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Determination of the Correlation Between Disease Adaptation in Patients Undergoing Hemodialysis Treatment and Fluid Control: Descriptive and Relationship Seeking Study

Hemodiyaliz Tedavisi Uygulanan Hastaların Hastalığa Uyumu ile Sıvı Kontrolü Arasındaki İlişkinin Belirlenmesi: Tanımlayıcı ve İlişki Arayıcı Çalışma

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Bu çalışma, Hacı Ahmet Çankaya'nın "Hemodiyaliz Tedavisi Uygulanan Hastaların Hastalığa Uyumunun Sıvı Kontrolüne Etkisi" başlıklı yüksek lisans tezinden üretilmiştir (Muğla: Muğla Sıtkı Koçman Üniversitesi; 2023).

ABSTRACT Objective: This research was conducted to determine the correlation between disease adaptation of patients undergoing hemodialysis treatment and fluid control. **Material and Methods:** It was carried out in the hemodialysis unit of a public hospital in the Marmara Region of Türkiye between June 13-September 11, 2022. This cross-sectional and correlational research design included 71 patients undergoing hemodialysis treatment. In the power analysis, type 1 error=0.05, effect size=0.502 and power level=0.995. Data were collected using a patient evaluation form, the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ), and the Fluid Control in Hemodialysis Patients Scale (FCHPS). The results were at 95% confidence interval and a significance level of p<0.05. **Results:** Of the individuals participating in the study, 54.9% were female, 57.7% were married, and 50.7% had an educational level of primary school or lower. Of the patients, 47.9% had been receiving hemodialysis treatment for 13 months to 5 years and 93% received hemodialysis treatment 3 times a week. The mean total score of the ESRD-AQ among the patients participating in the study was 986.66±154.38, while the mean total score of the FCHPS was 51.82±5.78. There was a significant relationship between the total score of the patients' sex, marital status, having a child and subscale mean score from the ESRD-AQ (p<0.05). **Conclusion:** Hemodialysis patients exhibited knowledge, behaviors, and attitudes regarding treatment adherence and fluid control above the moderate level. Additionally, there was a significant positive correlation between their treatment adherence and fluid control.

Keywords: Adaptation; hemodialysis; fluid control

ÖZET Amaç: Bu araştırma, hemodiyaliz tedavisi uygulanan hastaların hastalığa uyumu ile sıvı kontrolü arasındaki ilişkinin belirlenmesi amacıyla yapıldı. **Gereç ve Yöntemler:** Bu araştırma 13 Haziran-11 Eylül 2022 tarihleri arasında Türkiye'nin Marmara Bölgesi'nde bulunan bir kamu hastanesinin hemodiyaliz ünitesinde yapıldı. Kesitsel ve ilişki arayıcı tipteki araştırma hemodiyaliz tedavisi uygulanan 71 hasta ile gerçekleştirildi. Yapılan güç analizinde tip 1 hata=0,05, etki değeri=0,502 ve güç düzeyi=0,995 olarak belirlendi. Araştırmanın veri toplama aşamasında Hasta Değerlendirme Formu, Son Dönem Böbrek Yetmezliği Uyum Ölçeği [End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ)] ve Hemodiyaliz Hastalarında Sıvı Kontrolü Ölçeği [Fluid Control in Hemodialysis Patients Scale (FCHPS)] kullanıldı. Sonuçlar, %95'lik güven aralığında istatistiksel anlamlılık için p<0,05 düzeyinde değerlendirildi. **Bulgular:** Çalışmaya katılan bireylerin %54,9'u kadın, %57,7'si evli, %50,7'sinin eğitim durumu ilköğretim ve altıdır. Hastaların %47,9'unun 13 ay-5 yıldır hemodiyaliz tedavisi almakta ve %93'üne haftada 3 kez hemodiyaliz tedavisi uygulanmaktadır. Araştırmaya katılan hastaların ESRD-AQ toplam puan ortalaması 986,66±154,38, FCHPS toplam puan ortalaması ise 51,82±5,78'dir. Hastaların cinsiyet, medeni durum ve çocuk sahibi olma durumu ile ESRD-AQ toplam puan ve alt boyut puan ortalaması arasında istatistiksel olarak anlamlı bir ilişki olduğu görüldü (p<0,05). **Sonuç:** Hemodiyaliz hastalarının tedaviye uyumun ve sıvı kontrolü hakkında bilgi, davranış ve tutumlarının orta düzeyin üzerinde olduğu, hastaların tedaviye uyumu ile sıvı kontrolü arasında pozitif yönde istatistiksel olarak anlamlı bir ilişki olduğu belirlendi.

