Original Article

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The Relationship Between Thirst Distress and Severity and Compliance with Fluid Control and Interdialytic Weight Gain in Hemodialysis Patients

Hemodiyaliz Hastalarında Susama Sıkıntısı ve Susama Şiddetinin Sıvı Kontrol Uyumu ve İnterdiyalitik Kilo Alımı ile İlişkisinin İncelenmesi

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ABSTRACT

Objective: This study was performed to examine the relationship between thirst distress and severity and compliance with fluid control and interdialytic weight gain (IDWG) in patients receiving outpatient hemodialysis (HD) treatment.

Methods: This two-center, descriptive and cross-sectional study was completed with 148 patients receiving outpatient HD treatment. The data were collected by using the "patient introduction form", the "thirst distress scale (TDS)", the "fluid control scale in hemodialysis patients (FCSHP)", the "visual analog scale (VAS)". IDWG was calculated as the difference between the weight before HD and the weight recorded after the previous session; the mean of sessions over 3 months was recorded. Independent sample t-test, one-way ANOVA test, Mann-Whitney U, and Kruskal-Wallis tests were used to evaluate the data, and Pearson correlation analysis was used to determine the relationship between the scales.

Results: According to the results, the mean TDS score was 21.67±5.02, the mean VAS score was 4.62±1.68, the mean FCHPS total scale score was 44.86±6.80, the mean FCHPS behavior subscale score was 22.14±5.74, the mean FCHPS knowledge subscale score was 12.54±2.79, and the mean FCHPS attitude subscale score was 10.17±2.76. A negative correlation was found between TDS scores and FCHPS total scores, FCHPS subscale

ÖZ

Amaç: Bu araştırma, ayaktan hemodiyaliz tedavisi alan hastaların susama sıkıntısı ve susama şiddetinin sıvı kontrol uyumu ve interdiyalitik kilo alımı (IDWG) ile ilişkisini incelemek amacıyla yapıldı.

Yöntemler: Bu iki merkezli tanımlayıcı ve kesitsel çalışma, ayaktan hemodiyaliz tedavisi gören 148 hasta ile tamamlandı. Veriler "hasta tanıtım formu", "hemodiyaliz hastalarında susama sıkıntısı ölçeği (HHSSÖ)", "hemodiyaliz hastalarında sıvı kontrol ölçeği (HHSKÖ)", vizüel analog skala (VAS)" kullanılarak toplandı. IDWG, hemodiyaliz öncesi ağırlık ile önceki seanstan sonra kaydedilen ağırlık arasındaki fark olarak hesaplandı; 3 aylık interdiyalitik kilo alımının ortalaması kaydedildi. Verilerin değerlendirilmesinde, Independent sample t-testi ve one-way ANOVA testi, Mann-Whitney U ve Kruskall-Wallis testleri kullanıldı. Ölçekler arasındaki ilişkiyi belirlemek için Pearson korelasyon analizi kullanıldı.

Bulgular: Elde edilen sonuçlara göre HHSSÖ puan ortalaması 21,67±5,02, VAS susuzluk puan ortalaması 4,62±1,68, HHSKÖ toplam ölçek puan ortalaması 44,86±6,80, HHSKÖ davranış alt boyutu puan ortalaması 22,14±5,74, HHSKÖ bilgi alt boyutu puan ortalaması 12,54±2,79 ve HHSKÖ tutum alt boyutu puan ortalaması 10,17±2,76 olarak belirlendi. Susama sıkıntısı

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ABSTRACT

knowledge scores and FCHPS subscale attitude scores, and IDWG and FCHPS subscale attitude scores. A positive correlation was also found between the VAS score and IDWG.

Conclusion: Thirst distress was higher than the moderate level in HD patients, and IDWG increased as thirst severity (VAS score) increased.

Keywords: Drinkings, hemodialysis, thirst, weight gain, xerostomia

ÖZ

ölçek puanları ile HHSKÖ toplam puanları, HHSKÖ alt boyut bilgi puanları ile HHSKÖ alt boyut tutum puanları, IDWG ile HHSKÖ alt boyut tutum puanları arasında negatif bir korelasyon tespit edildi. VAS susuzluk puanı ile IDWG arasında pozitif bir ilişki tespit edildi.

