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The Effect of COVID-19 Fear on Treatment Adherence and Health-Seeking Behavior in Individuals with Type 2 Diabetes

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ABSTRACT

Objective: This descriptive and cross-sectional study aimed to determine the impact of COVID-19 induced fear on the treatment adherence and health-seeking behavior of individuals with type 2 diabetes. Method: The sample for this research consisted of 150 type 2 diabetes patients who attended the Mersin City Training and Research Hospital endocrinology outpatient clinics for treatment and follow-up. Data collection involved the use of a Personal Information Form, the COVID-19 Fear Scale, the Type 2 Diabetes Mellitus Patient Treatment Adherence Scale, and the Health-Seeking Behavior Scale. Data was analyzed using Student's t-test, One Way ANOVA and Multiple Linear Regression analysis. Findings: Among the individuals participating in the study, it was determined that while 54.7% were female, 48.7% had an HbA1c level of 8.1 and above, 64% used insulin, 80.7% developed complications related to diabetes and the average age of the participants were 62.9±11.9. Furthermore, the majority were not diagnosed with COVID-19, and they did not require hospitalization due to COVID-19. The adherence to diabetes treatment among the patients was found to be moderate, with the lowest adherence was observed in terms of lifestyle changes and the highest adherence was observed in terms of the emotional and behavioral adherence dimensions. Multiple regression analysis revealed that the fear of COVID-19 did not affect diabetes treatment adherence levels of the patients ($p>0.05$). It was found that only those patients who were using insulin and those who were not adhering to medical nutritional treatment had lower adherence to diabetes treatment ($p<0.05$). As the level of education and the level of COVID-19 induced fear increased, the score for health-seeking behavior increased as well. Conversely, as age increased, the average score for health-seeking behavior decreased ($p<0.05$). Conclusion: This study found that the fear of COVID-19 did not affect adherence levels to diabetes treatment but the fear of the disease did affect health-seeking behavior. An increase of 1 point in the COVID-19 Fear Scale resulted in a 1.23-fold increase in the overall score of the Health-Seeking Behavior Scale.

Key words: Diabetes, Fear of COVID-19, Treatment adherence, Health-seeking behavior.

Tip 2 Diyabeti Olan Bireylerdeki COVID-19 Korkusunun Tedaviye Uyum ve Sağlık Arayışı Davranışına Etkisi

ÖZ

Amaç: Tanımlayıcı ve kesitsel tipte olan bu çalışma tip 2 diyabetli bireylerin COVID-19 korkusunun tedaviye uyum ve sağlık arama davranışına etkisini belirlemek amacıyla gerçekleştirilmiştir. Yöntem: Araştırmanın örneklemini Mersin Şehir Eğitim ve Araştırma Hastanesi endokrin polikliniklerine tedavi ve izlem için başvuran 150 tip 2 diyabet hastası oluşturmaktadır. Verilerin toplanmasında; Kişisel Bilgi Formu, COVID-19 Korkusu Ölçeği, Tip 2 Diyabetes Mellitus Tedavisine Hasta Uyum Ölçeği ve Sağlık Arama Davranışı Ölçeği kullanılmıştır. Araştırma verileri, Student's t test, One Way ANOVA ve Çoklu Lineer Regresyon analizi ile değerlendirilmiştir. Bulgular: Araştırmaya katılan bireylerin %54,7'sinin kadın, %48,7'sinin HbA1c düzeyinin 8.1 ve üzerinde olduğu, %64'ünün insülin kullandığı, %80,7'sinde diyabete bağlı komplikasyonların geliştiği ve yaş ortalamasının 62,9±11,9 olduğu belirlenmiştir. Ayrıca çoğunun COVID-19 tanısı almadığı ve COVID-19 nedeniyle hastanede yatmadığı saptanmıştır. Araştırmaya katılan hastaların diyabet tedavisine uyumlarının orta düzeyde olduğu, yaşam tarzı değişikliğine uyumun en düşük, uyuma uygun duygu ve davranışlar boyutuna uyumun ise en yüksek olduğu bulunmuştur. Yapılan çoklu regresyon analizinde COVID-19 korkusunun diyabet tedavisine uyumu etkilemediği ($p>0,05$), sadece insülin kullananların ve tıbbi beslenme tedavisine uymayanların diyabet tedavisine uyumlarının daha düşük olduğu saptanmıştır ($p<0.05$). Yine eğitim düzeyi ve COVID-19 korku düzeyi arttıkça sağlık arama davranışı puanının arttığı, yaş arttıkça ise sağlık arama davranışı puan ortalamasının düştüğü saptanmıştır ($p<0.05$). Sonuç: Bu araştırmada COVID-19 korkusunun; diyabet tedavisine uyumu etkilemediği ancak sağlık arama davranışına etkisinin olduğu, COVID-19 Korku Ölçeği puanındaki 1 puanlık artışın Sağlık Arama Davranışı Ölçeği toplam puanında 1,23 kat artış sağladığı bulunmuştur.

Anahtar kelimeler: Diyabet, COVID-19 korkusu, Tedaviye uyum, Sağlık arama davranışı.

