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Evaluation of the Relationship Between Self-Care and Treatment Compliance in Patients with Type 2 Diabetes: A Cross-Sectional Study from Northeast Türkiye

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Abstract

Background: The study aimed to investigate the connection between self-care behaviors and treatment adherence among individuals with type 2 diabetes.

Methods: This cross-sectional correlational study was conducted between January and May 2022 in a public hospital involving 191 patients diagnosed with type 2 diabetes. Data were collected using the patient information form, the diabetes self-care scale, and the assessment scale for treatment compliance in type 2 diabetes.

Results: The mean self-care score was 84.57 ± 14.46 years, and the mean treatment compliance score was 79.50 ± 11.13 years, with a significant negative correlation between them (r = −0.315, p < 0.001). Factors positively influencing self-care were being female (p < 0.05), unemployed (p < 0.05), farmer or civil servant (p < 0.05), hospitalized in the past year (p < 0.01), and exercising regularly or occasionally (p < 0.001). Treatment compliance was significantly higher in those who did not exercise (p < 0.01). A positive correlation was found between age and treatment compliance (r = 0.152, p < 0.05) but not with BMI or diagnosis duration.

Conclusions: The study revealed that patients exhibited moderate levels of self-care and treatment compliance. Moreover, as self-care improved, treatment compliance tended to decrease.

Keywords: nurse, self-care, treatment compliance, type 2 diabetes

INTRODUCTION

Diabetes is a condition characterized by the insufficient action of the insulin hormone, leading to persistently high blood sugar levels. Insulin is crucial in regulating the body's metabolism and utilization of glucose for energy.[1,2] It represents a significant global health concern, affecting approximately 537 million individuals worldwide. In Turkey, the prevalence of diabetes stands at 14.5%, as reported by the International Diabetes Federation in 2021.[3] Diabetes affects all age groups because of various factors such as aging, imbalanced nutrition, obesity, and a sedentary lifestyle. This condition not only diminishes life expectancy but also imposes a considerable economic burden and necessitates the development of self-care skills.[4,5] Self-care encompasses personalized practices aimed at fostering health promotion and disease prevention. It involves adherence to medications, adoption of appropriate dietary habits, engagement in physical activity, regular monitoring of blood glucose levels, and adherence to prescribed diabetes treatments.[1] Engaging in self-care behaviors has been associated with enhanced glycemic control and decreased risk of diabetes-related complications.[6,7] For instance, a Nigerian study revealed that individuals with high levels of self-care activities exhibited improved glycemic control and reported a higher quality of life.[8] Similarly, a Taiwanese study demonstrated that patients with inadequate glycemic control tended to exhibit lower self-care levels.[9] In addition, a Singaporean study of patients with type 2 diabetes indicated that individuals with insufficient self-monitored blood glucose levels experienced a detrimental effect on their quality of life.[10] The management of type 2 diabetes aims to attain blood glucose normalization and mitigate complications and necessitates lifestyle modifications, medication adherence (including oral hypoglycemic drugs/insulin injections), and adoption of self-care practices.[11] A study conducted in Nicosia reported a treatment non-compliance rate of 4.5% among patients with type 2 diabetes, whereas in Southwest Ethiopia, the non-compliance rate was 24.9%.[12,13] A systematic review revealed that at least 45% of patients with type 2 diabetes failed to achieve adequate glycemic control, with poor treatment adherence being a significant contributing factor. Findings of a study conducted in southwestern Nigeria indicated that poor medication adherence among patients with type 2 diabetes was associated with suboptimal glycemic control.[14] Moreover, non-adherence to treatment in patients with type 2 diabetes correlated with heightened rates of

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hospitalization, inferior health outcomes, increased morbidity and mortality rates, and high healthcare expenditures.[15,16] By actively involving patients in their care, nurses can empower them to fulfill their treatment, care, and informational needs.[5] Treatment compliance denotes the extent to which an individual's behaviors, medication adherence, dietary selections, and lifestyle adjustments conform to the guidance provided by healthcare professionals.[17] Nurses are pivotal in helping patients with diabetes acclimate to their condition, oversee their treatment, embrace healthy dietary practices, participate in consistent physical activity, and mitigate the likelihood of future complications.[12] The literature review identified several studies that evaluated self-care and treatment compliance in Turkish patients diagnosed with type 2 diabetes.[20,21] However, none of these studies investigated both self-care and treatment compliance concurrently. Consequently, this study aimed to identify factors affecting self-care and treatment compliance among patients with type 2 diabetes and analyze the associations between these determinants.