Sonuç: Çalışmamızda, hemodiyaliz hastalarında susama sıkıntısı orta düzeyden yüksek ve susama şiddeti (VAS susuzluk puanı) arttıkça interdiyalitik kilo alımının arttığı saptandı.

Anahtar Kelimeler: Sıvı tüketimi, hemodiyaliz, susama, kilo alımı, ağız kuruluğu

Introduction

Hemodialysis (HD) is a medical procedure that filters blood outside the body using a machine equipped with a semi-permeable membrane. It is essential for managing fluid and electrolyte imbalances in individuals with chronic kidney disease (CKD), a condition affecting approximately 2.6 million people worldwide. Projections indicate that this number could rise to about 5.4 million by 2030, representing around 10% of the global population (1,2). According to the Turkish Society of Nephrology's Turkish Kidney Registration System Report for 2020, the countries with the highest rates of use of HD treatment are Japan (95%), Bangladesh (92%), and Malaysia (86%). In Türkiye, this figure stands at 74% (3).

Thirst, defined as the sensation prompting water intake, is prevalent among HD patients, with studies showing a prevalence range of 30.9% to 95% (4-7). The causes of thirst that develops in patients receiving HD treatment include age, medications, diabetes mellitus, fluid restriction, Sjogren's syndrome (8,9). The saliva flow rate, which begins to decrease in patients with chronic kidney patients, the HD treatment process it decreases thoroughly along with. In these patients, urea comes to saliva from the gum groove fluid with salivary gland secretions (10). It is often associated with inadequate saliva secretion, leading to dry mouth and discomfort (11). Thirst distress is the level of distress caused by thirst or thirst-related conditions (12). For HD patients, maintaining adequate fluid consumption between dialysis sessions is critical, especially as they adhere to a fluid-restricted diet to prevent fluid overload (13). In patients undergoing HD, the level of fluid restriction depends on several factors, including the patient's residual kidney function, comorbid conditions, and the effectiveness of the dialysis treatment itself. However, complete dehydration should be avoided, as it can lead to serious complications. Most HD patients are advised to limit fluid intake to 1-1.5 liters per day in addition to urine output. The total fluid intake includes all drinks and fluids from food, medications and other parameters (14). However, the strong drive of thirst can complicate compliance with these dietary restrictions (15,16).

Non-compliance with fluid restrictions may result in serious complications, including hypertension, acute pulmonary edema, and cardiovascular issues (17). Residual kidney function, thirst sensation comorbid conditions, dialysis frequency and efficacy, patient education and understanding, psychological distress, cognitive function, cultural and social norms, physical activity, dietary habits, dialysis quality are the factors affecting compliance with fluid restriction (18). Additionally, dehydration can lead to increased morbidity and mortality through excessive interdialytic weight gain (IDWG), which is calculated by the difference between pre- and post-dialysis weights (15,16). Dehydration, in a clinical sense, does not directly cause IDWG; rather, it is usually associated with a lack of fluid balance, which can contribute to excessive fluid retention when the body compensates for perceived dehydration. During dialysis, the goal is to remove excess fluid that has accumulated between sessions. However, if the patient has been dehydrated, the dialysis treatment may remove not only the excess fluid but also some of the essential body water, leading to a relative dehydration post-dialysis. After the treatment, patients may then consume more fluid to compensate for the perceived dehydration, resulting in high IDWG between treatments (19). While dehydration can play a role in fluid imbalance, high IDWG is primarily due to excessive fluid intake (non-compliance with fluid restrictions), sodium intake, reduced dialysis efficiency (inadequate ultrafiltration or dialysis treatment), residual renal function, cardiovascular factors, such as heart failure, medications that promote fluid retention, malnutrition and hypoalbuminemia, inflammatory states or infections (17,19).Thirst is a significant factor influencing fluid intake and IDWG, often exacerbating weight gain in patients (20). Many studies highlight a correlation between heightened thirst and increased IDWG, with one indicating that 86% of HD patients reported severe thirst (7,21,22).

To avoid excessive IDWG defined as a weight gain exceeding 5.7% of dry weight between sessions patients must adhere to strict fluid intake guidelines (8). In line with all this information, in this study, we aimed to investigate the relationship between thirst distress, thirst severity and compliance with fluid control and IDWG in HD patients.

Methods

Purpose and Type of Research

This descriptive and cross-sectional study was conducted to investigate the relationship between thirst distress, severity and compliance with fluid control, and IDWG in HD patients.

