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RESEARCH ARTICLE

THE EFFECT OF ROY ADAPTATION MODEL GUIDED EDUCATION ON FLUID ADHERENCE AND DISEASE ACCEPTANCE OF HEMODIALYSIS PATIENTS: A NONRANDOMIZED INTERVENTIONAL STUDY

Merve Çayır Yılmaz[1], Elanur Yılmaz Karabulutlu[2]

[1] Amasya University, Faculty of Health Sciences, Amasya, Turkey.
[2] Erzurum Technical University, Faculty of Health Sciences, Erzurum, Turkey.

ORCID: M.Ç.Y. 0000-0002-8576-4127; E.Y.K. 0000-0001-5798-853X

Corresponding author: Merve Çayır Yılmaz, **E-mail:** mervehemsiiire@hotmail.com
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ABSTRACT

Purpose: Difficulty in acceptance of illness and adherence to fluid control are common in patients receiving haemodialysis treatment, and they are associated with higher morbidity and mortality. This study aims to identify the effects of the training based on the Roy Adaptation Model, which is given to patients receiving haemodialysis treatment on the acceptance of illness, and adherence to fluid control.
Material and Methods: The study was designed as a nonrandomised interventional study. This study was conducted with 81 patients, who received haemodialysis treatment. The experimental group was given training according to the Roy Adaptation Model for six months. Data were collected through the Patient Identification Form, Acceptance of Illness Scale, and Fluid Control Scale in Haemodialysis Patients.
Results: While the difference between the experimental and control groups' second interview Acceptance of Illness Scale mean score was not statistically significant, the difference between the score of Fluid Control Scale in Haemodialysis Patients were statistically significant.
Conclusion: The training based on the Roy Adaptation Model given to the experimental group caused an increase in adherence to fluid control but had no effects on the acceptance of illness levels.

Keywords: Fluid control, haemodialysis, illness acceptance, Roy Adaptation Model

INTRODUCTION

Chronic kidney disease (CKD) is characterised by progressive and irreversible nephron loss. Patients diagnosed with CKD are given renal replacement treatments (RRT). These treatments are life-saving, and haemodialysis (HD) is the most common method (1).

Haemodialysis treatment decreases mortality rates and prolongs life expectancy; however, it also causes various unwanted problems in physical, psychological, social and economic areas. Patients receiving HD treatment experience numerous problems including fluid-intake/food restrictions, adverse medicine-related effects, fatigue, changes in the roles and responsibilities of family members, sexual dysfunction, anxiety, depression and financial problems (2,3).

An efficient HD is largely associated with making a lifestyle change through dedication to the medical treatment, regular dialysis, fluid-intake restrictions

and appropriate nutrition programmes (4). Patients' acceptance of illness is of great importance in complying with the present lifestyle changes (5). Patients receiving HD treatment should be helped to comply with the treatment and to accept the illness so that their quality of life can increase and mortality can decrease (6,7).

Fluid-intake restrictions are one of the most important causes of stress and difficulty related to treatment adherence (8). Patients receiving HD treatment can experience serious complications due to nonadherence of fluid-intake restrictions. First of all, a decrease occurs in HD efficiency as a result of the increased fluid consumption of patients and important long-term problems such as pulmonary oedema, hypertension and coronary failure might develop. All these unwanted cases can cause an increase in patient mortality (8-10).

Haemodialysis nurses should identify patients' acceptance of illness as well as adherence to the treatment levels and the affecting factors and provide them with individualised interventions (11). Here, nursing theories are a guide for clinical practice. Sister Callista Roy, one of the most important theoreticians of nursing, developed the Roy adaptation model (RAM). Roy, according to her developed adaptation model, defined the individual as an adaptive system that has cognitive and regulatory coping mechanisms. While the direct observation of cognator and regulator coping mechanisms is not possible, Roy identified four adaptive modes that enable the observation of regulator and cognator activities. These are physiological, self-concept, role function and interdependence modes (12).

1. The physiological adaptive mode is related to the individual's physiological integrity, and it consists of five main physiological needs, including oxygenation, nutrition, elimination, activity-rest and protection. In addition, physiological adaptation includes four processes that include senses, fluid electrolyte, neurological function and endocrine function (12).