METHODS

Ethical considerations

The study obtained permission from the relevant authors to use the scales. To conduct the study, approval was obtained from the Artvin Çoruh University Ethics Committee on March 10, 2021 (Approval no. E-18457941-050.99-24269). In addition, permission was obtained from the institution where the study took place (Permission no. E-17720518-602.05). Patients with type 2 diabetes who participated in the study were informed about the research, and they provided consent. The study was conducted in accordance with the Declaration of Helsinki.

Type, population, and sample

In this cross-sectional and correlational study, the population consisted of patients with type 2 diabetes who were admitted to the internal medicine outpatient clinic of a state hospital in the northeast of Turkey. The sample included patients who were admitted to the clinic between January and May 2022 and met the inclusion criteria. The inclusion criteria were as follows: age >18 years, diagnosis of type 2 diabetes at least a year ago, lack of verbal communication disability, and willingness to participate in the study. Initially, 228 patients with type 2 diabetes were interviewed for the study. However, the final sample size only included 191 patients because 24 declined to participate and 13 were diagnosed less than a year ago. Based on the post hoc power analysis conducted using the G Power 3.1.9.7 program, which examined the relationship between treatment compliance scale and self-care scale scores ($r = -0.315$), the study obtained a power of 0.99 at a 95% confidence interval and a significance level of $a = 0.05$. These results indicate that the sample size is adequate.[22]

Data collections tools

The following instruments were used: diabetes patient information form, diabetes self-care scale, and the assessment scale for treatment compliance in type 2 diabetes mellitus.

Diabetes Patient Information Form. This researcher-created form is divided into two parts. The first part consists of eight descriptive questions that focus on sociodemographic data, including age, sex, marital status, educational level, and employment status of the patients. The second part contains nine questions that inquire about disease-related factors. These questions cover topics such as illness duration, treatment type, dependence level, and hospitalization status.

Diabetes Self-Care Scale. The Lee and Fisher scale was developed to evaluate diabetes-related self-care activities.[23] Its validity and reliability studies were conducted in Turkish by Karakurt and Kaşıkçı.[24] The Likert structure of the scale was modified to a 4-point Likert-type scale: 1 = never, 2 = sometimes, 3 = often, and 4 = always. The scale ranges from a minimum of 35 to a maximum of 140 points, and a higher score indicates greater engagement in self-care activities. In patients with a total scale score of >66%, their self-care is at an acceptable level. The scale does not have subdimensions or items with reversed scoring. The item–total correlations of the scale ranged from $r = -0.19$ to $r = 0.56$, and the test–retest correlation coefficient was 0.96.[24] The validity and reliability studies reported Cronbach's alpha of 0.81, whereas in the present study, Cronbach's alpha was 0.85.

Assessment Scale for Treatment Compliance in Type 2 Diabetes Mellitus. This assessment scale was developed by Demirtaş and Albayrak to evaluate treatment compliance among individuals with type 2 diabetes in the Turkish population.[25] This scale comprises 30 items and follows a 5-point Likert structure. The scale ranges from 1, indicating "strongly agree," to 5, indicating "strongly disagree." The minimum and maximum possible scores on this scale are 30 and 150, respectively. A lower score indicates higher patient compliance in the treatment of type 2 diabetes. The scale includes 13 and 17 items that measure positive and negative attitudes, respectively. Positive items are scored from 1 to 5, whereas negative items are scored inversely from 5 to 1. The study's KMO test resulted in a score of 0.75, indicating good sampling adequacy. The factor loadings of the items in the scale ranged from 0.30 to 0.77. Furthermore, the test–retest correlation coefficient yielded an impressive result of 0.99.[25] Its Cronbach's alpha was 0.77, whereas in the present study, it was 0.70.

Data collection

Data were collected using the diabetes patient information form, diabetes self-care scale, and assessment scale for treatment compliance in type 2

diabetes mellitus. Patients with type 2 diabetes who were visiting the outpatient clinic of internal medicine were personally informed by the researcher, and their consent was obtained before data collection. The forms took approximately 15–20 min to complete.