Anahtar Kelimeler: Uyum; hemodiyaliz; sıvı kontrolü

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Chronic kidney disease (CKD) is a significant public health issue both globally and in Türkiye, occurring when kidney function declines or is lost over time.[1] CKD can develop due to various causes, including diabetes mellitus, hypertension, glomerulonephritis, and polycystic kidney diseases.[2] It is estimated that approximately 700 million people worldwide have CKD.[3] According to the 2023 Joint Report by the Ministry of Health of the Republic of Türkiye and the Turkish Society of Nephrology, the total number of patients undergoing renal replacement therapy in Türkiye has been reported as 159.8 per million population (pmp). Among these patients, 69.39% (62,123 pmp) were reported to be receiving hemodialysis treatment.[4]

Hemodialysis is the most commonly used treatment modality for end-stage renal disease. Hemodialysis treatment facilitates the removal of accumulated electrolytes and waste products from the body through a semipermeable membrane.[1,5] While hemodialysis helps manage patients' clinical signs and symptoms, those who must sustain their lives dependent on hemodialysis machines often experience numerous physical, social, and psychological challenges.[6,7] Among the challenges faced by patients are adaptation to changes in nutrition and fluid intake, fatigue, nausea and vomiting, muscle cramps, itching, sleep disturbances, and emotional and psychosocial issues. These challenges faced during the hemodialysis treatment process negatively affect patients' adherence to both their illness and treatment regimen. Ensuring patients' adherence to their disease and treatment and maintaining this adherence is crucial for effective management of the treatment process.[8,9]

One of the most significant challenges faced by patients undergoing hemodialysis, which necessitates lifestyle modifications, is maintaining fluid control. Due to the disruption of fluid excretion mechanisms in hemodialysis patients, failure to regulate fluid intake can lead to undesirable conditions such as hypovolemia or hypervolemia.[10,11] Uncontrolled fluid intake among hemodialysis patients exacerbates existing health problems and negatively impacts their quality of life. Furthermore, inability to ensure adequate fluid control significantly increases morbidity and mortality rates.[12,13] Hemodialysis nurses play a critical role in the treatment, care, and education of these patients. It is crucial for them to understand patients' knowledge, behaviors, and attitudes regarding fluid control, to provide education in areas where patients lack awareness, and to develop individualized fluid management strategies.[11,13]

Related studies have indicated that hemodialysis patients experience difficulties in adhering to dietary restrictions and maintaining compliance with their disease and treatment.[14-16] Studies assessing adherence to fluid restriction suggest that patients generally show low compliance with fluid control.[12,17,18] Abatay and Akyol found that while hemodialysis patients possess knowledge regarding fluid control, they cannot reflect this knowledge into behavior and attitudes, ultimately failing to adhere to fluid management guidelines.[11] The existing literature includes studies evaluating hemodialysis patients' adherence to treatment as well as their compliance with fluid control.[11,12,14-18] However, there were no accessible studies that specifically examined the impact of patients' adaptation to the disease on fluid control among those undergoing hemodialysis treatment. Therefore, by identifying the correlation between disease adherence and fluid control in hemodialysis patients, the present study may provide evidence for the literature and serve as a guide for nurses and researchers in delivering high-quality patient care.

Aim

This study aimed to determine the correlation between disease adaptation of patients undergoing hemodialysis treatment and fluid control.

Research Questions

1. What is the level of disease adaptation in patients undergoing hemodialysis treatment?

2. What is the level of fluid control in patients undergoing hemodialysis treatment?

3. Is there a relationship between the level of disease adaptation and fluid control in patients undergoing hemodialysis treatment?

MATERIAL AND METHODS

POPULATION AND RESEARCH SAMPLE

The study is cross-sectional and correlational. The study was conducted in the hemodialysis unit of a public hospital in the Marmara Region of Türkiye between June 13-September 11, 2022. Its population consisted of patients undergoing hemodialysis treatment (n=86). In the sample selection, 71 patients were determined using a sample formula with a known population. Fifteen patients who refused to participate were not included in the study. The study included patients, who voluntarily agreed to participate in the research, were undergoing hemodialysis treatment, were 18 years and older, could communicate, and had cognitive competence to answer the questions. It excluded patients with communication issues, those lacking cognitive competence to answer questions, those unwilling to participate in the research, and those who did not fully complete the data collection forms.

DATA COLLECTION TOOLS

The data for the research were collected using the patient evaluation form, End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ), and Fluid Control in Hemodialysis Patients Scale (FCHPS).

Patient Evaluation Form: This form, prepared by the researchers in accordance with the literature, consists of 28 questions in total. It includes 9 questions related to patients' sociodemographic characteristics such as age, sex, educational level, marital status, employment status, and number of children; 3 questions regarding whether they receive support; and 16 questions addressing diagnosis and hemodialysis treatment, including the presence of other diseases and the duration of hemodialysis treatment.[19,20]

End-Stage Renal Disease Adherence Questionnaire: The ESRD-AQ was developed in 2010 by Kim et al. to measure patients' adherence to treatment.[21] Its adaptation to Turkish, reliability, and validity studies were conducted by Ok and Kutlu in 2019.[10] This questionnaire consists of four dimensions: assessing patients' participation in hemodialysis treatment, drug utilization, adherence to fluid restriction, and adherence to dietary recommendations. The scoring of the questionnaire ranges from 0-1,200. A higher score obtained from the scale shows patients' higher levels of adherence to treatment. There are no reverse items in the questionnaire. In the original study, Kim et al. stated that the items on the scale did not have a homogeneous structure, making the calculation of Cronbach's Alpha coefficient impossible.[21] Therefore, in this study, the Cronbach's Alpha coefficient could not be calculated.