2. The self-concept adaptive mode indicates the individual's psychological and spiritual characteristics. It is composed of all the beliefs and emotions the individual has formed about themself. The concept of self is divided into two, as physical and personal self. While the physical self indicates body sensation and body image, the personal self consists of ideals, behaviours, a harmony of the personal standards and moral-spiritual values (12).

3. The basic need of the role adaptive function model is social integrity. RAM has three kinds of role classifications which are called the primary, secondary and tertiary roles. The primary role is the fundamental part of the behaviours in an individual's life. The secondary role is the sum of the tasks related to the primary role and developmental phase. Tertiary roles are the roles in the secondary role; they are about personal choices. Tertiary roles are temporary and are formed in line with likes (12).

4. The interdependence adaptive mode focuses on the interactions of the balance of receiving and giving of love, respect and value. It includes the relationship of individuals with people important to them and support systems. The basic need underlying the interdependent relationship is the maintenance of relational integrity or feeling of safety in the development of relationships (12).

According to RAM, nursing is an information system which helps individuals to reach better health levels and is open to development and innovation; by using this knowledge, nurses improve the individual's adherence level. The purpose of the nurse is to help individuals to adapt to their physiological needs, roles and changes related to improving their health (12,13). There are numerous studies reporting the effectiveness of nursing approaches developed according to the RAM in increasing patient adherence (2,14,15). Training based on RAM given to the patients receiving HD treatment has increased patients' adherence levels in the physiological, self-concept and role function domains (2); Vicdan and Karabacak (2016) found that it increased patients' psychosocial adherence, self-respect and functional performance levels.

Haemodialysis is a difficult treatment to accept and adherence to, and studies on accepting the disease and increasing fluid compliance are limited in the literature. This study aims to identify the effects of RAM-based training given to patients receiving HD treatment on the acceptance of illness and adherence to fluid control.