Data analysis

The study data were analyzed using IBM SPSS Statistics for Windows version 23 (IBM Corp., Armonk, NY, USA). Significance was determined at a *P*-value of <0.05, with a 95% confidence interval. Data were presented as percentiles and means ± standard deviations (SDs). The normality of data distribution was assessed using skewness and kurtosis analysis. For normally distributed binary variables, the mean scores of self-care and treatment compliance were compared using independent sample t-tests. For more than two normally distributed data, one-way analysis of variance (ANOVA) and post hoc tests were employed. The relationship between continuous variables (such as age and duration of diagnosis) and self-care and treatment compliance was examined using Pearson/Spearman correlation analysis. Furthermore, a multiple linear regression analysis was conducted to assess the relationship between independent variables and the prediction of self-care and treatment adherence scores.

RESULTS

The study involved 191 patients diagnosed with type 2 diabetes. The average age of these patients was 56.06 ± 13.72 years. Among the participants, 46.6% were between the ages of 43 and 61, 55% were female, 88% were married, 40.8% had completed primary school, and 29.8% were employed. In terms of occupation, 42.1% were civil servants. In addition, 36.7% of the patients had lower income than expenses. The average weight of the patients was 80.67 ± 15.09 kg, and the average height was 167.09 ± 8.98 cm. The mean body mass index was 28.99 ± 5.65 kg/m^2 (Table 1).

The mean duration of diagnosis was 9.78 ± 7.69 years. In this study, 77% took oral antidiabetic medications for treatment, 36.1% had diabetes-related complications, 35.1% were hospitalized in the past year because of diabetes or its complications, 25.1% were smokers, 3.7% consumed alcohol, 15.2% engaged in regular exercise, 62.8% had another chronic disease in addition to

TABLE 1. Demographics and clinical characteristics of the sample (N = 191)

Variable	Mean ± SD	Min – Max
Age/years	56.06 ± 13.72	24 – 87
Weight/kg	80.67 ± 15.09	48 – 124
Height/cm	167.09 ± 8.98	145 – 189
BMI (kg/m^2)	28.99 ± 5.65	17.30 – 50.31
Diabetes diagnosis duration (years)	9.78 ± 7.69	1 – 40
Age	N	%
24–42	35	18.3
43–61	89	46.6
62–80	57	29.8
>81	10	5.2
Sex		
Male	86	45.0
Female	105	55.0
Marital status		
Married	168	88.0
Single	23	12.0
Educational status		
Literate	30	15.7
Primary education	78	40.8
Secondary/high school	57	29.8
Undergraduate/ postgraduate	26	13.7
Employment status		
Employed	57	29.8
Unemployed	134	70.2
Profession (N = 57)		
Farmer	11	19.3
Self-employed	22	38.6
Civil servant	24	42.1
Income status		
Income < Expense	70	36.7
Income = Expense	87	45.5
Income > Expense	34	17.8
Type of treatment		
OAD	147	77.0
OAD + Insulin	26	13.6
Insulin	18	9.4
Diabetes-related complication		
Present	69	36.1
Absent	122	63.9
Hospitalization in the last year because of diabetes or its complications		
Yes	67	35.1
No	124	64.9
Smoking status		
Yes	48	25.1
No	143	74.9
Alcohol use		
Yes	7	3.7
No	184	96.3
Exercise status		
Yes	29	15.2
Sometimes	64	33.5
No	98	51.3
Chronic diseases other than diabetes		
Present	120	62.8
Absent	71	37.2
Family member with diabetes		
Present	123	64.4
Absent	68	35.6

OAD, oral antidiabetic drug; SD, standard deviation

TABLE 2. Mean scores of the diabetes self-care scale items of the participants (N = 191)