Research Questions

Question 1: Are thirst distress and severity related to fluid restriction compliance in HD patients?

Question 2: Are thirst distress and severity related to IDWG in HD patients?

Setting and Time of the Study

The study was conducted between June 2020 and January 2021 at X State Hospital in Gümüşhane province and Y State Hospital HD Unit in Bayburt province.

Population and Sample of the Study

The population consisted of 180 patients receiving outpatient HD treatment in the HD Units of X and Y State Hospitals. The sample was determined to be at least 138 patients in the G*Power 3.1.9.6 program with an error amount of α=0.05, an effect size of 0.25, and a targeted test power of 0.90 (90%). However, considering the possibility of dropout or death during the study, the sample number was increased by 13%, and 10 more patients were included in the study. The study was completed with 148 patients. The participation rate was determined to be 82.2%.

Inclusion Criteria

Receiving HD treatment three times a week for at least 3 months (to be defined as a chronic HD program) (15) in the HD Units of X and Y State Hospitals, being over 18 years of age or older, having blood glucose level within the normal interval, not using any medication that affects thirst, the sodium level in the dialysate liquid in the interval of 139-140 mg/dL, being able to measure weight while standing, being able to communicate verbally, having no impairment in mental and cognitive functions, and accepting to participate in the research.

Exclusion Criteria

Having a psychiatric disorder requiring treatment, receiving peritoneal dialysis, withdrawing from the study, and continuing HD treatment in a different institution.

Tools of Data Collection

"Patient introduction form", the "thirst distress scale in hemodialysis patients (TDSHP)", the "fluid control scale in hemodialysis patients", "visual analog scale (VAS)". Thirst, and a high-precision scale with a height gauge were used to collecting the data. Clinical and laboratory data were obtained from medical records.

The Patient Introduction Form

The form was developed by the researcher after reviewing the literature (15,20,23). It consists of two parts and eight questions. The first section included 5 questions to determine the sociodemographic characteristics of the patients (gender, age, marital status, etc.), and the second part includes 3 questions to determine the characteristics related to HD treatment (chronic disease status, family history of kidney disease).

The Thirst Distress Scale in Hemodialysis Patients (TDSHP)

The scale was developed by Welch (12), and its Turkish validity and reliability were tested by Kara (15). It is a 6-item measurement tool with a single dimension. The scale is a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The possible total score range is 6-30, and high scores indicate high thirst distress. The Cronbach's alpha coefficient of TDSHP was found to be 0.78 (12) for the original scale. The Cronbach alpha coefficient of TDSHP our study is 0.81.

The Fluid Control in Hemodialysis Patients Scale (FCHPS)

Developed by Albayrak Cosar and Cinar Pakyuz (24), the scale has three subscales and 24 items. Questions 1-7 comprise the "knowledge" subscale, questions 8-18 comprise the "behavior" subscale, and questions 19-24 comprise the "attitude" subscale. Items 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 are scored positively (agree=3, undecided=2, disagree=1), while items 6, 7, 18, 19, 20, 21, 22, 23, and 24 are reverse scored. The lowest and highest scores obtained from the scale are 24 and 72. High scores indicate that the patient's compliance with fluid control is high. Cronbach's alpha internal consistency coefficients were 0.92 for the knowledge subscale, 0.80 for the behavior subscale and 0.67 for the attitude subscale (24). In our study, the Cronbach alpha internal consistency coefficients were found to be 0.85 for the knowledge subscale, 0.78 for the behavior subscale and 0.65 for the attitude subscale.

High-Precision Weighing Scale with Height Gauge

It was used for interdialytic weight measurement (pre- and post-HD weight measurement). Weight was measured on an empty stomach and without removing any clothes before each HD procedure and 15 minutes after the HD was finished. In the unit, patients were placed barefoot on a precision scale with a calibrated height scale.

The Visual Analog Scale Thirst

Thirst level means "the intensity, strength, or amount of thirst" (25). VAS was used to measure the thirst intensity of HD patients. The scale is a horizontal line 10 cm long. Patients were asked to rate their thirst since the last dialysis on the VAS. The VAS consists of numerical values arranged on a horizontal line, with "0" indicating "no thirst" and "10" indicating "worst possible thirst." In this study, VAS thirst scores were evaluated as 0-3 mild, 4-6 moderate, and 7-10 severe based on the study of Yang et al. (26). The meaning of VAS thirst was explained ("0" means "no thirst" and "10" means "worst possible thirst"), and the patients were asked to give a value between 0 and 10 for their thirst level, and the numerical value was noted by the researcher. The patients were asked about VAS thirst values before the second dialysis session, and they were noted. The duration of thirst was the same for all patients.