Hypotheses of the study

1. RAM-based training given to patients receiving HD treatment increases patients' acceptance of illness level.

2. RAM-based training given to patients receiving HD treatment increases patients' adherence to fluid control.

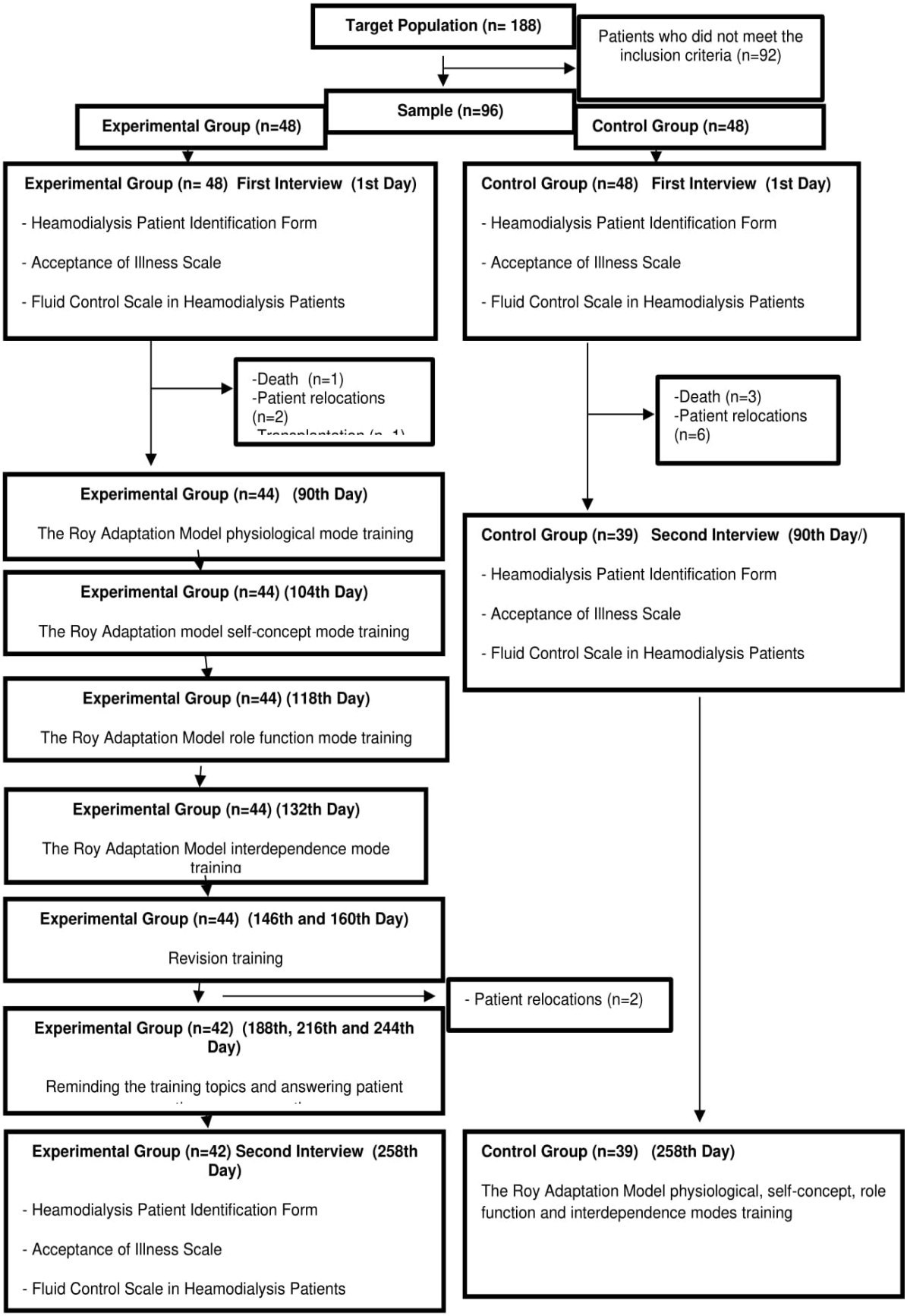

Figure 1. Flow chart of the study

Design and Sample

The study was designed as a nonrandomised interventional study. The study was conducted at three dialysis centres in Turkey between January 2016 and December 2017. The reason for this study to be carried out in three different dialysis centres was the inadequate number of patients. The haemodialysis-related techniques and nursing practices in these three dialysis centres where the study was conducted were similar to each other, and the dialysis centres included two groups of patients who received HD for either 2 or 3 times a week. The inclusion criteria included was ≥18 years of age, having received HD treatment for at least 6 months, being literate, being open to cooperation, having no vision or hearing loss, and having no psychiatric diseases. Ninety-six patients met the inclusion criteria. The first individual to come was included in the experimental group. Individuals who came later were involved in the experimental and control groups one by one based on the matching criteria (age, gender, number of weekly dialysis sessions and duration of HD treatment). Due to 4 deaths, 1 transplantation and 10 patient relocations, the study was completed with 81 patients (experimental, 42; control, 39).

A post hoc (experimental) power analysis was conducted to identify whether the sample size was sufficient; the study had a 0.05 significance level, 95% confidence interval, 90% power and 0.73 effect size. These values indicated that the sample size was sufficient.

Data Collection

Data were collected using the Haemodialysis Patient Identification Form, Acceptance of Illness Scale (AIS) and Fluid Control Scale in Haemodialysis Patients (FCSHP). The data were gathered by a face-to-face meeting technique during the first one-hour of the HD sessions, taking about 15 minutes.

Instruments

Patient Identification Form: A patient identification form consisting of 18 questions was used to list the participants' sociodemographic features (age, gender, marital status, education level, etc.), treatment-related characteristics (Kt/V ratio, amount of phosphor, BUN and potassium) and fluid control-related clinical variables (interdialytic weight, amount of ultrafiltration).