Item No.	Items	Mean ± SD	Min–max
1	I eat my meals at the same time every day.	2.59 ± 0.97	1–4
2	I always eat my snacks.	2.48 ± 0.96	1–4
3	I keep bound to my diet when I eat out in the restaurants.	2.18 ± 0.98	1–4
4	I stick to my diet when I go to invitations (to others, friends, meetings, etc.).	2.21 ± 0.96	1–4
5	I keep bound to my diet even when the people around me do not know I am diabetic.	2.49 ± 0.98	1–4
6	I do not eat excessively.	2.66 ± 0.94	1–4
7	I do exercise regularly.	2.07 ± 0.97	1–4
8	I do my exercises even when I do not feel like exercising.	1.91 ± 0.97	1–4
9	I do exercise adequately.	1.96 ± 0.99	1–4
10	I measure my blood sugar.	3.18 ± 0.96	0–4
11	I keep records of my blood sugar measurements.	2.45 ± 1.09	1–4
12	I take my oral antidiabetic drugs as recommended.	3.51 ± 0.83	0–4
13	I take my insulin injections as recommended.	0.88 ± 1.54	0–4
14	I adjust my insulin dosage according to my blood sugar measurements.	0.82 ± 1.29	0–4
15	I keep a lump of sugar with me when I am out/away from home.	2.59 ± 1.18	1–4
16	I eat a lump of sugar when my blood sugar drops.	2.71 ± 1.08	1–4
17	I regularly go and see my doctor.	2.96 ± 0.91	1–4
18	I consult my doctor when my blood sugar level is very high.	2.84 ± 0.97	1–4
19	I consult my doctor when my blood sugar level is very low.	2.78 ± 1.03	1–4
20	I regularly check my feet.	2.90 ± 1.04	1–4
21	I always wear shoes, by all means, outside the house.	3.18 ± 1.05	1–4
22	I always wear a slipper or a house shoe when inside.	2.87 ± 1.10	1–4
23	I always wear socks.	3.02 ± 1.00	1–4
24	I keep my toenails short and straight.	3.41 ± 0.83	1–4
25	I routinely take a shower (at least once a week or more).	3.45 ± 0.81	1–4
26	I brush my teeth every day.	3.01 ± 0.97	1–4
27	I carry a diabetes identification card.	2.04 ± 1.16	1–4
28	I talk with the other patients with diabetes about how they care for themselves.	2.42 ± 0.99	1–4
29	I consult nurses, doctors, and other health care providers/specialists about how to prevent complications.	2.63 ± 1.01	1–4
30	I read handouts and brochures about diabetes, when given.	1.99 ± 1.03	1–4
31	I go to the library to get information on diabetes.	1.30 ± 0.69	1–4
32	I attend to a diabetes support group.	1.30 ± 0.70	1–4
33	I am a member of a diabetes journal.	1.25 ± 0.63	1–4
34	I do research on the Internet to find information about diabetes.	1.89 ± 0.97	1–4
35	I use the things I learn to avoid any complications that can occur about diabetes.	2.65 ± 0.96	1–4

TABLE 3. Participants' mean scores on the assessment scale for treatment compliance in type 2 diabetes mellitus items (N = 191)

Item No.	Items	Mean ± SD	Min–max
1	I check my blood sugar regularly.	1.91 ± 1.01	1–5
2	I do not feel like a diabetic.	2.90 ± 1.41	1–5
3	I regularly take my oral antidiabetics/insulin.	1.65 ± 0.97	1–5
4	I believe that my disease will completely cure when my worries or stress is over.	3.09 ± 1.29	1–5
5	I eat the amount of food in the recommended manner as advised by healthcare professionals.	2.60 ± 1.16	1–5
6	I want to manage my disease by making dietary changes rather than using oral antidiabetics or insulin.	2.89 ± 1.29	1–5
7	I think that nothing bad will happen even if my blood sugar is high.	2.27 ± 1.28	1–5
8	I visit the doctor with the recommended frequency.	2.14 ± 1.10	1–5
9	Nothing has changed in my life after I was diagnosed with diabetes mellitus (DM).	2.29 ± 1.21	1–5
10	I get angry with my friends and relatives more easily after my diagnosis.	3.35 ± 1.29	1–5
11	I arrange my oral antidiabetic medication/insulin dose according to my food intake.	3.27 ± 1.31	1–5
12	I am more nervous and furious due to the difficulties of diabetes.	3.43 ± 1.31	1–5
13	I always try to improve my knowledge about DM.	2.61 ± 1.26	1–5
14	I always feel depressed about my future due to my disease.	2.87 ± 1.33	1–5