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INTRODUCTION

In a short period of time, the novel coronavirus rapidly spread, impacting the entire world, leading the World Health Organization to declare the disease as a pandemic on March 11, 2020 (Haybar et al., 2020). Particularly, elderly individuals and those with chronic diseases were identified as being more vulnerable to the virus. It is highlighted that COVID-19 poses the most significant threat to these two populations (Barone et al., 2021). This is because the presence of a chronic disease in an individual can exacerbate the progression of the COVID-19 infection, intensifying its symptoms (TEMD, 2022).

Diabetes is a significant global health issue characterized by elevated glucose levels in the blood, affecting numerous organs and tissues, with its prevalence among the global population increasing continually. Studies concerning diabetes management, which encompasses multiple components such as self-monitoring of blood glucose, medical nutrition therapy, regular exercise, medication adherence, stress management, foot care, and diabetes education, have concluded that patient adherence levels to diabetes treatment was suboptimal (Baykal and Kapucu, 2015; Üstündağ and Dayapoğlu, 2021). Due to suppressed immune systems, the coexistence of multiple diseases, and the complications of such diseases, diabetes has been recognized as a major risk factor for COVID-19, with a significant proportion of the cases being attributed to this metabolic disease (TEMD, 2022).

While COVID-19 has impacted the routine daily lives of even healthy individuals, it made it more difficult for patients with diabetes to adapt to diabetes treatment (Sürücü and Sungur, 2021). Due to pandemic precautions, procedures other than emergency surgeries have been postponed, walk-in patients have been denied the services of examination and treatment services, outpatient services have been reduced, and during this period, priority has been given to patients who had COVID-19. Consequently, it has been noted that individuals with chronic conditions have faced interruptions in their routine medical check-ups (Kutlutürk, 2020; Peric and Stulnig, 2020; Sürücü and Sungur, 2021; Wicaksana, 2020). Particularly, individuals with chronic diseases like diabetes, hypertension, and cancer, who tend to utilize healthcare services more frequently, are projected to encounter worsened clinical outcomes at the end of the pandemic phase (Koliaki, 2020; Sürücü and Sungur, 2021). Furthermore, these individuals reportedly experience heightened fear and stress levels due to their awareness of being at a greater risk compared to their healthier counterparts (Heiat et al., 2021; Lima-Martínez et al., 2021).

While the threat of COVID-19 has directed many individuals towards protective behaviors to safeguard against the pandemic, paradoxically, this concern can sometimes lead to non-adherent behaviors in the quest for obtaining health-related information. Therefore, it is imperative for individuals to adopt health-seeking behaviors that are beneficial (Kim et al., 2021).

In the literature, there are many studies on the effect of fear of COVID-19 on adherence levels to diabetes treatment, and it has been reported in these studies that fear of COVID-19 reduces adherence to treatment in individuals with diabetes (Mukona and Zvinavashe, 2020; Pardhan et al., 2021; Önmez et al., 2020; Saraçoğlu and Avcı, 2021; Say and Çakır, 2021). However, no study has been found during our literature review process with regards to the effect of fear of COVID-19 on adherence to diabetes treatment and health-seeking behavior in individuals with type 2 diabetes. For this purpose, this study was planned.

MATERIAL AND METHOD

Research Type

This study was conducted with a descriptive and cross-sectional design to determine the impact of COVID-19 fear on treatment adherence and health-seeking behaviors among individuals with type 2 diabetes during the pandemic period.

Population and Sample of the Study

The population for the study consisted of patients who were diagnosed with type 2 diabetes and who sought treatment and control services at the Mersin City Training and Research Hospital's endocrinology outpatient clinics between the 4th of July and the 30th of September, 2022. The sample size for

the study was calculated using the G*Power 3.1.9.4 software, based on a presumed medium effect size (d=0.3) between scores on the COVID-19 Fear Scale and the Health-Seeking Behavior Scale (Faul et al., 2009) (α = 0.05, 1-ß= 0.95, effect size d=0.30), resulting in a sample size of 138. However, to account for a potential loss from the study for any reason, a 10% data loss rate was added, leading to a total sample of 150 patients. Patients aged 18 and over, who could speak and write in Turkish, who were diagnosed with type 2 diabetes for at least one year, whose COVID-19 test was negative at the time, whose physical and cognitive health levels were suitable for answering the forms planned to be applied in the research were included in the study.

Data Collection Tools

Personal Information Form

The personal information form was created by researchers as a result of the literature review on the subject (Kıraç, 2019; Özdemir and Arpacıoğlu, 2020; Pardhan et al., 2021; Saraçoğlu and Avcı, 2021; Utli and Doğru, 2021). This form contains a total of 18 questions, 8 questions regarding socio-demographics (e.g., age, sex, education level) and 10 questions regarding clinical status (e.g., history of COVID-19, duration of diabetes, medications taken, HbA1c levels).

The COVID-19 Fear Scale

In order to assess the level of fear related to COVID-19 infection among participants, a unidimensional 7-item scale, adapted to the Turkish context by Satici and colleagues (2021), was employed. Originally developed by Ahorsu and colleagues, this tool utilizes a five-point Likert scale. Scores on the scale range from 1 point (strongly disagree) to 5 points (strongly agree). The maximum achievable score is 35, while the minimum is 7. A higher score on the scale indicates a more pronounced fear of COVID-19. In the Turkish validity and reliability study of the scale, it had a Cronbach's Alpha coefficient (α=0.82)(Satici et al., 2021), whereas in this study, it was found to be (α= 0.94).