Table 1. Socio-demographic and Treatment-related Features of the Patients (N=81)

Features	Experimental Group (n=42)		Control Group (n=39)		Significance
	n	%	n	%	
Age					
18-45	17	40.5	11	28.2	x^2=2.055
46+	25	59.5	28	71.8	p=0.561
Gender					
Female	18	42.9	15	38.5	x^2=0.162
Male	24	57.1	24	61.5	p=0.687
Marital Status					
Married	30	71.4	29	74.4	x^2=0.088
Single	12	28.6	10	25.6	p=0.767
Education level					
Literate	5	11.9	8	20.5	
Primary school	21	50.0	21	53.8	
Secondary School	3	7.1	3	7.7	x^2=4.187
High school	5	11.9	5	12.8	p=0.381
University	8	19.0	2	5.1	
Occupation					
Unemployed	38	90.5	37	94.9	x^2=2.302
Working	4	9.5	2	5.1	p=0.512
Income level					
Income exceeds expenditure	12	28.6	10	25.6	
Income equals expenditure	17	40.5	17	43.6	x^2=0.111
Expenditure exceeds income	13	31.0	12	30.8	p=0.946
Presence of someone to support care					
Yes	39	92.9	36	92.3	x^2=0.009
No	3	7.1	3	7.7	p=0.925
Presence of someone in family receiving heamodialysis treatment					
Yes	11	26.2	4	10.3	x^2=3.403
No	31	73.8	35	89.7	p=0.065
Number of weekly dialysis sessions**					
2 times	2	4.8	5	12.8	p=0.253
3 times	40	95.2	34	87.2	
Duration of the treatment					
6-60 month	20	47.7	22	56.4	x^2=7.369
61 month+	22	52.4	17	43.5	p=0.061
Presence of another chronic disease					
Yes	34	81.0	30	76.9	x^2=0.198
No	8	19.0	9	23.1	p=0.656
Disease type*					
Diabetes mellitus	13	31.0	13	33.3	
Hypertension	28	66.7	15	38.5	
Rheumatic diseases	-	-	1	2.6	-
Heart disease	8	19.0	6	15.4	
Other	4	9.5	6	15.4	

*More than one option was selected. **Fisher's exact chi-square test

Acceptance of Illness Scale (AIS): Reliability and validity of the "Acceptance of Illness Scale-AIS", which was developed by Felton et al. (16), was performed by Buyukkaya Besen and Esen (5), who adapted the scale to Turkish Society. The AIS is an eight-item self-report measure designed to evaluate adjustment to a chronic illness. The items are specifically worded to describe the negative consequences of illness, such as limitations, dependence on others, or lowered self-esteem. The total score is calculated as a sum of scores for each item; scores obtained from the scale range between 8 and 40. Higher scores indicate higher acceptance and better adjustment to illness (5). Cronbach's alpha value was found to be 0.79 in the study conducted by Buyukkaya Besen and Esen (5) and was found to be 0.85 in the present study.

Fluid Control Scale in Haemodialysis Patients (FCSHP): The scale was developed by Albayrak Cosar and Cınar Pakyuz (17) with a view to assessing knowledge, behaviours and attitudes of HD patients about fluid control. The scale has 24 items and 3 sub-scales. The knowledge sub-scale involves questions from 1 to 7, the behaviour sub-scale from 8 to 18, and the attitude sub-scale from 19 to 24. The scores in the scale range between 24 and 72; higher scores indicate higher adherence to fluid control. Cronbach's alpha internal consistency coefficients of the scale are 0.92 for the knowledge sub-scale, 0.80 for the behaviour sub-scale, 0.67 for the attitude sub-scale and 0.88 for the whole scale (17). Cronbach's alpha internal consistency coefficients in the present study were 0.51 for the knowledge sub-scale, 0.75 for the behaviour sub-scale, 0.75 for the attitude sub-scale and 0.72 for the whole scale.