Fluid Control in Hemodialysis Patients Scale: This scale was developed by Albayrak Cosar and Cinar Pakyuz with the aim to determine the knowledge, behavior, and attitudes of hemodialysis patients regarding fluid control.[22] The FCHPS consists of 3 sections: knowledge, behavior, and attitude. The scale has a 3-point Likert structure with both positive and negative items, comprising a total of 24 items. When evaluating FCHPS, negative scores are reverse-coded and they are summed with the positive items. This scale yields a minimum of 24 and a maximum of 72 points. A higher score obtained from the scale reveals patients' higher levels of adherence to fluid control. The Cronbach's Alpha value of the scale is 0.88. In the present study, however, this value was found to be 0.62.

DATA COLLECTION PROCESS

The data for the study were collected through face-to-face interviews between June 13-September 11, 2022, after obtaining the necessary permissions from the institution to which the hemodialysis unit, the study setting, was affiliated. The data were collected during hemodialysis sessions, with each interview lasting approximately 30-35 minutes. Informed consent form was obtained from the participants. To assess the comprehensibility of the data forms used in the study, a pilot study was conducted on April 11, 2022, involving eight patients. Following the pilot study, no adjustments were made to the forms and the pilot study data were not included in the research.

Study Variables

Dependent variables: The FCHPS subscale and total mean scores of patients.

Independent variables: Data related to ESRD-AQ subscale and mean total scores, sociodemo-

graphic data, patients' care conditions, disease characteristics, and hemodialysis treatment.

ETHICAL CONSIDERATIONS

To conduct the study, ethical approval was obtained from the institution's Scientific Research and Publication Ethics Committee (date: April 26, 2021, no: 80) and institutional permission was obtained from the hospital where the research was conducted. The scale owners gave their permission to use the scale via email. All participants of the study provided written consent after the study aim was explained to them. The research was conducted following the principles of the Helsinki Declaration.

DATA ANALYSIS

The data were transferred to the statistical SPPS 22 package programme and evaluated. The data were analyzed using frequency distribution (number, percentage) for categorical variables and the normal distribution of the data was tested using the Kolmogorov-Smirnov test. Independent sample t-tests were used to determine whether there was a difference between the two groups, while one-way analysis of variance (ANOVA) was employed to assess differences among more than 2 groups. After the one-way ANOVA, the Levene test was initially used for homogeneity of variance, followed by a "post hoc" multiple comparison test (Bonferroni or Tamhane's T2) to identify which group or groups contributed to the differences. To examine differences between groups in variables that satisfied the homogeneity of variance, the Bonferroni test was utilized. In cases where variance homogeneity was not satisfied, the Tamhane's T2 test was employed for the examination of differences between the groups. Pearson's correlation test was employed to examine the relationship between 2 numerical variables and the Cronbach's Alpha value was calculated for scale reliabilities. The results were at 95% confidence interval and a significance level of $p<0.05$.

RESULTS

The study included 54.9% female and 45.1% male participants, with a mean age of 46.94±15.42. Of them, 50.7% had an education level of primary school or below, 52.1% were employed, and 64.8% had social security. Of them, 57.7% were married, 57.7% had children, and 70.7% had 3 or more children, with an average of 3.93±2.60 children. Furthermore, 60.6% of the participants reported equal income to their expenses and 70.4% lived with their parents (Table 1).

There were no significant differences in age, education level, employment status, social security status, and income status concerning the total score and subscale score of ESRD-AQ ($p>0.05$). However, there was a significant difference in the total score and subscale score of ESRD-AQ related to individuals' sex, fluid restriction, and dietary restriction ($p<0.05$) (Table 2). There was a significant difference in the subscale score of participation in hemodialysis treatment concerning individuals' marital status and child status ($p<0.05$). In this context, married individuals had a higher subscale mean score for participation in hemodialysis treatment compared to unmarried individuals. Additionally, individuals without children had a higher subscale mean score for participation in hemodialysis treatment compared to those with children (Table 2).

The study found no significant difference ($p>0.05$) in the total mean score and subscale score of FCHPS concerning age, employment status, social security status, marital status, and income status of the participants. However, there was a significant difference in the total score and behavior subscale score of FCHPS based on the participants' sexes ($p<0.05$). Male participants had higher total mean scores and behavior subscale scores compared to female participants (Table 3).

There was a significant difference ($p<0.05$) in the behavior subscale scores based on the education and child status of patients undergoing hemodialysis treatment. Individuals with a university degree had higher behavior subscale scores compared to those with a high school diploma. Furthermore, individuals without children had higher behavior subscale mean scores compared to those with children (Table 3).