The Type 2 Diabetes Mellitus Patient Treatment Adherence Scale (T2DMPTAS)

The scale, developed by Demirtaş and Akbayrak (2017), was designed to assess the adherence levels of individuals with type 2 diabetes to their treatments. It is requisite for the individuals whom were diagnosed with type 2 diabetes for at least one year in order to utilize this scale. The scale comprises seven sub-dimensions: Attitudinal and Emotional Factors (AEF), Knowledge and Personal Factors (KPF), Lifestyle Changes (LC), Anger Emotions (AE), Emotions and Behaviors Consistent with Adherence (EBCA), Dietary Bargaining (DB), and Denial Feelings (DF). The instrument has 30 items, each rated on a five-point Likert scale. The sum of all item scores produces the total scale score. The highest possible score on the scale is 150, while the lowest is 30. Scores ranging from 30 to 54 are interpreted as "good treatment adherence" scores between 55 and 125 indicate "moderate treatment adherence," and scores from 126 to 150 are seen as "poor treatment adherence." Lower scores on the sub-dimensions suggest that the individual's treatment process is proceeding in a positive manner and that the patients are they are exhibiting the desired behaviors. The scale's Cronbach's Alpha coefficient was found to be 0.77 (Demirtaş and Akbayrak, 2017) and 0.75, respectively in this research.

The Health-Seeking Behavior Scale (HSBS)

To assess individuals' health-seeking behaviors, the scale developed by Kıraç (2019) consists of three sub-dimensions: Online Health-Seeking Behavior (OHSB), Professional Health-Seeking Behavior (PHSB), and Traditional Health-Seeking Behavior (THSB). Each item on this five-point Likert scale is scored between 1 and 5. The total possible score from the scale ranges from a minimum of 12 to a maximum of 60. A high score indicates that the level of engagement in terms of the health seeking behavior is high. The scale's Cronbach's Alpha coefficient was reported as 0.75 by Kıraç (2019). In this study, the alpha reliability coefficient was found to be 0.80. Additionally, the scale's Cronbach's Alpha (α was previously reported as 0.75 (Kıraç, 2019). Whereas in this study, it was determined to be 0.80.

Data Collection

Data was collected by the researchers using a questionnaire administered to patients who met the inclusion criteria of the

study and patients who consented to participate. The face-to-face interview technique was employed in the outpatient clinic room. After explaining the purpose of the research to the patients, they were provided with the questionnaire and were asked to fill in the form. Completing the questionnaire took approximately 20-30 minutes. Social distance was maintained in all communication processes with patients.

Data Analysis

In the statistical analysis process of the data, normality testing in continuous variables was evaluated with Kolmogorov-Smirnov statistics. With this evaluation, it was seen that continuous variables were normally distributed ($p>0.05$). For analyzing continuous data in scales, mean and standard deviation were employed, while frequency and percentage values were used to describe categorical variables. The Student's t-test was applied in order to compare the means of two independent groups. When comparing the means of more than two independent groups, the One Way ANOVA test statistic was used. If a difference was detected with ANOVA, further analysis was carried out using the Tukey post-hoc test. The perceived relationships between the scores from the Type 2 Diabetes Mellitus Patient Treatment Adherence Scale and the Health-Seeking Behavior Scale were evaluated using the Multiple Linear Regression analysis to predict variations by the associated independent variables. A significance level of $p<0.05$ was considered as statistically significant.

Ethical Aspect of the Research Study

Prior to commencing the research, permissions to utilize the scales in the study were obtained from the Toros University Scientific Research and Publication Ethics Committee (03.25.2022-52), the Mersin City Training and Research Hospital Ethics Committee (05.30.2022-2022-05-05), the Mersin Provincial Health Directorate (06.23.2022-39), and the Republic of Turkey Ministry of Health's Scientific Research Platform (2022-03-06T21_32_51). Additionally, after detailing the purpose and methodology of the study to the participating patients, both verbal and written consent (via informed consent forms) were obtained. The research was conducted in accordance with the principles of the Helsinki Declaration.

RESULTS

The majority of the patients participating in the study were aged 50 and above, with a mean age of 62.9±11.9 years. 54.7% of the participants were female, 70% were married, and 52.7% had elementary school diploma as their highest educational attainment. Most did not currently work and resided in districts, living with their families and reported their income as being equivalent to their expenditures (Table 1).

Table 1. Socio-demographic Characteristics of Individuals With Type 2 Diabetes

Characteristics	Number (n)	%
Age ($\bar{x}$ ±SS)	62.9±11.9	
Age		
50 year-old and under	24	16.0
51-65 year-old	62	41.3
Over 65 year-old	64	42.7
Sex		
Female	82	54.7
Male	68	45.3
Marital status		
Married	105	70.0
Single	45	30.0
Educational status		
Literate	42	28.0
Elementary school	79	52.7
High school	19	12.7
Undergraduate and over	10	6.7
Employment status		
Yes	17	11.3
No	133	88.7
Place of residence		
Province	6	4.0
County	138	92.0
Village	6	4.0
Member(s) of household		
Living alone	25	16.7
Living with family	125	83.3

*Correlation is significant at 0.05 level
p<0.05 is significant

Income status		
Income is lower than expenses	43	28.7
Income equals expenses	100	66.7
Income is higher than expenses	7	4.7

53.3% of the participants had been diagnosed with type 2 diabetes for 10 years or more, with the average duration of the type 2 diabetes diagnosis being 13.7±9.6 years. The most recent HbA1c level measured had a mean value of 8.7±2.5, and 64% of the participants were using insulin. 80.7% of the patients developed complications due to diabetes. Among the microvascular complications, diabetic neuropathy was the most prevalent (34.7%), and among the macrovascular complications, cardiovascular diseases were the most common (56.7%). 84.7% of the patients had chronic conditions other than type 2 diabetes, with hypertension being the most common among the participants. Furthermore, the majority of the patients had neither previously received a COVID-19 diagnosis (70%) nor been hospitalized due to COVID-19 (87.3%). 89.3% did not report any loss of close relatives to COVID-19. However, it was found that 58.7% had family members who had been diagnosed with COVID-19 (Table 2).