TABLE 3. Continued

Item No.	Items	Mean ± SD	Min–max
15	I can easily tell everyone that I am a diabetic.	1.74 ± 1.01	1–5
16	After I was diagnosed with DM. I quit my bad habits.	2.58 ± 1.23	1–5
17	I feel when my blood sugar is low.	1.80 ± 1.02	1–5
18	I do not trust the health staff; they do not help me.	1.87 ± 1.27	1–5
19	I regularly exercise in both winter and summer as recommended.	3.30 ± 1.21	1–5
20	I am angry because I have to eat special food and have special needs.	2.99 ± 1.28	1–5
21	I am very angry that I have this disease.	3.03 ± 1.38	1–5
22	I feel anxious when it is medication/insulin time.	2.89 ± 1.34	1–5
23	I can easily live with diabetes by doing everything that is required.	2.69 ± 1.14	1–5
24	I wish there was no special diet for the disease.	3.51 ± 1.24	1–5
25	I feel when my blood sugar is high.	1.81 ± 1.02	1–5
26	I started caring for my feet after I was diagnosed with DM.	2.28 ± 1.28	1–5
27	I usually have a defense for not doing exercises.	2.97 ± 1.39	1–5
28	I am sad because I have to endure my disease.	3.19 ± 1.21	1–5
29	I feel strong enough to fight the disease.	2.45 ±1.23	1–5
30	I believe that my diabetes will cure if I strictly follow to my diet.	3.16 ± 1.32	1–5

TABLE 4. Comparison of patients' descriptive characteristics with their self-care and treatment compliance scores (N = 191)

Variable	Self-care score		Treatment compliance score	
	Mean ± SD	*p*	Mean ± SD	*p*
Age				
24–42	84.62 ± 15.28		76.51 ± 7.68	
43–61	84.03 ± 15.02	0.533	79.82 ± 11.83	0.305
62–80	86.12 ± 13.19		80.33 ± 11.73	
>81	80.40 ± 14.34		82.50 ± 10.88	
Sex				
Male	81.82 ± 14.91	0.017*	81.11 ± 11.50	0.071
Female	86.82 ± 13.74		78.19 ± 10.69	
Marital status				
Married	84.49 ± 14.05	0.833	79.61 ± 10.89	0.710
Single	85.17 ± 17.51		78.69 ± 13.02	
Educational status				
Literate	88.33 ± 12.24		81.90 ± 12.79	
Primary education	84.52 ± 13.93	0.416	80.78 ± 10.15	0.093
Secondary/high school	83.68 ± 18.29		76.56 ± 11.70	
Undergraduate/postgraduate	82.34 ± 14.14		79.38 ± 9.80	
Employment status				
Employed	81.03 ± 16.02	0.027*	81.42 ± 9.65	0.122
Unemployed	86.08 ± 13.53		78.69 ± 11.64	
Profession (N = 57)				
Farmer	88.00 ± 14.51		84.00 ± 10.85	
Self-employed	73.36 ± 11.98	0.012*	82.68 ± 8.12	0.282
Civil servant	84.87 ± 17.52		79.08 ± 10.24	
Income status				
Income < Expense	86.21 ± 13.31		81.01 ± 11.14	
Income = Expense	84.03 ± 16.10	0.438	78.73 ± 11.45	0.361
Income > Expense	82.58 ± 12.51		78.38 ± 10.21	
Type of treatment				
OAD	83.44 ± 14.40		79.14 ± 11.24	
OAD + insulin	86.46 ± 14.03	0.081	79.61 ± 11.28	0.519
Insulin	91.11 ± 14.28		82.33 ± 10.12	
Diabetes-related complication				
Present	85.81 ± 13.63	0.376	79.14 ± 11.89	0.736
Absent	83.87 ± 14.92		79.71 ± 10.72	
Hospitalization in the last year because of diabetes or its complications				
Yes	88.53 ± 13.60	0.005*	80.38 ± 11.97	0.423
No	82.43 ± 14.51		79.03 ± 10.67	