Nursing Intervention

In the nursing initiative, the training booklet, prepared in accordance with the RAM, was used as the material and with the guidance of the experts. The training booklet consisted of four sections, according to RAM. In the first chapter, information included: the functions of the kidneys related to the physiological field, renal failure, treatment options applied, HD treatment, problems that may occur in HD, nutrition and fluid intake, activity, rest and protection. The second part included: information about developing positive body image for self-concept, increasing self-esteem, effective sexual function, coping with stress. The third part included: effective coping in the role change, the importance of planned life and the ability to perform as much as possible, the responsibility for fulfilling the roles and effective examples of performing the roles. The fourth section included; trust in relationships related to the field of interdependence, the importance of sharing feelings

Table 2. Distribution and Comparison of the fluid control-related clinical variables of the Patients (N=81)

Variables	Experimental Group (n=42)	Control Group (n=39)	Significance
	Ort ±SS	Ort ±SS	
Interdialytic weight (kg)			
First İnterviews	2.96±1.12	3.39±1.53	t=-1.426 p=0.158
Second İnterviews	2.60±1.06	2.97±1.44	U=723.000 p=0.364
Significance	t=2.161 p=0.036	U=-1.940 p=0.052	-
Amount of ultrafiltration (L)			
First İnterviews	3.21±1.10	3.31±1.24	U=790.500 p=0.787
Second İnterviews	3.01±1.11	3.13±1.25	t=-0.462 p=0.645
Significance	t=1.387 p=0.173	t=0.885 p=0.382	-
Phosphor (mg/dL)			
First İnterviews	5.19±1.61	4.94±1.22	U=758.500 p=0.567
Second İnterviews	5.35±1.56	4.80±1.10	t=1.844 p=0.069
Significance	t=-0.789 p=0.434	t=0.753 p=0.456	-
Kt/V			
First İnterviews	1.41±0.23	1.39±0.22	U=818.000 p=0.992
Second İnterviews	1.42±0.25	1.41±0.21	U=776.500 p=0.685
Significance	U=-0.188 p=0.851	U=-0.983 p=0.325	-
BUN (mg/dL)			
First İnterviews	83.03±43.04	96.46±42.61	U=642.500 p=0.095
Second İnterviews	76.47±35.28	92.23±39.59	U=621.500 p=0.062
Significance	t=1.409 p=0.166	U=-0.268 p=0.788	-
Potassium (mmol/L)			
First İnterviews	4.97±1.25	5.05±0.65	U=666.500 p=0.149
Second İnterviews	4.81±0.75	5.04±0.73	U=702.500 p=0.270
Significance	U=-0.238 p=0.812	U=-0.238 p=0.812	-

Abbreviation: BUN, blood urea nitrogen.

with family and close friends, communication with other individuals receiving HD treatment, coping with the situation of separation and loneliness, and information about effective communication and relationships.

Individuals in the experimental and the control group received treatment in the same centres. Therefore, first of all, the control groups' first and second interviews (90 days later) data were collected in order to prevent any effects of the training given to the experimental group on the individuals in the control group. The training process started after the control group was given their second interview. Individuals in the experimental group were given training booklets prepared according to RAM, and they were informed about the contents of the booklet. After that, four main topics, namely the physiological field, the field of self-concept, role function area and mutual commitment were conducted biweekly. After the training was completed, the training was repeated twice for each of the four main topics. The training given by the same researcher was conducted through face to face interviews and were provided in the dialysis centres during the dialysis session. The training took about 30 minutes, was supported with booklets, and included the use of instruction and question and answer techniques. After about three months of one-to-one training, phone calls were held once a month for three months, the training topics were reminded and the patients' questions were answered. Once the predicted 6 months of the training process for behaviour change was completed, the control group patients were also given the same training, considering the ethically justified right of all patients to be fully informed (Figure 1).

Ethical Considerations

Prior to the study, the approval was obtained from Atatürk University Faculty of Health Sciences Ethics Committee (Decision No: 2016/01/03, 18.01.2016), and from the dialysis centres. The purpose of the study was explained, and consent was obtained from the patients.

Data Analysis

Statistical analysis was performed using the SPSS (Statistical Package Programme for the Social Science) 17.0 statistical software package. Data analysis included numbers, percentages, minimum and maximum values, means and standard deviations; normality distribution of the data was identified via kurtosis and skewness coefficients.

Comparison of the demographic features between the experimental and control groups was done using chi-square analysis; comparison of the disease features and experimental and control group first interview scale scores was done using t-test and Mann–Whitney U-test; comparison of the experimental and control group first interview and second interview scale scores was done using t-test and Wilcoxon test. Cronbach's alpha coefficient was calculated for the analysis of internal consistency. Differences were considered significant if the corresponding p-value was <0.05.