Table 2. Findings Regarding Patients With COVID-19 and Their Clinical Characteristics

Characteristics	Number (n)	%	Characteristics	Number (n)	%
Duration of Type 2 diabetes			**Additional chronic disease**		
(x̄ ±SS)	13.7±9.6		Yes	127	84.7
1-5 years	37	24.7	No	23	15.3
6-10 years	33	22.0	**Additional chronic disease***		
Over 10 years	80	53.3	Hypertension	105	70.0
Last measured HbA1c level			Heart disease	51	34,0
(x̄ ±SS)	8.7±2.5		Kidney failure	19	12.7
< 6.5%	28	18.7	COPD	15	10.0
6.5-8%	49	32.7	Other**	63	42.1
8.1-10%	30	20.0	**Previously diagnosed with COVID-19**		
Over 10%	43	28.7	Yes	45	30
Diabetes treatment *			No	105	70
Medical nutrition treatment	23	15.3	**Hospitalization for COVID-19**		
Oral antidiabetic in-take (OAI)	92	61.3	Yes	19	12.7
Insulin in-take	96	64.0	No	131	87.3
Not receiving any treatment	3	2.0	**Having a relative diagnosed with COVID-19**		
Existence of diabetes-related complications			Yes	88	58.7
Yes	121	80.7	No	62	41.3
No	29	19.3	**Having relatives who lost their lives due to COVID-19**		

Microvascular complications *			Yes	88	58.7
Diabetic retinopathy	23	15.3	No	62	41.3
Diabetic nephropathy	36	24.0			
Diabetic neuropathy	52	34.7			
Macrovascular complications *					
Cardiovascular disease	85	56.7			
Peripheral vascular disease	26	17.3			
Cerebrovascular seizure (stroke, ischemic paralysis)	20	13.3			
Diabetic foot	28	18.7			

*: Multiple options are selected. **Other****: Cerebrovascular disease, rheumatoid arthritis, liver cirrhosis, cancer, pneumonia, asthma

Table 3. Distribution of Patients' Mean Scores of T2DMPTAS, the COVID-19 Fear Scale and HSBS

Scales and their Sub-dimensions	Item Number	Minimum	Maximum	($\bar{x}$ ±SS)
The Type 2 Diabetes Mellitus Patient Treatment Adherence Scale (T2DMPTAS)				
Attitudinal and Emotional Factors (AEF)	8	11	36	21.3±4.8
Knowledge and Personal Factors (KPF)	6	7	29	15.8±4.2
Lifestyle Changes (LC)	3	3	15	9.7±2.5
Anger Emotions (AE)	3	3	14	7.1±2.1
Emotions and Behaviors Consistent with Adherence (EBCA)	4	4	20	9.3±2.8
Dietary Bargaining (DB)	3	4	15	8.9±1.9
Denial Feelings (DF)	3	3	15	8.5±2.2
T2DMPTAS Total	30	53	126	80.8±10.5
The COVID-19 Fear Scale	7	7	35	20.1±8.1
The Health-Seeking Behavior Scale (HSBS)				
Online Health-Seeking Behavior (OHSB)	6	6	25	10.5±5.1
Professional Health-Seeking Behavior (PHSB)	3	3	15	11.9±2.9
Tradition Health-Seeking Behavior (THSB)	3	3	15	9.4±2.9
HSBS Total	12	15	55	31.8±7.6

Participants' adherence levels to type 2 diabetes treatment was found to be moderate (80.8±10.5). Their adherence to lifestyle changes was found as the lowest (9.7±2.5), while their adherence in terms of appropriate emotions and behaviors was found as the highest (9.3±2.8) dimension of adherence in terms of treatment. Furthermore, patients' mean score on the COVID-19 Fear Scale was found to be above average (20.1±8.1), and they were most likely to engage in professional health-seeking behaviors (11.9±2.9) (Table 3).

In the univariate analysis based on variables such as age, sex, employment status, income status, the most recent HbA1c level measured, medical nutrition therapy, insulin intake, the presence of complications due to diabetes, additional chronic diseases, and the loss of a relative due to COVID-19; significant statistical differences ($p<0.05$) were found in the mean scores of both the overall and sub-dimensions of the T2DMPTAS (Table 4 and Table 5). Similarly, based on variables like age, sex, education, and employment status, significant statistical differences were identified in the mean scores of both overall and the sub-dimensions of the HSBS ($p<0.05$). For other variables, the differences between groups were not found as statistically significant ($p>0.05$) (Table 6).