TABLE 4. Continued

Variable	Self-care score		Treatment compliance score	
	Mean ± SD	*p*	Mean ± SD	*p*
Smoking				
Yes	85.04 ± 15.06	0.797	79.00 ± 12.54	0.716
No	84.41 ± 14.30		79.67 ± 10.66	
Alcohol use				
Yes	81.27 ± 10.02	0.541	82.85 ± 11.65	0.419
No	84.70 ± 14.60		79.38 ± 11.12	
Exercise status				
Yes	92.51 ± 15.62		76.86 ± 13.42	
Sometimes	86.98 ± 12.51	0.000*	76.18 ± 9.82	0.001*
No	80.65 ± 14.32		82.45 ± 10.48	
Chronic disease other than diabetes				
Present	84.59 ± 13.85	0.984	79.05 ± 11.40	0.470
Absent	84.54 ± 15.55		80.26 ± 10.70	
Family member with diabetes				
Present	83.20 ± 13.95	0.078	79.78 ± 11.36	0.650
Absent	87.05 ± 15.13		79.01 ± 10.77	
Age/year (min, 24; max, 87)	56.06 ± 13.72	(r = −0.026)		(r = 0.152)*
BMI (kg/m^2) (min,17.30; max, 50.31)	28.99 ± 5.65	(r = −0.040)		(r = −0.057)
Diabetes diagnosis duration/year (min,1; max, 40)	9.78 ± 7.69	(r = −0.031)		(r = −0.098)

SD: standard deviation; r: Pearson correlation analysis; statistical analysis was conducted using independent sample t-test, ANOVA, Pearson correlation, and Spearman correlation as required. *$p < 0.05$.

TABLE 5. Predictors affecting patients' self-care and treatment compliance scores

Independent Variables	β	SE	*p*	Model *p*	R^2
Self-care					
Constant		3.871	0.000*	0.054	0.212
Sex$^{ref = male}$					
Female	0.100	5.327	0.454		
Profession$^{ref = self-employed}$					
Farmer	0.322	6.191	0.041*		
Civil servant	0.284	4.699	0.057		
Hospitalization in the last year because of diabetes or its complications$^{ref = yes}$					
No	−0.060	4.496	0.666		
Exercise status$^{ref = no}$					
Yes	0.162	6.234	0.283		
Sometimes	0.230	4.693	0.106		
Treatment compliance					
Constant		3.531	0.001*	0.001*	0.085
Age	0.101	0.057	0.159		
Exercise status$^{ref = no}$					
Yes	−0.158	2.326	0.037*		
Sometimes	−0.253	1.740	0.001*		

β: standardized regression coefficient; SE: standard error of the coefficient; R^2: proportion of variations in the dependent variable that is explained by the regression model; $p < 0.05$.

diabetes, and 64.4% had a family member with diabetes (Table 1). The patients were found to have a mean self-care score of 84.57 ± 14.46 (min, 52; max, 132).

The mean scores of patients' responses to the self-care scale are presented in Table 2. The mean self-care score of the female patients was significantly higher than that of male patients, ($p < 0.05$, independent sample t-test). Patients had a mean treatment compliance score of 79.50 ± 11.13 (min, 50; max, 102). The mean scores of patients' responses to the treatment compliance scale are presented in Table 3.

Non-working patients had significantly higher self-care scores than working patients ($p < 0.05$). Occupation also influenced the self-care scores of patients ($p < 0.05$, ANOVA test). Farmers and civil servants had higher self-care scores than self-employed individuals, as determined by post hoc analysis (LSD). Furthermore, patients who had been hospitalized for diabetes or its complications in the past year had higher mean self-care scores than those who had not been hospitalized ($p < 0.01$, independent sample t-test). Moreover, a significant difference was found between patients' exercise status and their self-care scores ($p < 0.001$, ANOVA test). Post hoc analysis (LSD) demonstrated that both regular and occasional exercisers had higher self-care scores than non-exercisers (Table 4).

No significant difference was found in the mean self-care score based on the patients' age, marital status, educational level, income status, treatment type, presence of diabetes-related complications, smoking and alcohol use, presence of chronic disease other than diabetes, and presence of a family member with diabetes ($p > 0.05$) (Table 4).

The ANOVA test showed a significant change in the mean treatment compliance score based on exercise status ($p < 0.01$). Further analysis using the LSD method revealed that patients who did not exercise had higher treatment compliance scores than those who exercised occasionally and regularly (Table 4).

In this study, no significant differences in treatment compliance total score based on age, sex, marital status, educational level, employment status, occupation, income status, treatment type, presence of diabetes-related complications, hospitalization in the last year because of diabetes or its complications, smoking and alcohol use, presence of chronic diseases other than diabetes, and having family members with diabetes ($p > 0.05$) (Table 4).