In this study, there was no significant difference in the total mean score and subscale score of ESRD-AQ concerning patients' receiving support, the time

TABLE 1: Data distribution regarding the patients' sociodemographic attributes (n=71)

Sociodemographic attributes		n	%
Gender	Female	39	54.9
	Male	32	45.1
Age	18-30	15	21.1
	31-43	16	22.5
	44-56	16	22.5
	57-69	19	26.8
	70 and ↑	5	7.1
Age mean	46.94±15.42 (minimum=18 maximum=75)		
Employment status	Employed	37	52.1
	Unemployed	34	47.9
Social security	Private health insurance	2	2.8
	SSI	44	62.0
	No social security	25	35.2
Educational status	Primary school or lower	36	50.7
	High school	10	14.1
	University	25	35.2
Marital status	Married	41	57.7
	Single	30	42.3
Having a child	Yes	41	57.7
	No	30	42.3
Number of children	1	7	17.1
	2	5	12.2
	3 and ↑	29	70.7
Economic status	Less income than expense	9	12.6
	Equal income to expense	43	60.6
	More income than expense	19	26.8
Cohabited individuals	Parents	50	70.4
	Children	10	14.1
	Friends	4	5.6
	Alone	7	9.9
Total		**71**	**100**

SSI: Social security institution

of starting hemodialysis treatment after diagnosis, the duration of hemodialysis treatment, the presence of other chronic conditions, receiving training on hemodialysis treatment, and the presence of any obstacles to adapting to hemodialysis treatment ($p>0.05$) (Table 4). However, it revealed significant differences between the disease durations, chronic disease status, the ability to adapt to hemodialysis treatment, and the participation sub-dimension scores in patients undergoing hemodialysis treatment ($p<0.05$) (Table 4).

There was a significant difference between the total score of ESRD-AQ and the subscale score of fluid restriction concerning the amount of fluid consumed between 2 dialysis sessions by patients undergoing hemodialysis ($p<0.05$). Patients who consumed 2000 cc or less of fluid between 2 dialysis sessions had higher mean scores in the total ESRD-AQ and fluid restriction subscale compared to those who consumed 2000 cc or more. Additionally, patients who consumed fluids ranging from 200-3000 cc had higher mean scores in the fluid restriction subscale compared to those who consumed 3001 cc or more (Table 4).

There was a significant difference between individuals' daily fluid intake and the mean score of the

TABLE 2: Examination of the relationship between the patients' sociodemographic attributes and total mean score of ESRD-AQ and subscale scores (n=71).

Sociodemographic attributes	Participation in hemodialysis treatment	Drug utilization	Adherence to fluid restriction	Dietary recommendations	ESRD-AQ
	X̄±SD	X̄±SD	X̄±SD	X̄±SD	X̄±SD
Age					
18-30	545.00±81.39	180.00±41.40	126.67±59.36	113.33±58.15	965.00±98.11
31-43	512.50±124.50	187.50±28.87	115.63±62.50	125.00±36.51	940.63±139.31
44-56	537.50±104.08	178.13±44.60	121.88±68.24	115.63±65.11	953.13±201.22
57-69	560.53±75.61	173.68±34.83	118.42±73.05	126.32±63.18	978.95±170.23
70 and ↑	600.00±0.00	190.00±22.36	150.00±35.36	140.00±54.77	1080.00±90.83
F/p value	1.046/0.390	0.404/0.805	0.303/0.875	0.299/0.878	0.838/0.506
Gender					
Female	551.28±89.95	176.92±41.11	98.72±67.36	106.41±56.40	933.33±139.71
Male	535.16±100.97	184.38±29.61	151.56±44.87	140.63±49.90	1011.72±162.51
t value/p value	0.711/0.479	-0.858/0.394	**-3.947/0.000***	**-2.677/0.009***	**-2.185/0.032***
Educational status					
Primary school orlower	558.33±91.42	180.56±38.32	122.22±72.16	116.67±62.11	977.78±172.15
High school	565.00±81.82	170.00±48.30	110.00±61.46	110.00±61.46	955.00±140.34
University	515.00±100.52	184.00±27.84	128.00±52.20	134.00±42.62	961.00±136.57
F/p value	1.875/0.161	0.525/0.594	0.280/0.756	0.969/0.384	0.129/0.879
Employment status					
Employed	529.73±101.01	185.14±33.05	112.16±70.12	116.22±58.99	943.24±151.46
Unemployed	559.56±86.17	175.00±39.41	133.82±54.66	127.94±52.50	996.32±154.98
t value/p value	-1.333/0.187	1.178/0.243	-1.458/0.150	-0.882/0.381	-1.459/0.149
Social security					
Yes	539.67±92.88	183.70±33.42	126.09±64.76	120.65±54.34	970.11±143.72
No	552.00±99.46	174.00±41.13	116.00±62.45	124.00±59.72	966.00±175.43
t value/p value	-0.521/0.604	1.075/0.286	0.635/0.528	-0.239/0.811	0.106/0.916
Marital status					
Married	565.85±83.25	182.93±36.42	117.07±70.36	119.51±61.11	985.37±169.28
Single	514.17±102.49	176.67±36.51	130.00±53.50	125.00±48.69	945.83±130.66
t value/p value	**2.268/0.027***	0.715/0.477	-0.879/0.382	-0.406/0.686	1.067/0.290
Having a child					
Yes	514.17±102.49	176.67±36.51	130.00±53.50	125.00±48.69	945.83±130.66
No	565.85±83.25	182.93±36.42	117.07±70.36	119.51±61.11	985.37±169.28
t value/p value	**2.268/0.027***	0.715/0.477	-0.879/0.382	-0.406/0.686	1.067/0.290
Economic status					
Less income than expense	577.78±44.10	188.89±33.33	133.33±55.90	122.22±36.32	1022.22±66.67
Equal income to expense	550.58±86.34	180.23±34.74	118.60±67.28	119.77±59.90	969.19±149.79
More income than expense	513.16±122.30	176.32±42.06	126.32±60.94	126.32±56.20	942.11±190.22
F/p value	1.718/0.187	0.359/0.700	0.239/0.788	0.088/0.916	0.819/0.445