Table 4. Comparison of T2DMPTAS Total and Subscale Score Averages According to the Socio-Demographic Characteristics of the Patients

Features	The Type 2 Diabetes Mellitus Patient Treatment Adherence Scale (T2DMPTAS)							
	AEF	KPF	LC	AE	EBCA	DB	DF	T2DMPTAS Total
	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS
Age								
50 year-old and under	22,1±4,8	13,9±4,3	8,5±2,7	7,1±1,9	9,2±3,4	9,7±2,3	8,9±2,8	79,4±8,6
51-64 years old	21,3±4,6	16,3±3,9	9,9±2,4	7,4±2,1	9,3±2,5	9,1±1,8	8,5±1,9	81,9±8,8
Over 65 year-old	20,9±5,1	16,1±4,3	9,8±2,3	6,9±2,2	9,4±2,7	8,6±1,8	8,3±2,2	80,1±12,4
Testing and significance*	0,501	3,132	3,527	1,242	0,038	2,618	0,67	0,718
	0,61	0,05	**0,03•**	0,29	0,96	0,08	0,51	0,49
Tukey Test 1 vs 2, 1 vs 3, 2 vs 3			**0,03•, 0,04•,** 0,98					
Sex								
Male	21,1±4,3	15,6±3,9	9,8±2,3	6,7±2,1	9,5±2,5	8,9±2,1	8,4±1,9	79,9±10,1
Female	21,6±5,4	15,9±4,5	9,6±2,7	7,6±2,1	9,2±2,9	9±1,8	8,7±2,5	81,7±11,1
Testing and significance•	-0,702	-0,51	0,494	-2,659	0,63	-0,267	-0,973	-1,03
	0,48	0,61	0,62	**0,009•**	0,53	0,79	0,33	0,31
Employment status								
Yes	21±4,6	16±5,3	8,6±2,6	7,2±2,1	9,4±3,5	9±1,9	9,8±1,6	81,1±9,1
No	21,4±4,9	15,8±4,1	9,8±2,4	7,1±2,1	9,3±2,7	8,9±1,9	8,4±2,2	80,7±10,7
Testing and significance•	-0,283	0,215	-1,89	0,088	0,124	0,11	2,605	0,122
	0,78	0,83	0,06	0,93	0,9	0,92	**0,01•**	0,9

Income status								
Income is lower than expenses	22,8±5,5	16,8±4,1	10,2±2,3	7,5±2,2	9,7±3,3	9,2±1,9	8,2±2,1	84,5±11,4
Income equals expenses	20,5±4,2	15,4±3,9	9,5±2,5	6,9±2,1	9,2±2,5	8,8±1,9	8,7±2,2	78,9±9,6
Income is higher than expenses	23,9±6,3	15±7,8	10,1±3,1	8±2,9	9±2,9	10±2,5	9±3	85±11,5
Testing and significance*	4,729 **0,01•**	1,843 0,16	1,57 0,21	1,818 0,17	0,674 0,51	1,98 0,14	0,888 0,41	5,248 **0,006•**
Tukey Test **1 vs 2, 1 vs 3,** **2 vs 3**	**0,02•,** 0,85, 0,16	-	-	-	-	-	-	**0,008•,** 0,99,0,28

*: p<0,05 •: Student's t test *: One Way ANOVA test

AEF: Attitudinal and Emotional Factors **KPF:** Knowledge and Personal Factors **LC:** Lifestyle Changes

AE: Anger Emotions **EBCA:** Emotions and Behaviors Consistent with Adherence **DB:** Dietary Bargaining **DF:** Denial Feelings

Table 5. Comparison of T2DMPTAS Total and Subscale Score Averages According to the Clinical Characteristics of the Patients

Features	**The Type 2 Diabetes Mellitus Patient Treatment Adherence Scale (T2DMPTAS)**							
	AEF	**KPF**	**LC**	**AE**	**EBCA**	**DB**	**DF**	**T2DMPTAS Total**
	x̄ ±SS	**x̄ ±SS**	**x̄ ±SS**	**x̄ ±SS**	**x̄ ±SS**	**x̄ ±SS**	**x̄ ±SS**	**x̄ ±SS**
Last measured HbA1c level								
<6.5%	19,1±4,6	15,3±3,6	8,6±2,8	6,4±1,7	9,5±3,1	9,1±1,7	9,4±2,1	77,5±8,8
6.5-8%	20,3±4,6	15,7±4,7	10,1±2,3	6,9±1,8	9,8±3,1	8,7±1,8	8,3±2,3	79,8±11,9
8.1-10%	23,3±5,5	16,3±4,2	10,3±2,2	7,1±,6	8,4±2,2	8,7±2,1	8,3±2,2	82,5±11,8
Over 10%	22,5±3,9	15,8±3,9	9,6±2,5	7,9±2,1	9,3±2,4	9,3±2,1	8,4±2,2	82,9±8,2
Testing and significance*	5,857 **0,001•**	0,291 0,83	3,039 **0,03•**	3,247 **0,02•**	1,562 0,2	0,909 0,44	1,973 0,12	1,927 0,13
Tukey Test **1 vs 2, 1 vs 3, 1 vs 4,** **2 vs 3, 2 vs 4, 3 vs 4**	0,67, **0,04•,** **0,01•,** **0,03•**,0,1, 0,9	-	0,05, **0,04•**, 0,38, 0,98, 0,7,0,54	0,78,0,65, **0,02•,** 0,99,0,1, 0,33	-	-	-	-
Diabetes treatment **Medical nutrition therapy**								
Adaptable	19,6±4,1	13,3±2,9	8,6±2,6	6,4±2,1	8,4±2,5	8,9±1,5	8,2±2,2	73,4±8,1
Non-adaptable	21,6±4,9	16,3±4,2	9,9±2,4	7,3±2,1	9,5±2,8	8,9±2,1	8,6±2,2	82,1±10,3