RESULTS

The patients' descriptive features are given in Table 1. The experimental and control groups are similar in terms of all variables (p >0.05).

In treatment-related characteristics and fluid control-related clinical variables, the difference between the experimental and control groups was not statistically significant in first and second interviews (p >0.05). As for intra-group comparisons, the interdialytic weight first interview (2.96 ± 1.12) and second interview (2.60 ± 1.06) mean scores in the experimental group displayed a statistically significant difference (p = 0.036) with the interdialytic weight being lower in the second interview (Table 2).

A comparison of the patients' first and second interviews intra-group AIS, total FCSHP, and sub-scale mean scores indicated that the difference between behaviour sub-scale, attitude sub-scale and total FCSHP mean scores of the experimental group was statistically significant (p = 0.000, p = 0.000, p =0.000). The second interview mean scores were found to be higher in all these scales. The difference between experimental group AIS and knowledge sub-scale mean scores was not statistically significant (p >0.05). As for the control group, the difference between AIS, knowledge sub-scale, behaviour sub-scale and total FCSHP first and second interviews mean scores were not statistically significant (p >0.05) (Table 3).Distribution and comparison of patients' second interview intergroup AIS, total FCSHP and sub-scale mean scores showed that the difference between the experimental and control groups in terms of the knowledge sub-scale, behavior sub-scale, attitude sub-scale and total FCSHP mean scores were statistically significant (p = 0.024, p = 0.001, p = 0.027, p = 0.001). All scale mean scores

Table 3. Distribution and Comparison of Patients' intra-group and inter-group AIS, total FCSHP and sub-scales mean scores in First and Second Interviews (N=81)

Variables	Experimental Group (n=42)	Control Group (n=39)	Significance
	Ort ±SS	Ort ±SS	
AIS			
First İnterviews	22.14±5.73	21.49±6.83	U=752.000 p=0.526
Second İnterviews	23.38±6.60	21.72±6.97	t=1.103 p=0.273
Significance	Z=-1.832 p=0.067	Z=-1.342 p=0.180	-
FCSHP Knowledge Sub-scale			
First İnterviews	18.38±3.98	18.54±4.60	U=816.500 p=0.981
Second İnterviews	18.98±0.15	18.49±1.35	U=666.500 p=0.024
Significance	Z=-0.925 p=0.355	Z=-0.068 p=0.946	-
FCSHP Behavior Sub-scale			
First İnterviews	21.81±4.35	23.31±4.05	t=-1.601 p=0.113
Second İnterviews	26.50±4.39	23.21±4.02	t=3.516 p=0.001
Significance	t=-9.486 p=0.000	t=1.670 p=0.103	-
FCSHP Attitude Sub-scale			
First İnterviews	8.29±2.11	8.79±3.06	U=800.000 p=0.855
Second İnterviews	9.83±2.56	8.79±3.06	U=587.500 p=0.027
Significance	Z=-4.344 p=0.000	Z=0.000 p=1.000	-
Total FCSHP			
First İnterviews	48.48±6.54	50.64±7.98	t=-1.340 p=0.184
Second İnterviews	55.31±6.41	50.67±6.23	t=3.300 p=0.001
Significance	t=-8.785 p=0.000	t=-0.034 p=0.973	-

Abbreviations: AIS, acceptance of illness scale; FCSHP, fluid control scale in heamodialysis patients.

were higher in the experimental group. The difference in the AIS mean scores between the experimental and control groups was not statistically significant (p >0.05) (Table 3).

DISCUSSION

Effects of RAM-Based Education on Treatment-Related Characteristics and Fluid Control-Related Clinical Variables

This study reported no significant changes in the treatment-related characteristics and fluid control-related clinical variables between the experimental and control groups. However, interdialytic weight mean scores in the experimental group were found to be statistically significant in the first and second interviews with interdialytic weight being lower in the second interview. This finding suggests that except for interdialytic weight, the RAM-based training did not affect treatment-related characteristics and other fluid control-related clinical variable of patients receiving HD treatment. Other experimental studies show that patients receiving HD treatment displayed a decrease in their interdialytic weight gain after training (18-20). In their study regarding diet/fluid-intake restrictions recommendations and the importance of continuing treatment, Rafiee Vardanjani et al. (21) reported that the post-test experimental and control group laboratory values displayed no significant differences in variables except for the phosphorus value.