Data Collection

The "patient introduction form," the "TDSHP," and the "FCHPS" were administered to the patients by the researcher using the face-to-face interview technique before the HD procedure in the HD Unit. The questions were asked to the patients by the researcher, and their answers were recorded on the data collection forms. This application took an average of 15 minutes.

Interdialytic Weight Measurement

Patients included in the study underwent bicarbonate HD, 4 hour thrice weekly. (Monday-Wednesday, Saturday group, and Tuesday, Thursday, and Sunday group) (15). The researcher used a high-precision weighing scale with a height gauge calibrated by the hospital to weigh the patients. The interdialytic weight measurement value was calculated by subtracting the pre-and post-HD weights of the patients; the average of the HD sessions in 3 month were registered and assessed as absolute IDWG (27). Interdialytic weight measurement was performed in the second dialysis session for each patient. The time between the two hemodialyses was the same for all patients.

Statistical Analysis

The collected data were analyzed using SPSS (for Windows, version 25.0) package program. Data were presented using descriptive statistics (frequency, percentages, arithmetic mean, standard deviation). The Kolmogorov-Smirnov test was applied for conformity to the normal distribution. Independent samples t-test, one-way ANOVA, and post-hoc tests were used in the evaluation of parametric data; Mann-Whitney U and Kruskal-Wallis tests were used in the evaluation of non-parametric data. In addition, Pearson correlation analysis was used to determine the relationship between the scores obtained from the scales.

Ethical Considerations

Ethics committee approval was obtained from the Gümüşhane University Scientific Research and Publication Ethics Committee (date: 14.06.2019, approval no: 2019/6), and written institutional permissions were obtained from the Gümüşhane Provincial Health Directorate (date: 24.05.2019, approval no: E.1271) and Bayburt Provincial Health Directorate (date: 14.02.2019, approval no: 91871880/903.07.01). In addition, the patients were informed about the research by the researcher, and their written and verbal consent was obtained.

Results

The mean age of the patients was 61.82±11.45 years, ranging from 27 to 81 years. The average IDWG during a 3-month HD period was 2724.32±961.40 grams. The mean VAS thirst score was 4.62±1.68. In X province, 51.4% of patients were male, 75.0% were married, and 46.3% were housewives or unemployed. Additionally, 47.9% had only a primary school education, and 80.5% had comorbidities, with hypertension being the most common (57.4%). Furthermore, 60.6% reported a family history of chronic kidney diseas. In Y province, the demographic distribution was similar as 51.4% were male, 65.8% were married, and 51.5% were housewives or unemployed. Primary school education was the highest level attained by 46.7% of patients. The rate of comorbidities was also high (84.8%), with hypertension affecting 53.9% of patients and 60.5% of indivials did not have a family history of CKD (Table 1). Regarding VAS thirst scores, 62.2% of patients had moderate thirst, 25.6% had mild thirst, and 12.2% had severe thirst (Figure 1).

The Mann-Whitney U test revealed significant differences in the total FCHPS scores based on gender (Z=-2.393; p=0.017) and family history of CKD (Z=-3.537; p=0.000). However, no significant differences were found related to marital status, comorbidities, or education level (p>0.05) (Table 2). Similarly, significant differences were observed in the behavior subscale scores of the FCHPS based on gender (Z=-2.228; p=0.026) and the presence of comorbid chronic diseases (Z=-2.337; p=0.019). In contrast, no significant differences were found for marital status, family history of CKD, occupation, or education level (p>0.05) (Table 2).

The Independent samples t-test revealed a significant difference in the FCHPS knowledge subscale scores based on a family history of CKD (t=4.802; p<0.001). However, no significant differences were found for gender, marital status, or the presence of comorbidities (p>0.05).

The Independent samples t-test revealed a significant difference in the FCHPS attitude subscale scores based on the presence of comorbidities (t=2.261; p=0.025). However, no significant differences were found for gender, marital status, family history of CKD, occupation, or education level (p>0.05) (Table 2).