Testing and significance•	-1,904 0,06	-3,252 **0,001•**	-2,445 **0,02•**	-1,716 0,09	-1,701 0,09	-0,108 0,91	-0,724 0,47	-3,83 **<0,001••**
Insulin in-take								
Yes	22,5±4,8	16,1±4,3	9,9±2,5	7,5±2,2	9,4±2,3	8,9±1,9	8,3±2,3	82,5±10,9
No	19,2±3,9	15,3±3,9	9,4±2,4	6,5±1,9	9,3±2,4	8,9±1,9	8,9±2,1	77,6±8,9
Testing and significance•	4,278 **<0,001•**	1,009 0,33	0,992 0,32	2,7 **0,008•**	0,184 0,86	0,216 0,83	-1,818 0,07	2,811 **0,006•**
Existence of diabetes-related complications								
Yes	21,8±4,6	15,9±4,2	9,9±2,4	7,3±2,2	9,3±2,7	8,8±1,9	8,4±2,1	81,7±10,3
No	19,1±5,2	15,2±4,1	8,8±2,7	6,2±1,6	9,3±3,1	9,4±1,9	8,9±2,6	77±10,6
Testing and significance•	2,761 **0,006•**	0,839 0,4	2,247 **0,03•**	3,066 **0,003•**	-0,025 0,98	-1,426 0,16	-0,905 0,37	2,181 **0,03•**
Additional chronic disease								
Yes	21,4±4,7	15,9±4,1	9,9±2,4	7,1±2,1	9,3±2,8	8,9±1,9	8,5±2,2	81,1±10,7
No	20,8±5,5	14,8±4,7	8,5±2,6	7,5±2,3	9,3±2,9	9,2±2,1	8,7±2,3	78,8±9,1
Testing and significance•	0,572 0,57	1,261 0,21	2,638 **0,009•**	-0,948 0,34	0,054 0,96	-0,59 0,56	-0,497 0,62	0,986 0,33
Having relatives who lost their lives due to COVID-19								
Yes	23,6±5,3	15,8±4,1	9,9±1,8	7,3±2,4	8,9±2,3	8,4±1,8	7,8±2,1	81,8±10,5
No	21,1±4,7	15,8±4,2	9,7±2,6	7,1±2,1	9,4±2,8	9,1±1,9	8,6±2,2	80,6±10,5
Testing and significance•	2,048 **0,04•**	-0,44 0,96	0,38 0,7	0,354 0,72	-0,603 0,55	-1,124 0,26	-1,364 0,18	0,421 0,67

*: p<0,05 •: Student's t test *: One Way ANOVA test

AEF: Attitudinal and Emotional Factors **KPF:** Knowledge and Personal Factors **LC:** Lifestyle Changes

AE: Anger Emotions **EBCA:** Emotions and Behaviors Consistent with Adherence **DB:** Dietary Bargaining **DF:** Denial Feelings

Based on the multiple regression analysis, medical nutrition and insulin intake were found to have a significant effect on the overall score of the T2DMPTAS (p<0.05). However, the presence of diabetes-related complications, scores on the COVID-19 Fear Scale and the overall scores of the HSBS did not significantly influence the overall T2DMPTAS scores (p>0.05). As adherence levels to medical nutrition therapy increase, there is a 7.81-fold decrease in the overall T2DMPTAS score. With increasing insulin intake, there is a 3.62-fold increase in the overall T2DMPTAS score (Table 7).

Table 6. Comparison of COVID-19 fear and HSBS total and subscale score averages accor-ding to patients' socio-demographic characteristics

Features	The Health-Seeking Behavior Scale (HSBS)				
	OHSB	PHSB	THSB	HSBS Total	The COVID-19 Fear Scale
	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS	x̄ ±SS
Age					
50 year-old and under	13±5,1	11,2±3,7	10,1±2,8	34,3±8,1	17,3±8,4
51-64 years old	11,6±5,6	12,1±2,7	8,9±2,9	32,7±8,3	20,8±7,9
Over 65 year-old	8,6±3,8	12,1±2,8	9,5±2,8	30,1±6,4	20,3±7,8
Testing and significance*	9,75 **<0,001••**	0,856 0,43	1,264 0,29	3,332 **0,04•**	1,716 0,18
Tukey Test **1 vs 2, 1 vs 3, 2 vs 3**	0,44, **0,001•,** **0,002•**	-	-	0,65, 0,05, 0,14	-
Sex					
Female	10,5±5,1	12,2±2,3	9,5±2,6	32,2±6,9	22,4±7,6
Male	10,6±5,3	11,6±3,5	9,2±3,2	31,4±8,5	17,2±7,7
Testing and significance*	-0,056 0,96	1,154 0,25	0,735 0,46	0,681 0,5	4,218 **<0,001••**
Educational status					
Literate	8,7±3,5	11,7±2,8	9±2,8	29,4±6,1	21,3±7,9
Elementary school	10,2±5,2	12,1±3,1	9,7±2,9	31,9±7,7	19,9±8,2
High school	12,6±4,7	11,7±3,1	8,8±2,9	33,1±8,2	18,1±7,5
Undergraduate and over	16,9±8,1	12,1±2,8	9,6±3,2	38,6±7,9	19,3±8,6
Testing and significance*	9,578 **<0,001••**	0,158 0,93	0,724 0,54	4,518 **0,005•**	0,763 0,52
Tukey Test **1 vs 2, 1 vs 3, 1 vs 4, 2 vs 3, 2 vs 4, 3 vs 4**	0,31, **0,02•,** **<0,001••,** 0,21, **<0,001••,** 0,09	-	-	0,28, 0,27, **0,003•,** 0,93, **0,04•**, 0,23	-
Employment status					
Yes	11,8±4,1	10,5±3,9	8,2±3,3	30,6±9,3	16,5±6,9
No	10,4±5,2	12,1±2,7	9,5±2,8	31,9±7,4	20,5±8,1
Testing and significance•	1,107 0,27	-2,105 **0,04•**	-1,731 0,09	-0,706 0,48	-1,932 0,06