*p<0.05. ESRD-AQ: End-Stage Renal Disease Adherence Questionnaire; SD: Standard deviation; ↑: over; F: One-way analysis of variance test; t: Independent sample t-test.

fluid restriction subscale (p<0.05). According to the findings, individuals who consumed 50 cc or less of daily fluid had higher mean scores in the fluid restriction subscale compared to those who consumed 500 cc or more (Table 4). There was a significant positive relationship (p<0.05) between the total mean score and subscale score of ESRD-AQ and FCHPS. As patients' levels of adherence to the disease increased, their fluid control levels increased accordingly (Table 5).

TABLE 3: Examination of the relationship between the patients' sociodemographic attributes and total mean score of FCHPS and subscale scores (n=71)

Sociodemographic variables	Knowledge	Behaviour	Attitude	FCHPS
	X̄±SD	X̄±SD	X̄±SD	X̄±SD
Age				
18-30	18.60±2.23	23.80±3.55	10.20±1.86	52.60±4.66
31-43	18.19±1.97	23.31±5.04	10.19±2.34	51.69±6.60
44-56	18.75±2.14	21.69±5.17	10.75±2.59	51.19±6.80
57-69	18.16±2.03	22.95±3.44	10.53±2.55	51.63±5.36
70 and ↑	1740±2.51	23.80±2.28	11.40±2.88	52.60±6.07
F/p value	0.507/0.731	0.580/0.678	0.345/0.847	0.139/0.967
Gender				
Female	18.41±2.04	22.00±3.91	10.15±1.94	50.56±5.34
Male	18.25±2.18	24.19±4.28	10.91±2.76	53.34±6.00
t value/p value	0.319/0.750	**-2.246/0.028***	-1.300/0.199	**-2.064/0.043***
Educational status				
Primary school or lower	18.56±2.01	22.25±3.52	10.44±2.42	51.25±5.85
High school	18.90±2.08	21.10±3.96[b]	9.90±1.66	49.90±4.72
University	17.80±2.18	24.80±4.66[a]	10.80±2.53	53.40±5.87
F/p value	1.400/0.254	**4.254/0.018***	0.528/0.592	1.697/0.191
Employment status				
Employed	18.27±1.90	22.65±4.47	10.03±2.02	50.95±5.69
Unemployed	18.41±2.31	23.35±3.92	11.00±2.62	52.76±5.80
t value/p value	-0.283/0.778	-0.703/0.484	-1.762/0.083	-1.333/0.187
Social security				
Yes	18.61±1.93	23.28±4.09	10.50±1.92	52.39±5.12
No	17.84±2.32	22.44±4.43	10.48±3.06	50.76±6.80
t value/p value	1.493/0.140	0.805/0.423	0.030/0.976	1.139/0.259
Marital status				
Married	18.51±1.98	22.20±3.98	10.32±2.32	51.02±6.21
Single	18.10±2.25	24.07±4.32	10.73±2.43	52.90±5.03
t value/p value	0.819/0.416	-1.888/0.063	-0.732/0.467	-1.360/0.178
Having a child				
Yes	18.03±2.19	24.57±4.22	10.70±2.42	53.30±5.34
No	18.56±2.01	21.83±3.83	10.34±2.33	50.73±5.90
t value/p value	1.051/0.297	**-2.847/0.006***	-0.630/0.531	1.884/0.064
Economic status				
Less income than expense	18.44±2.30	20.56±3.54	10.44±2.24	49.44±2.83
Equal income to expense	18.51±2.14	23.58±4.19	10.51±2.32	52.60±5.97
More income than expense	17.89±1.91	22.79±4.28	10.47±2.61	51.16±6.18
F/p value	0.580/0.563	2.016/0.141	0.004/0.996	1.294/0.281

*p<0.05. FCHPS: Fluid Control in Hemodialysis Patients Scale; SD: Standart deviation; ↑: over; F: One-way analysis of variance test; t: Independent sample t-test; a,b: Shows mean differences between groups (a: highest average)

DISCUSSION

Hemodialysis requires patients to make significant lifestyle changes. These changes can disrupt patients' adherence to both their disease management and treatment. As a result, patients with disrupted adherence often struggle to maintain essential lifestyle changes, such as dietary restrictions and fluid limitation, which are crucial for effective treatment.[11,13]

The study identified a significant relationship between the sexes of patients undergoing hemodialysis treatment and the total score of ESRD-AQ, as well as the scores for fluid restriction and dietary restriction sub-dimensions. Male patients had higher