The regression model examining the relationship between participants' sex, occupation, hospitalization because of diabetes and its complications in the last year, exercise status, and self-care score was not significant ($p > 0.05$). On the contrary, the regression model exploring the association between participants' age, exercise status, and treatment compliance score was significant ($p < 0.01$). The model was able to explain 8% of the variance. Exercise status was identified as a significant predictor of treatment adherence score (yes, $\beta = -0.158$, $p < 0.05$; sometimes: $\beta = -0.253$, $p < 0.01$) (Table 5). The Pearson correlation analysis showed a positive and significant correlation ($r = 0.152$; $p < 0.05$) between patients' age and their total treatment compliance score. However, no significant correlations were found among BMI, duration of diagnosis, and treatment compliance score ($p > 0.05$). Furthermore, no significant correlations were observed between the self-care score and age, BMI, and duration of diagnosis ($p > 0.05$) (Table 4). Conversely, the Pearson correlation analysis revealed a negative and significant correlation ($r = -0.315$, $p < 0.001$) between patients' self-care score and treatment compliance score.

DISCUSSION

This study explored the factors influencing self-care and treatment adherence in patients with type 2 diabetes. The relationship between these factors and the relevant literature was also examined. In this study, patients had a moderate level of diabetes self-care. A similar study conducted at a medical center in Southern Taiwan on patients with type 2 diabetes also found a moderate level of self-care in these patients.[9] Neşe *et al*. also found moderate self-care levels in their study of patients with type 2 diabetes.[19] Xie *et al*. reported that older patients with type 2 diabetes had high self-care levels, whereas another study conducted in East Delhi with patients with type 2 diabetes aged ≥20 reported weak self-care activities.[26,27] Self-care is a significant aspect of diabetes care.[5] Limited awareness about the importance of self-care practices and insufficient education on diabetes management could contribute to moderate self-care levels. Cultural beliefs and socioeconomic factors may influence self-care behaviors.

Therefore, healthcare providers can empower patients to engage in more effective self-care practices and improve outcomes in diabetes management through a multifaceted approach. This approach can include enhancing patient education, implementing culturally tailored interventions, providing better support from the healthcare system, and addressing psychosocial and socioeconomic barriers.

In this study, the treatment compliance of patients with type 2 diabetes was moderate. According to Yüksel and Bektaş 20.7%, 60.9%, and 66.2% of their patients had good, moderate, and poor compliance levels, respectively. Another study conducted in Nicosia found that 66.2% of their patients showed good compliance, 29.3% showed moderate compliance, and 4.5% did not comply with the treatment.[12] Similarly, in southwestern Ethiopia, 24.9%, 37.9%, and 37.2% of the patients had low, moderate, and high levels of treatment compliance, respectively.[13] Arı and Özdelikara also examined patients with type 2 diabetes and found that moderate treatment compliance, similar to our study.[21] Literature reports that patient follow-up has a positive effect on treatment compliance.[29] Therefore, treatment adherence is crucial in diabetes management. We believe that the moderate level of treatment compliance in this study may be attributed to the sociocultural characteristics of our sample. To improve treatment compliance, more frequent monitoring of the patients is necessary.

The findings of this study indicate that women with diabetes exhibit better diabetes self-care than men. This is consistent with other studies conducted in Iran and Poland, which also found that women with type 2 diabetes had higher self-care levels than men.[30,31]. However, a discrepancy was found between our study and the findings of Borba *et al*., who reported that men had higher self-care than women.[32] İlhan *et al*. and Neşe *et al*. also found no significant sex differences in self-care.[18,19] Given that women generally tend to prioritize self-care, the results of our study align with expectations.

In this study, unemployed patients demonstrated better self-care than employed ones. Specifically, self-care was better among civil servants and farmers than self-employed individuals. A study carried out in Poland also found that unemployed patients with type 2 diabetes exhibited higher self-care behaviors than employed ones.[31] However, a study reported opposite results, indicating that patients with type 2 diabetes had better self-care.[18] Neşe *et al*. mentioned that self-care did not vary based on profession.[19] It is speculated that unemployed individuals have better self-care, potentially due to having more time to dedicate to themselves and their illness. On the contrary, self-employed patients may struggle with self-care because they lack regular work schedules, making it difficult to allocate enough time to properly manage their diabetes.