•: p<0,05 ••: p<0.001 •: Student's t test *: One Way ANOVA test

OHSB: Online Health-Seeking Behavior **PHSB:** Professional Health-Seeking Behavior **THSB:** Tradition Health-Seeking Behavior

Table 7. Evaluation of Factors Affecting Adherence With Type 2 Diabetes Treatment in Patients

	Model Coefficient (95% CI)	Variable coefficient Significance P value	Model Significance p value
Medical Nutrition	-7.81 (-12.31.-3.3)	0.001	<0.001
Insulin In-take	3.62 (0.16-7.09)	0.04	
DM Complication	4.01 (0.08-8.09)	0.06	
The COVID-19 Fear Scale	0.11 (-0.1.0.32)	0.31	
HSBS	-0.08 (-0.29.0.14)	0.47	

Dependent Variable: T2DMPTAS Total

Independent Variables: Medical Nutrition, Insulin In-take, DM Complications, The COVID-19 Fear Scale Total, HSBS Total

Additionally; age, educational status, and the COVID-19 Fear Scale were found to have a significant impact on the overall scores of the HSBS ($p<0.05$), however, the overall T2DMPTAS scores did not significantly affect the overall HSBS scores ($p>0.05$). As age increased, there was a 1.84-fold decrease in the overall HSBS score. Furthermore, as the level of education was higher, there also was a 2.46-fold increase in the overall HSBS score. A 1-point increase in the COVID-19 Fear Scale resulted in a 1.23-fold increase in the overall HSBS score (Table 8).

Table 8. Evaluation of Factors Affecting Health-Seeking Behaviour in Patients

	Model Coefficient (95% CI)	Variable coefficient Significance P value	Model Significance p value
Age	-1.84 (-3.45.0.18)	**0.03**	<0.001
Education	2.46 (1.03.3.91)	**0.001**	
The COVID-19 Fear Scale	1.23 (1.09.1.38)	**0.002**	
T2DMPTAS Total	-0.03 (-0.14.0.08)	**0.64**	

Dependent Variable: HSBS Total

Independent Variables: Education, Age, The COVID-19 Fear Scale, Total, T2DMPTAS Total

DISCUSSION

Before the COVID-19 pandemic, studies related to diabetes management reported that patients' adherence to treatment was low (Baykal and Kapucu, 2015; Utli and Doğru, 2021; Üstündağ and Dayapoğlu, 2021; Yazew et al., 2019). With the advent of the pandemic, the literature suggests that individuals with diabetes experience fear of COVID-19, and this fear further diminishes their adherence to diabetes treatment and management (Mukona and Zvinavashe, 2020; Pardhan et al., 2021; Utli and Doğru, 2021). In this study, it was found that the latest measured HbA1c levels in individuals with type 2 diabetes were high, as were the rates of insulin intake and development of diabetes-related complications, whereas their adherence to medical nutrition therapy was low. To manage their condition effectively, individuals diagnosed with diabetes need to accept their condition from the outset and demonstrate positive attitudes and behaviors, adopt healthy lifestyle changes, and maintain lifelong adherence to medical nutrition therapy. During the pandemic, health services experienced disruptions, largely because priority was given to the COVID-19 outbreak and patients infected with COVID-19 (Peric and Stulnig, 2020; Kutlutürk, 2020; Sürücü and Sungur, 2021; Wicaksana, 2020). Among those with chronic diseases, diabetic individuals faced numerous challenges, such as inadequate access to these services. Their increased fear and stress, stemming from their self-awareness of a weaker immune system compared to healthy individuals, led to the development of a personal preference which can be characterized as "wanting to stay at home in order to avoid infection" also led to reduced physical activity, and their inclination towards the consumption of unhealthy foods due to convenience and accessibility factors exacerbated the situation (Eskici, 2020). It is believed that all these factors may contribute to decreased adherence levels towards medical nutrition therapy and increased HbA1c levels in diabetic individuals and subsequently, these factors might also increase insulin intake and trigger the development of diabetes-related complications.