TABLE 4: Examination of the relationship between the patients' diagnosis and hemodialysis treatment characteristics and total mean score of ESRD-AQ and subscale scores (n=71)

Characteristics related to diagnosis and hemodialysis	Participation in hemodialysis treatment	Drug utilization	Adherence to fluid restriction	Adherence to dietary recommendations	ESRD-AQ
	X̄±SD	X̄±SD	X̄±SD	X̄±SD	X̄±SD
Receiving support					
Yes	556.25±91.40	176.92±40.17	128.85±60.51	125.00±52.86	987.02±148.31
No	510.53±98.01	189.47±20.94	105.26±70.50	113.16±64.21	918.42±163.48
t value/p value	1.831/0.071	-1.706/0.093	1.390/0.169	0.788/0.433	1.679/0.098
Duration of chronic kidney disease					
1-5 year	567.74±58.52	175.81±44.48	119.35±65.42	122.58±63.03	985.48±150.66
6-10 year	501.47±117.4[b]	188.24±21.86	126.47±56.23	120.59±50.18	936.76±159.62
11-15 year	513.33±124.59	183.33±24.40	123.33±70.37	116.67±58.76	936.67±175.73
16 year and ↑	600.00±0.00[a]	175.00±46.29	125.00±70.71	131.25±37.20	1031.25±103.29
F/p value	**3.611/0.018***	0.509/0.677	0.050/0.985	0.118/0.949	1.018/0.390
Time to initiate hemodialysis treatment after diagnosis					
1 year or lower	545.45±75.45	186.36±35.13	120.45±62.98	134.09±49.73	986.36±130.18
13.moon-5 year	550.00±89.69	172.92±41.65	131.25±60.46	118.75±65.63	972.92±177.53
6-10 year	535.00±105.98	186.67±22.89	110.00±68.66	113.33±54.99	945.00±153.01
11 year and ↑	540.00±134.99	175.00±42.49	125.00±71.69	115.00±47.43	955.00±164.06
F/p value	0.082/0.970	0.751/0.526	0.346/0.792	0.532/0.662	0.238/0.870
Duration of receiving hemodialysis treatment					
1 year or lower	532.14±121.74	188.10±31.24	128.57±60.36	114.29±59.46	963.10±163.86
13 moon-5 year	550.00±75.88	170.59±42.85	113.24±69.97	122.06±56.66	955.88±154.12
6 year and ↑	546.88±95.69	190.63±20.16	134.38±53.91	131.25±51.23	1003.13±146.59
F/p value	0.235/0.791	2.441/0.095	0.728/0.487	0.412/0.664	0.522/0.596
Presence of other chronic disease					
Yes	566.22±71.74	179.73±38.11	122.97±67.28	116.22±62.42	985.14±154.95
No	519.85±110.74	180.88±34.85	122.06±60.54	127.94±47.98	950.74±154.05
t value/p value	2.074/0.043*	-0.133/0.895	0.060/0.952	-0.882/0.381	0.937/0.352
Receiving training on hemodialysis treatment					
Yes	550.53±86.37	182.98±33.42	122.34±59.72	122.34±50.87	978.19±133.17
No	531.25±110.15	175.00±41.70	122.92±72.20	120.83±65.80	950.00±191.11
t value/p value	0.809/0.421	0.874/0.385	-0.036/0.972	0.107/0.915	0.647/0.522
Amount of fluid consumption between 2 dialysis sessions					
2000 cc or lower	554.29±95.77	180.00±38.73	155.71±43.34[a]	137.14±58.59	1027.14±154.99[a]
2001-3000 cc	536.11±96.66	187.04±26.28	103.70±55.34[b]	111.11±34.90	937.96±111.24[b]
3001 cc ↑	527.78±90.52	161.11±48.59	50.00±75.00[c]	94.44±80.79	833.33±165.83[b]
F/p value	0.425/0.656	1.758/0.180	17.219/0.000*	3.061/0.053	7.758/0.001*
Adherence to the diet					
I comply	564.13±70.24	184.78±31.75	158.70±55.70[a]	173.91±25.54[a]	1081.52±113.87[a]
I partly comply	521.88±106.97	179.69±35.60	128.13±43.88[a]	114.06±40.63[b]	943.75±133.65[b]
I do not comply	555.56±93.76	172.22±46.09	44.44±56.59[c]	83.33±59.41[b]	855.56±134.92[b]
F/p value	1.886/0.160	0.747/0.478	49.285/0.000*	13.025/0.000*	15.185/0.000*
Daily fluid intake					
500 cc or lower	543.75±120.93	175.00±44.72	165.63±39.66[a]	137.50±61.91	1021.88±177.92
501-1000 cc	544.79±89.68	183.33±28.23	137.50±47.20[b]	127.08±51.03	992.71±155.95
1001-1500 cc	547.50±89.55	180.00±41.04	105.00±60.48[b]	102.50±52.50	935.00±124.71
1501 cc ↑	536.36±83.94	181.82±33.71	59.09±73.55[b]	122.73±60.68	900.00±143.18
F/p value	0.032/0.992	0.170/0.916	9.624/0.000*	1.305/0.280	1.946/0.131
Adherence to fluid restriction					
I comply	562.50±64.73	180.36±39.30	167.86±33.92[a]	155.36±45.82[a]	1066.07±123.27[a]
I partly comply	515.00±117.70	186.00±22.91	128.00±35.59[b]	112.00±41.53[b]	941.00±134.41[b]
I do not comply	555.56±93.76	172.22±46.09	44.44±56.59[c]	83.33±59.41[b]	855.56±134.92[b]
F/p value	1.886/0.160	0.747/0.478	49.285/0.000*	13.025/0.000*	15.185/0.000*
Ability to adhere to hemodialysis treatment					
Yes	577.27±54.62[a]	183.33±36.80	116.67±75.69	124.24±61.39	1001.52±152.83
Partially	508.87±103.39	174.19±38.45	127.42±49.73	117.74±50.91	928.23±147.58
No	542.86±151.19	192.86±18.90	128.57±63.62	128.57±56.69	992.86±171.82
F/p value	4.596/0.013*	0.970/0.384	0.257/0.774	0.161/0.852	1.948/0.150
Having a barrier to hemodialysis treatment					
Yes	542.31±115.19	176.92±48.37	123.08±69.57	111.54±71.16	953.85±197.34
No	544.40±90.69	181.03±33.54	122.41±62.95	124.14±52.35	971.98±144.95
t value/p value	-0.071/0.943	-0.366/0.715	0.034/0.973	-0.732/0.467	0.380/0.705