The parametric independent t-test revealed a significant difference in TDSHP scores based on gender (t=3.642; p<0.001). The one-way ANOVA showed a significant difference in TDSHP scores by occupation (F=7.063; p=0.001). Post-hoc analysis indicated that housewives/unemployed patients had significantly higher TDSHP scores (23.08±3.16) compared to employed/self-employed (18.75±7.16) and retired patients (20.76±5.67) (p<0.001). No significant differences were found for marital status, educational level, comorbidities, or family history of CKD with respect to TDSHP scores (p>0.05) (Table 3).

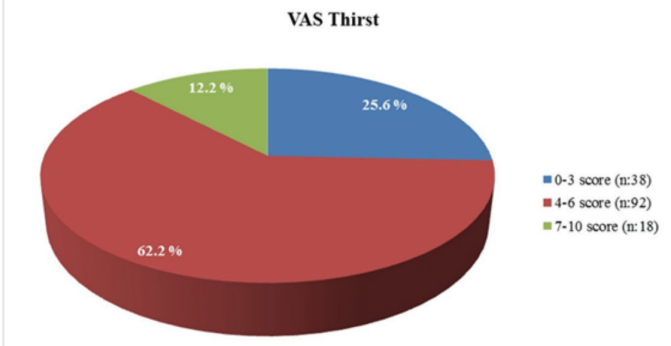

Figure 1. VAS severity of thirst (0-10)
VAS: Visual analog scale

Table 1. Descriptive, clinical and laboratory characteristics of HD patients in X and Y Hospitals (n=148)

Mean age (year)	61.82±11.45 (minimum: 27 maximum: 81)				
IDWG (gr)	2724.32±961.40 (minimum: 300 maximum: 5800)				
VAS	4.62±1.68				
Characteristics		n		%	
		X	**Y**	**X**	**Y**
Gender	Female	36	36	48.6	48.6
	Male	38	38	51.4	51.4
Marital status	Married	54	50	75.0	65.8
	Single [divorced/widow(er)]	18	26	25.0	34.2
Occupation	Worker/civil servant/self-employed	10	6	12.2	9.1
	Retired	34	26	41.5	39.4
	Housewife/unemployed	38	34	46.3	51.5
Education level	Literate	25	21	35.2	27.3
	Primary school	34	36	47.9	46.7
	Secondary school and above	12	20	16.9	26.0
Any comorbidity disease	Yes	66	56	80.5	84.8
	No	16	10	19.5	15.2
Type of comorbidity disease	Hypertension	66	62	57.4	53.9
	Heart diseases	20	26	17.4	22.6
	Diabetes	24	22	20.9	19.2
	Stroke	5	5	4.3	4.3
Family history of CKD	Yes	26	30	60.6	39.5
	No	40	46	39.4	60.5
Clinical and laboratory characteristics		**X**		**Y**	
	Dialytic age (months)	68±1.2		64±2.4	
	Body mass index	24 (22-25)		24 (23-25.6)	
	IDWG (kg)	2.7		2.7	
	Creatinine (mg/dL)	8.65±2.64		7.49±2.71	
	Albumin (g/dL)	3.82±0.36		3.6±0.31	
	Hemoglobin (g/dL)	11.4±1.89		11.4±1.25	
	PTH	216 (185-261)		267(166-328)	
	Kt/V	1.30± 0.42		1.31±0.24	
	Na dialysate (mg/dl)	140(140-140)		139(139-140)	

CKD: Chronic kidney disease, X, Y: Hospital, PTH: Parathyroid hormone, Kt/V: K: Dialyzer clearance of urea, t: Dialysis time, V: Volume of distribution of urea

The Kruskal-Wallis test showed significant differences between VAS thirst levels and both the mean total FCHPS score (KW=12.298; p=0.002) and the behavior subscale scores of the TDSHP (KW=13.522; p=0.001). However, no significant difference was found between VAS thirst levels and the FCHPS knowledge subscale (p>0.05) (Table 4).

The one-way ANOVA revealed a significant difference between VAS thirst levels and the attitude subscale of the FCHPS (F=3.260; p=0.041). Post-hoc analysis indicated that this difference was driven by patients with mild and severe VAS thirst levels.

The mean scores for the key scales were as follows: TDSHP =21.67±5.02, FCHPS total scale =44.86±6.80, FCHPS behavior subscale =22.14±5.74, FCHPS knowledge subscale =12.54±2.79, and FCHPS attitude subscale =10.17±2.76 (Table 5).

