a few limitations. The cross-sectional design of the study prevents the deduction of causal relationships between the variables. In addition, we did not measure patients' HbA1c values but rather relied on their statements when delving into the relationships between anxiety, depression, and social-cognitive factors. Finally, our findings are limited to the data from patients applying to family health centers and may be representative only of this particular patient population.

In a nutshell, the present study examined the sociodemographic characteristics, anxiety and depression levels, and psychosocial factors of diabetes among T2DM patients followed up in three family health centers. The findings revealed that the sociodemographic characteristics of these patients were associated with multidimensional factors of diabetes. Overall, the findings from both the original scale development study and the present study indicate that the MDQ is a reliable instrument for assessing psychosocial factors in individuals with type 2 diabetes. It is well known that T2DM patients often have a desire to discuss their coping strategies with their care providers; therefore, primary care centers where patients conveniently consult their physicians may be an optimal setting for their follow-up. It is essential to enhance the efficacy of diabetes screening and follow-up programs in primary healthcare and ensure the integration of psychosocial assessments into these processes. To achieve this, further in-depth research is recommended to explore the barriers to the routine implementation of screening programs and support the integration of psychosocial components into diabetes management in primary healthcare. Moreover, family physicians and primary care staff should be well informed about the multidimensional factors of diabetes, including its psychological aspects, to effectively manage patients with T2DM. It is also essential to offer psychological counseling services tailored to the specific needs of individuals with diabetes in family health centers. Finally, relevant educational interventions for diabetic patients and their families help improve their social-cognitive perceptions of diabetes to encourage their adherence to treatment and reduce the risk of developing anxiety and depression.

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Authors Contributions
Çiğdem Samancı Tekin and **Yasemin Uğurlu** conceptualized the study. **Çiğdem Samancı Tekin** and **Yasemin Uğurlu,** interpreted the data, being supervised by **Aysun Güzel**. **Çiğdem Samancı Tekin** wrote the first draft, which was reviewed and edited by all authors.

Conflict of Interest
The authors declare no competing interests.

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Ethical Approval
The Research Ethics Committee of Nigde Omer Halisdemir University granted ethical approval to our study (No: 2020/06-11 dated 01/07/2020). We obtained informed consent from all participants and strictly followed the ethical principles predicated in the Declaration of Helsinki in each research phase. Consent for publication :Not applicable. Availability of data and materials:The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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