*p<0.05. ESRD-AQ: End-Stage Renal Disease Adherence Questionnaire; SD: Standart deviation; t: Independent sample t-test; ↑: over; F: One-way analysis of variance test; a,b,c: Shows mean differences between groups (a: highest average).

TABLE 5: Examination of the relationship between the patients' total mean scores of ESRD-AQ and FCHPS, as well as subscale scores

		Participation in hemodialysis treatment	Drug utilization	Adherence to fluid restriction	Adherence to dietary recommendations	ESRD-AQ
Knowledge	r value	0.328	-0.099	0.060	-0.009	0.199
	p value	**0.005***	0.411	0.619	0.940	0.096
Behavior	r value	-0.079	0.223	0.351	0.439	0.308
	p value	0.511	0.062	**0.003***	**0.000***	**0.009***
Attitude	r value	0.135	0.207	0.443	0.524	0.504
	p value	0.262	0.084	**0.000***	**0.000***	**0.000***
FCHPS	r value	0.116	0.211	0.458	0.530	0.502
	p value	0.335	0.078	**0.000***	**0.000***	**0.000***

*p<0.05. ESRD-AQ: End-Stage Renal Disease Adherence Questionnaire; FCHPS: Fluid Control in Hemodialysis Patients Scale; r: Pearson correlation coefficient

levels of fluid and dietary restrictions related to end-stage renal failure compared to female patients. This finding is consistent with the study conducted by Kim et al. determining that male patients exhibited higher adherence to hemodialysis treatment than female patients.[21] Another study involving patients undergoing hemodialysis revealed that adherence to treatment was lower among male patients compared to female patients.[23] This indicates that the adherence level of patients to hemodialysis treatment is influenced by the treatment, regardless of an individual's sex. Therefore, planned educational interventions can be implemented to enhance the adherence of all individuals undergoing hemodialysis treatment.

The current study found no significant relationship between the age of patients undergoing hemodialysis treatment and their adherence to the disease. However, a study reported that young individuals are at risk for nonadherence to hemodialysis treatment.[24] In a study conducted by Nakao et al. with patients undergoing hemodialysis, as patients' age increased, adherence to treatment increased accordingly.[25] Studies conducted on this argument shows differences between age and adaptation to the disease. As patients age, factors such as increased physical strain, the presence of comorbidities, and difficulties in emotional coping may influence their level of disease adaptation.

The current study found no significant correlation between educational level and the mean score of the ESRD-AQ. Similarly, a study conducted with hemodialysis patients found no significant correlation between adherence to fluid and dietary restrictions and educational level.[17] Contrary to these findings, another study on hemodialysis patients reported a correlation between medication adherence, fluid restriction adherence, and educational level. Illiterate individuals had lower medication adherence levels but higher fluid restriction adherence levels compared to other groups.[26] The results from these studies investigating the relationship between educational level and adherence to dietary restrictions, fluid control, medication use, and hemodialysis session attendance in end-stage renal disease patients differ. As nurses provide education to patients, increasing their knowledge about the disease and treatment, their adherence to the disease management process may increase.

The study found a significant correlation between hemodialysis patients' parental status and the mean score of the hemodialysis session and duration adherence subscale of the ESRD-AQ. Patients without children had higher adherence to hemodialysis attendance and duration compared to those with children. A previous study conducted on hemodialysis patients found no significant relationship between parental status and disease adherence in both the experimental and control groups.[27] This may be attributed to the fact that individuals without children do not have additional care giving responsibilities, which could contribute to a higher level of adherence to end-stage renal disease management.