Significant correlations were found between FCHPS scores and TDSHP total scores, FCHPS knowledge and behavior subscale scores, and IDWG and FCHPS behavior subscale scores (p<0.05). Additionally, a positive correlation was observed between the total FCHPS score and both the knowledge and behavior subscale scores, as well as between the VAS thirst score and IDWG (p<0.05). However, no significant correlation was found between TDSHP scores, FCHPS subscales, and IDWG (p>0.05) (Table 6).

Table 2. The FCHPS mean total and subscale scores of HD patients according to descriptive characteristics (n=148)

Characteristics		n		FCHPS total	Behavior subscale	Knowledge subscale	Attitude subscale
		X	Y	Mean rank	Mean rank	Score Mean ± SD	Score Mean ± SD
Gender	Female	36	36	65.86	66.50	12.44±2.57	10.08±2.76
	Male	38	38	82.68	82.08	12.63±2.99	10.26±2.78
				Z=-2.393; p=**0.017****	Z=-2.228; p=**0.026****	t=-0.407; p=0.685	t=-0.394; p=0.694
Marital Status	Married	54	50	75.71	76.46	12.51±2.71	10.23±2.59
	Single [widow(er)/divorced]	18	26	71.64	69.86	12.59±2.98	10.04±3.16
				Z=-0.530; p=0.596	Z=-0.863; p=0.388	t=-0.142; p=0.887	t=0.371; p=0.711
Comorbid disease	Yes	66	56	72.60	70.73	12.49±2.86	10.40±2.75
	No	16	10	83.43	92.19	12.76±2.43	9.07±2.57
				Z=-1.172; p=0.241	Z=-2.337; p=0.019**	t=-0.459; p=0.647	t=2.261; p=0.025*
Family history of CKD	Yes	26	30	90.43	86.86	13.85±2.28	9.92±2.52
	No	40	46	64.80	66.98	11.73±2.77	10.32±2.90
				Z=-3.537; p=0.000**	Z=-2.759; p=0.006	t=4.802; p=0.000*	t=-0.847; p=0.398
Occupation	Employee/civil servant/self-employed	10	6	83.00	87.75	12.87±3.55	9.75±3.67
	Retired	34	26	83.23	80.90	12.63±2.79	10.56±2.38
	Housewife/unemployed	38	34	65.33	66.22	12.38±2.62	9.94±2.83
				KW=6.44; p=0.040***	KW=5.644; p=0,059	F=0.252; p=0.778	F=1.040; p=0.356
Education level	Literate and below	25	21	80.07	80.02	12.91±3.09	9.86±2.48
	Primaryschool graduate	34	36	68.79	72.33	12.25±2.74	10.02±3.08
	Secondary school and above	12	20	79.00	71.31	12.62±2.40	10.93±2.31
				KW=2.385; p=0.303	KW=1.139; p=0.566	F=0.783; p=0.459	F=1.606; p=0.204

*: Independent Samples t-test, **: Mann-Whitney U test, ***: Kruskal-Wallis test, Significance level p<0.001 and p<0.05, FCHPS: Fluid control scale in hemodialysis patients, SD: Standard deviation

Discussion

In this study, we investigated the relationship between thirst distress, thirst severity, fluid control and IDWG in HD patients.

Thirst is a distressing symptom experienced by many HD patients. Our study found that thirst distress among HD patients was higher than the national norm and exceeded the TDSHP's midpoint of 18. Similar levels of thirst distress were reported in various studies (15,19,24,29), while American and Brazilian samples showed moderate distress (21,29), and Canadian samples showed mild distress (30). These differences may result from variations in sample characteristics, size, research methods, or design. Female HD patients in our study experienced higher thirst distress than males, consistent with findings from other research (29), possibly due to employment status differences. Unemployed patients, including housewives, had greater thirst distress than those employed or retired, similar to findings in other studies (29).

Fluid regulation is critical for HD patients. The mean score for the FCHPS was below moderate, aligning with results from Balım et al. (31). However, other studies (24,29,31-34) reported higher FCHPS scores, possibly due to differences in education levels and social environments among participants. In our study, HD patients with a family history of CKD and male patients showed higher compliance with fluid restriction, indicating increased awareness among those with a CKD family history. Another study (35) also highlighted the impact of gender and marital status on compliance with fluid control, as well as the influence of treatment duration and information on behavior and knowledge levels. Employment and spending time outside may affect male patients' adherence to fluid restrictions. In a related study (33), FCHPS scores for knowledge and attitude were similar to ours, with variations likely stemming from differences in educational background and information provided on fluid and salt restriction.