In this study, it was determined that 70% of individuals with type 2 diabetes were not diagnosed with COVID-19 previously, and 87.3% were not hospitalized due to the virus. Given that

COVID-19 poses a greater threat to those with chronic illnesses, it is hypothesized that these individuals might be more aware of their situation and thus, may lean more towards protective behaviors such as staying indoors, frequent handwashing, and wearing masks.

The average score from the COVID-19 Fear Scale for the patients participating in this study was found to be above average. It is postulated that high scores were not received from the COVID-19 Fear Scale because the data collection period coincided with the commencement of vaccination campaigns and a time when the profound feelings of uncertainty from the early stages of the pandemic were gradually diminishing. Additionally, since the majority of the participants in our research was women, combined with the fact that women tended to be more openly sharing their fears compared to men; might have contributed to obtaining a score above the median on the COVID-19 Fear Scale.

Despite the hospital where the data was collected being designated as a pandemic institution, the fact that patients still sought medical attention in this location indicates their inclination towards seeking professional medical care. This underscores the observation in our study that the most prominent health-seeking behavior among the participants was to seek professional medical assistance.

In this study, it was found that those who used insulin and those who did not adhere to medical nutritional therapy were less adherent to diabetes treatment. Ustaalioğlu and Tan (2017) reported in their research that individuals who adhered to dietary guidelines also exhibited a positive attitude towards diabetes. Conversely, Arı and Özdelikara (2022) indicated that the type of treatment patients underwent influenced their adherence. Specifically, they reported that patients who only took oral antidiabetic drugs had better treatment adherence compared to those who either solely used insulin or used it in conjunction with oral antidiabetics. It can be inferred that individuals managing their diabetes with medical nutritional therapy may find their treatment regimen simpler than those on insulin, which could potentially make adherence to diabetes management more straightforward.

In this study, it was determined that the fear of COVID-19 among patients diagnosed with type 2 diabetes influenced their health-seeking behaviors, with the predominant action being "seeking professional medical attention". In a similar research, Özdemir and Arpacıoğlu (2020) noted that individuals who placed higher emphasis on health-seeking behaviors exhibited greater fear of COVID-19. Furthermore, in a descriptive study conducted by Saraçoğlu and Avcı (2021), it was emphasized that during the pandemic, 69% of the participants (n:213) indicated that they couldn't attend hospital-based doctor check-ups, and 46.5% of them stated that they couldn't exercise regularly at home. In the same study, patients expressed a desire to know how the pandemic would affect diabetic patients (61.5%), to understand what other diabetic patients were doing during this period (53.1%), and a desire to receive advice from health professionals on possible courses of action (77.9%). Their primary fears were the possibility of making contact with the virus (68.1%), the potential of the virus causing illness in them (68.1%), and the prospect of dying from the virus (69%). Moreover, a significant proportion of the participants agreed with the belowmentioned statements: "I know I'm at high risk because I have diabetes" (58.2%) and "The constant mention on television that diabetic patients are at risk makes me anxious" (52.6%) (Saraçoğlu and Avcı, 2021).

CONCLUSION AND SUGGESTIONS

In conclusion, among the type 2 diabetic individuals who participated in this study, it was found that:

- Their adherence to diabetes treatment was of moderate level; the adherence dimension with regards to lifestyle changes was the lowest, while the adherence level towards emotional and behavioral dimensions were the highest.

- In the conducted multiple regression analysis, those who used insulin and did not follow medical nutrition therapy had lower adherence to diabetes treatment ($p<0.05$).

- The fear of COVID-19 did not affect adherence to diabetes treatment ($p>0.05$); however, it did influence health-seeking behavior ($p<0.05$). A one-point increase in the COVID-19 Fear Scale resulted in a 1.23-fold increase in the total score of the Health-Seeking Behavior Scale.

Based on our research findings, we can make the belowmentioned suggestions which can be applied during patient education:

- It should be emphasized that adherence to diabetes treatment is crucial in preventing and managing diabetes-related complications.

- In educational planning, special emphasis should be given to topics like healthy lifestyle changes and nutrition therapy. The reduced adherence of individuals using insulin to their treatment should be taken into account.

- It should be highlighted that during other possible future pandemics such as the COVID-19 outbreak, or in cases of infections such as influenza and pneumonia, blood sugar regulation might be disrupted. Therefore, there should be further emphasis on adherence to treatment during these times.

- Patients should be informed in terms of accessing accurate and reliable information in order to foster appropriate health-seeking behaviors. Therefore, efforts should be made to raise awareness on this matter.

LIMITATIONS OF THE RESEARCH

The study being conducted in a single health center and the data being collected during the COVID-19 period are considered limitations, making it challenging to generalize the research findings to all diabetic individuals.

AUTHOR CONTRIBUTION

Study Design: YÇ, MG; Data Collection and Analysis: YÇ, MG; Drafting of the Article: YÇ, MG; Final Review and Revisions: YÇ, MG.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FINANCIAL DISCLOSURE

The authors received no financial support for this research.

ETHICAL STATEMENT

Prior to commencing the research, permissions to utilize the scales in the study were obtained from the Toros University Scientific Research and Publication Ethics Committee (03.25.2022-52), the Mersin City Training and Research Hospital Ethics Committee (05.30.2022-2022-05-05), the Mersin Provincial Health Directorate (06.23.2022-39), and the Republic of Turkey Ministry of Health's Scientific Research Platform (2022-03-06T21_32_51).

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