In the study, it was observed that there was a significant relationship between the gender of the patients and the mean total score and behavioral

sub-dimension mean scores of the FCHPS, and the fluid control levels of male patients were higher than those of female patients. In studies conducted with hemodialysis patients, some findings indicate no significant correlation between sex and the total FCHPS score or its subscale mean scores, while other studies suggest that female patients have higher adherence to fluid control than males.[11,18,28,29] Many factors influence hemodialysis patients' adherence to fluid control; however, when negative factors are managed, fluid control adherence may improve positively.

In the study, it was determined that the marital status and fluid control levels of individuals were similar. A study with hemodialysis patients revealed that marital status did not statistically affect fluid control.[18] Another study found no impact of marital status on the total FCHPS score or its subscale mean scores.[19] In another study, while the total FCHPS score varied by marital status, the knowledge, behavior, and attitude subscale mean scores remained similar. These results indicate that single patients tend to have higher total FCHPS scores compared to married patients. As can be seen in the current and previous studies, chronic illnesses impact fluid control levels regardless of marital status.

In the study, considering the education level in relation to the total score and subscale score of FCHPS, individuals with a university degree had a higher mean score in the behavior subscale compared to those with a high school education. Additionally, individuals with a university degree had a higher level of fluid control compared to those with a high school education. A study conducted by Kulaksız and Arslan with 200 individuals undergoing hemodialysis found a significant relationship between patients' education levels and FCHPS total score and knowledge subscale score. Individuals with an education level of high school and above had higher total scores and knowledge subscale scores compared to those with lower education levels.[20] Providing patients with information about their disease and treatment is believed to prevent potential misbehaviors during the process and enhance their adherence to fluid control.

In the current study, individuals undergoing hemodialysis who received support in terms of care had a higher mean score in FCHPS knowledge subscale compared to the group that did not receive support. In a study, patients receiving social support had increased adherence to fluid restriction.[30] Similarly, in a study with patients undergoing hemodialysis, patients receiving care support from their families had higher adherence to fluid restriction.[31] As observed both in the present study and other studies, providing support to patients undergoing hemodialysis regarding their illness and treatment processes has a positive impact on the level of fluid control. In addition to hemodialysis sessions, offering psychological support and social assistance for better home conditions is expected to further support patients' adherence to both their illness and fluid control.

There was a significant relationship between adherence to fluid restriction and the total score, as well as the behavior and attitude subscale scores of the FCHPS. Individuals adhering to fluid restriction had higher total mean scores in the FCHPS, as well as behavior and attitude subscales compared to those not adhering to fluid restriction. In a study, 95% of patients undergoing hemodialysis did not adhere to fluid restrictions.[31] During hemodialysis sessions, the importance of fluid control should be emphasized on every occasion. As the level of adherence to fluid restriction increases, the levels of knowledge, behavior, and attitude regarding fluid control also increase.

There was a significant positive relationship between the total mean scores and subscale scores of FCHPS and ESRD-AQ. As the patients' levels of adaptation to the disease increased, the levels of fluid control also increased. A study conducted with individuals undergoing hemodialysis identified a low level of adherence to fluid control.[29] Accordingly, as treatment adherence decreases, fluid control adherence is expected to decline. Patients who adapt to the disease and treatment processes in hemodialysis can increase their fluid control levels by adapting to the physical, social, and psychological changes that occur throughout the disease period. Nurses are key members of the healthcare team; therefore, the care they provide can significantly benefit patients. The nurse's provision of individualized care, considering the patient's family and environment, can significantly con-

tribute to increasing the patient's awareness of disease adherence and the importance and priority of fluid intake.[13]

CONCLUSION

Hemodialysis patients exhibited knowledge, behaviors, and attitudes regarding treatment adherence and fluid control above the moderate level. Additionally, there was a significant positive correlation between their treatment adherence and fluid control. Despite the various challenges such as anxiety, stress, fear, and social isolation that the disease and treatment process bring to the daily lives of individuals undergoing hemodialysis, over time, patients accepted their current condition, leading to an increase in their level of adaptation to the disease. Results showed that individuals adapting to the disease have a higher level of fluid control. Factors adversely affecting patients during this period should be identified. Furthermore, there should be nursing interventions aimed at increasing adaptation to the disease and fluid control levels.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Hacı Ahmet Çankaya, Ayşe Kacaroğlu Vicdan;* ***Design:*** *Hacı Ahmet Çankaya, Ayşe Kacaroğlu Vicdan;* ***Control/Supervision:*** *Ayşe Kacaroğlu Vicdan;* ***Data Collection and/or Processing:*** *Hacı Ahmet Çankaya;* ***Analysis and/or Interpretation:*** *Hacı Ahmet Çankaya, Ayşe Kacaroğlu Vicdan;* ***Literature Review:*** *Hacı Ahmet Çankaya;* ***Writing the Article:*** *Hacı Ahmet Çankaya;* ***Critical Review:*** *Hacı Ahmet Çankaya, Ayşe Kacaroğlu Vicdan;* ***References and Fundings:*** *Hacı Ahmet Çankaya;* ***Materials:*** *Hacı Ahmet Çankaya.*

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