Table 3. TDSHP mean scores of HD patients in X and Y hospitals based on their descriptive characteristics

Characteristics		n		Thirst distress scale
		X	Y	Score mean ± SD
Gender	Female	36	36	23.13±3.14
	Male	38	38	20.28±6.00
				t=3.642; p=**0.000***
Marital Status	Married	54	50	21.61±5.54
	Single [widow(er)/divorced]	18	26	21.81±3.55
				t=-0.224; p=0.823
Comorbid disease	Yes	66	56	21.73±5.01
	No	16	10	21.38±5.13
				t=-0.320; p=0.751
Family history of CKD	Yes	26	30	22.32±4.86
	No	40	46	21.28±5.10
				t=-1.237; p=0.219
Occupation	Employee/civil servant/self-employed	10	6	18.75±7.16
	Retired	34	26	20.76±5.67
	Housewife/unemployed	38	34	23.08±3.16
				F=7.063; **p=0.001****
Education level	Literate and below	25	21	22.08±3.47
	Primary school graduate	34	36	22.20±5.16
	Secondary school and above	12	20	19.93±6.21
				F=2.502; p=0.085

*: Independent samples t-test, **: One-way ANOVA, Significance level p<0.001 and p<0.05, TDSHP: Thirst distress scale in hemodialysis patients, HD: Hemodialysis, CKD: Chronic kidney disease SD: Standard deviation

Table 4. Mean total and subscale scores of the VAS, TDSHP, and FCHPS (n=148)

VAS	n	TDSHP	FCHPS total	Behavior subscale	Knowledge subscale	Attitude subscale
		Score mean±SD	Mean rank	Mean rank	Score mean ± SD	Score mean ± SD
Mild (0-3 points)	38	21.57±5.09	66.97	62.82	11.94±3.12	10.00±2.90
Moderate (4-6 points)	92	22.06±4.86	83.00	84.11	12.93±2.50	9.22±2.15
Severe (7-10 points)	18	19.88±5.54	46.94	50.06	11.77±3.20	10.17±2.76
		F=1.431; p=0.242	KW=12.298; p=0.002**	KW=13.522; p=0.001**	F=2.499; p=0.86	F=3.260; p=0.041*

*: One-way ANOVA, **: Kruskal-Wallis test, Significance level p<0.001 and p<0.05, VAS: Visual analog scale, TDSHP: Thirst distress scale in hemodialysis patients, FCHPS: Fluid control scale in hemodialysis patients

Table 5. HD patients' mean total and subscale scores on the FCHPS and TDSHP (n=148)

Scale	Scale subscale	N	X ± SD	Min.-Max.	Score range/average
TDSHP	-	148	21.67±5.02	6-29	6-30/18
FCHPS	**Behavior subscale**	148	22.14±5.74	13-56	6-18/12
	Knowledge subscale	148	12.54±2.79	7-18	7-21/14
	Attitude subscale	148	10.17±2.76	6-18	11-33/22
	Total	148	44.86±6.80	30-78	24-72/48

HD: Hemodialysis, FCHPS: The fluid control in hemodialysis patients scale, SD: Standard deviation, TDSHP: Thirst distress scale in hemodialysis patients, Min.-Max.: Minimum-maximum

Table 6. Relationship between interdialytic weight gain and mean total and subscale scores of the TDSHP, FCHPS, and VAS thirst score (n=148)

Characteristics	1	2	3	4	5	6	7
(1) VAS thirst score	-	-	-	-	-	-	-
(2) FCHPS total score	r=-0.258**	-	-	-	-	-	-
(3) TDSHP total score	r=-0.120	r=0.653**	-	-	-	-	-
(4) FCHPS behavior subscale score	r=-0.150	r=0.831**	r=0.490**	-	-	-	-
(5) FCHPS attitude subscale score	r=-0.088	r=0,003	r=-0.427**	r=-0.349**	-	-	-
(6) Interdialytic weight gain	r=0.021	r= -0.101	r=0.004	r=-0.072	r=-0.183*	-	-
(7) VAS thirst scale score	r=-0.001	r=-0,100	r=-0.017	r=-0.060	r=-0.147	r=0.866**	-