In this study, patients who had been hospitalized for diabetes or its complications in the past year showed higher self-care levels than those who had not been hospitalized. This result aligns with the findings of Neşe *et al*., who concluded that hospitalization for diabetes did not affect self-care.[19] Furthermore, a meta-analysis revealed that patients, whether personal experiences or observing the complications of the disease in themselves and others, had a better understanding of the importance of self-care behaviors.[33] It is hypothesized that patients with hospitalization experience may improve their self-care because of fear of jeopardizing their health.

In this study, patients with diabetes who exercised regularly had higher self-care levels than those who did not exercise. This is supported by the results of Neşe *et al*., who also reported that patients with diabetes who exercised had better self-care.[19] Another study showed that exercise improved self-efficacy in patients with type 2 diabetes.[34] İlhan *et al*. analyzed data of patients with type 2 diabetes and revealed that those who exercised had higher self-care levels.[18] Exercise plays a crucial role in diabetes management because it improves blood glucose levels, reduces the risk of cardiovascular disease, and promotes overall well-being.[35] Given that exercise is a significant self-care activity, individuals with diabetes are encouraged to prioritize exercise.

In this study, patients who consistently exercised showed better treatment compliance than those who did not. This finding aligns with the results of Yüksel and Hicran who studied patients with type 2 diabetes and found that individuals who engaged in physical activity had higher treatment compliance.[28] Patients who exercise likely have a greater awareness of their diseases and choose to exercise because they believe it will positively affect their health. Therefore, healthcare professionals must inquire about patients' exercise habits when assessing their treatment compliance.

In this study, older patients with type 2 diabetes had lower treatment compliance. A study conducted in southwestern Nigeria on patients with type 2 diabetes also reported a decrease in treatment compliance with age.[15] Similarly, Shruthi *et al*. found that geriatric patients with chronic diseases had decreased treatment compliance with increasing age, which is consistent with our findings.[36] Another study on patients with chronic obstructive pulmonary disease found that advanced age was associated with lower medication compliance.[37] Factors such as forgetfulness and neglect negatively affect the treatment compliance of older individuals.[38] This may also contribute to the low treatment compliance rate among older patients. Therefore, healthcare providers must pay closer attention to treatment compliance in older patients with type 2 diabetes and offer more frequent follow-ups.

In this study, patients with high self-care levels exhibited better treatment compliance. This finding is supported by the results of Jannoo and Khan in their study of patients with type 2 diabetes, which also observed good self-care in individuals with good medication compliance.[39] Another study emphasized the significant effect of self-care behaviors on treatment compliance in patients with type 2 diabetes.[31] Walker *et al*. similarly noted that individuals with good medication compliance exhibited good self-care.[40] Neşe *et al*. further highlighted that individuals with type 2 diabetes who regularly took their medications had better self-care than others.[19] A meta-analysis further stated that difficulties in accessing drugs hindered treatment compliance, resulting in lower levels of diabetes self-care.[33] Overall, treatment compliance is a crucial aspect of self-care practices, and patients with high treatment compliance would also exhibit high self-care levels. When individuals with diabetes become more skilled at managing their health condition, they are more likely to adhere to their treatment plans and achieve better health outcomes. Consequently, increased self-care is directly linked to improved treatment compliance.

A strength of this study is that it is the first of its kind in Turkey to assess self-care and treatment compliance in patients with type 2 diabetes. However, this study is limited to a sample of 191 patients with type 2 diabetes who received treatment at the internal medicine outpatient clinic of Artvin State Hospital. Therefore, the

findings cannot be generalized to all individuals with type 2 diabetes, which is a significant limitation of our study.

CONCLUSIONS

This study revealed that patients displayed moderate self-care levels and treatment adherence. Furthermore, as self-care increased, so did treatment adherence. Further analysis indicated that several factors were associated with higher self-care levels. These factors were being female, unemployed, and a professional farmer or civil servant, having been hospitalized for diabetes or its complications within the past year, and engaging in regular exercise. Conversely, patients who did not exercise regularly showed lower treatment adherence. Thus, nurses are encouraged to prioritize patient education to enhance self-care behaviors among those with type 2 diabetes. In addition, nurses should actively encourage patients and conduct regular follow-ups while identifying patients who may be at higher risk for non-compliance with their treatment.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interests with respect to the authorship and/or publication of this article.

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