Effects of RAM-Based Education on Acceptance of Illness

This study showed that the RAM-based training did not have any effects on the acceptance of illness in patients receiving HD treatment. CKD and HD treatment cause serious changes in patients' lifestyles. As a result, patients are forced to struggle not only with the symptoms of the disease but also changes happening in their quality of life, making acceptance of the illness more difficult (5,22,23). Previous descriptive studies report insufficient acceptance of illness levels of dialysis patients (24,25). By providing patients with the training, consultancy and support services necessary in the treatment process, it can help them regain their autonomy over the treatment processes and make the acceptance of illness easier. Each patient's reaction to a stressful situation could be different, and the duration required for the acceptance of illness could differ from patient to patient (26). As another factor affecting this study, it can be said that the study was carried out in two different cities; because these cities are different in terms of opportunities that make life easier. Opportunities that make life easier may also affect acceptance.

Effects of RAM-Based Education on Adherence to Fluid Control

The RAM-based training increased fluid control adherence levels in the knowledge sub-scale of patients receiving HD treatment. Results of the previous studies which involved health education, dietetics and increased treatment and diet/fluid control adherence reported a significant increase in patients' fluid control knowledge levels (20,27). In the case of a thread, individuals try to obtain information to interpret the case objectively and develop effective coping behaviours. In order for these individuals to cope with uncertainties, it is very important to meet their knowledge needs (28). Increasing patients' knowledge levels about fluid control could eliminate uncertainties and strengthen patients' control mechanisms.

The RAM-based training increased patients' fluid control adherence levels in the behaviour sub-scale. An analysis of the research on this issue indicates that training that mainly aims to increase adherence increased patients' adherence to fluid control (20), but training programmes such as nutrition (27) and behavioural self-regulation interventions (29) did not show notable improvement in adherence to fluid control. Problems caused by excessive interdialytic fluid-intake could be prevented by developing fluid control adherence behaviours in patients receiving HD treatment.

The RAM-based training increased patients' fluid control adherence levels in the attitude sub-scale. Health training given to the patients receiving HD treatment (27) show training that aimed to increase diet/fluid-intake adherence through face-to-face or video-based training (30) increased patients' fluid-intake adherence attitude levels.

The RAM-based training was found to generally increase fluid control adherence of the patients receiving HD treatment. As a result of numerous previously conducted studies, educational practices and psychological interventions were found to increase fluid control adherence levels in patients receiving HD treatment (18,19,31). Fluid control adherence levels in patients receiving HD treatment were found to increase in the experimental studies which investigated training about diet/fluid-intake adherence (32), and trainig about the importance of maintaining diet/fluid-intake restrictions recommendations (21). Results of the present study are aligned with the literature. It is believed that RAM-based training given to the patients receiving HD treatment could increase their fluid control adherence levels and thus the quality of life by decreasing the number of experienced symptoms. HD nurses can provide important benefits, especially for patients with compliance problems with the applications they will perform on the basis of RAM. This study was carried out in two different cities due to patient insufficiency. Different cities mean different opportunities and different lifestyles. In this sense, it will be beneficial to provide special training for patients' facilities and lifestyles in order to obtain more effective results.

Limitations of The Study

The limitation of this study is that the study was carried out in two different cities since a sufficient number of patients could not be reached.

CONCLUSION

This study found that except for interdialytic weight, the RAM-based training conducted in four different areas did not have any effects on HD patients' treatment-related characteristics, fluid control-related clinical variables and acceptance of illness levels; however, it increased fluid control. While fluid control mainly requires adherence to the physical domain, it also requires adherence to the acceptance of illness, self-concept, role function and interdependence domains; adherence to these areas is more difficult than the adherence to the physiological areas, requiring more time and special training in line with patients' needs. Therefore, factors affecting acceptance of illness levels should be identified in patients receiving HD treatment, and training should be organised based on the needs of individuals or groups.

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