TDSHP: Thirst distress scale in hemodialysis patients, FCHPS: Fluid control in hemodialysis patients scale, VAS: Visual analog scale *: p<0.05, **: p<0.01 (Pearson correlation analysis was used)

Our study's findings regarding FCHPS scores align with other research (34), indicating low knowledge of fluid restriction, moderate behavioral compliance, and low attitudinal compliance. Similar patterns were noted in other studies (31,35), where compliance was found to be moderate overall but varied by subscale, with high knowledge and moderate behavioral compliance but low attitudinal compliance. The low knowledge level in our sample may explain the low attitude score, likely due to the lower education level of participants. Additionally, some studies reported significant non-compliance rates with fluid restriction, such as 21.9% (29), 39.1%, 74%, and 68.8% (36-38), which is consistent with our findings (39-42). Enhanced knowledge, attitudes, and behaviors around fluid control may help HD patients reduce interdialytic fluid intake and, in turn, ultrafiltration needs.

The absence of a significant correlation between thirst distress and FCHPS subscale scores in our study may be due to the small sample size, moderate behavioral compliance, and high awareness in patients with a CKD family history. Thirst complicates fluid management and leads to IDWG in HD patients, impacting their quality of life. Our findings underscore the discomfort and quality of life impacts of thirst for HD patients.

The mean IDWG in our study was 2,724 grams, comparable to findings from other studies (43,44). IDWG levels above 2,500 grams increase the risk of cardiovascular disease and hypertension (45). Some studies reported higher IDWG than ours (35,46), while others observed lower values (6,7,29,31,32,47-49), with differences likely attributable to sample size, sodium levels in dialysis fluid, and seasonal changes. The lack of a significant correlation between thirst distress and IDWG may also be explained by our sample's size and awareness levels.

Thirst often leads to dry mouth and elevated IDWG, as noted in other studies (7,8,11,21,29). Patients often use strategies to manage thirst, such as chewing gum, reducing sodium intake, and measuring fluid intake (21). A study of 21,919 patients (29) also found that weight changes varied by region, and dialysate sodium concentration was a key factor influencing IDWG (50). Literature reviews indicate that thirst prevalence in HD patients ranges from 6% to 95% (50).

The moderate VAS thirst scores in our study align with prior research (6,29,34). A significant association between VAS thirst scores and FCHPS behavior and attitude subscale scores suggests that patients with higher thirst levels face more challenges in adhering to fluid restrictions. Additionally, increased VAS thirst scores were correlated with greater IDWG, indicating higher fluid retention between dialysis sessions, which is consistent with evidence linking thirst to IDWG (24,51,52). The lack of significant differences between VAS and thirst distress scale scores in our study might reflect seasonal variations, as data were collected in summer and autumn.

Study Limitations

The limitation of the study was that data were collected only from two district hospitals in the black sea region and the period in which data were collected coincided with the time of coronavirus disease 2019.

Conclusion

HD patients showed moderate behavioral compliance with fluid control and thirst distress but had low knowledge and attitudes, which hindered their ability to exhibit adequate fluid control behaviors. In HD patients with a moderate VAS thirst score, IDWG increased as the VAS thirst score increased. In HD patients with moderate to high thirst distress, no significant association was established between thirst distress scale scores, FCHPS subscale scores, and IDWG. By focusing on practical tools for fluid monitoring, a multi-disciplinary approach, tailored interventions based on compliance levels, and strategies to address thirst management, healthcare providers can help improve fluid control behaviors, reduce thirst distress, and enhance overall compliance among HD patients.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained from the Gümüşhane University Scientific Research and Publication Ethics Committee (date: 14.06.2019, approval no: 2019/6).

Informed Consent: The patients were informed about the research by the researcher, and their written and verbal consent was obtained.

Footnotes

Authorship Contributions

Surgical and Medical Practices: A.C., H.D., B.D., S.H., Concept: A.C., H.D., B.D., S.H., Design: A.C., H.D., B.D., S.H., Data Collection or Processing: A.C., B.D., Analysis or Interpretation: A.C., H.D., Literature Search: A.C., H.D., B.D., S.H., Writing: A.C., H.D., B.D., S.H.

Conflict of Interest: No conflict of interest was declared by the authors.

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Erratum

Retraction Note

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