Original Article

The Effects of Peer Education on Treatment Adherence among Patients Receiving Hemodialysis: A Randomized Controlled Trial

Alireza Irajpour[1], Maryam Sadat Hashemi[1], Parvaneh Abazari[2,3], Shahrazad Shahidi[4]

[1]Nursing and Midwifery Care Research Center, Department of Critical Care, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Nursing and Midwifery Care Research Center, Department of Medical Surgical Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran, [3]Nursing and Midwifery Sciences Development Research Center, Najafabad Islamic Azad University, Najafabad, Iran, [4]Isfahan Kidney Diseases Research Center, Internal Medicine Department, Khorshid Hospital, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Non-adherence to treatments increases the rates of hemodialysis complications, hospitalization, and mortality. One strategy for adherence improvement is peer education. This study aimed to investigate the effects of peer education on treatment adherence among patients receiving hemodialysis. **Materials and Methods:** This was a randomized controlled trial. Patients in the control group were provided just with routine care, and the intervention group received peer education. Treatment adherence was assessed both before and after the intervention via the End-Stage Renal Disease (ESRD) Adherence Questionnaire. Data analysis was conducted by the Chi-square, the Mann-Whitney U, the paired-sample *t*, and the independent-sample *t* tests. **Results:** There were no significant between-group differences in terms of the pre-test mean scores of Adherence to regular attendance at hemodialysis sessions ($t = 0.19$, $p = 0.85$), Adherence to the prescribed medications ($t = 0.46$, $p = 0.64$), and Adherence to fluid restrictions ($t = 0.24$, $p = 0.81$). The same finding was observed after the intervention, except for the mean score of the adherence to fluid restrictions dimension which was significantly greater in the intervention group ($t = 2.86$, $p = 0.006$). Moreover, no significant changes were observed in the mean scores of treatment adherence dimensions in the control group. However, in the intervention group, the mean scores of the adherence to regular attendance at hemodialysis sessions ($t = 3.79$, $p < 0.001$) and the adherence to fluid restrictions dimensions were significantly greater than their pre-test values ($t = 4.47$, $p < 0.001$). **Conclusions:** Education by peer groups improves the compliance of patients with regard to the consumption of fluids in the interval between two dialysis sessions.

Keywords: *Adherence, peer, renal dialysis*

Introduction

According to the World Health Organization, treatment adherence is the corresponding level of a person receiving medication, following a prescriptive diet, or implementing lifestyle changes due to healthcare providers' recommendations. Adherence to hemodialysis for patients is essential and leads to lifestyle changes such as the need to regularly go to a dialysis center, consistently take prescribed medications, and extensively modify their diets.[1] Non-adherence to each of these self-management tasks has associated risks independently. For example, patients who are not limiting their fluids are at risk for fluid overload. Fluid overload can cause a number of adverse effects, including coughing, edema, congestive heart failure, chest pain, and shortness of breath. Further, there is a limit to the amount of fluid that can be safely removed in one treatment. Removing higher volumes of fluid during treatment can put patients at risk of serious side effects, such as hypotension, cramping, nausea, headache, and cardiac complications or death.[2]

Moreover, non-adherence to fluid restriction causes excessive weight gain between hemodialysis sessions and, therefore, necessitates greater fluid removal in each hemodialysis session. As the length of each hemodialysis session is about 3–4 hours, the removal of a larger amount of fluids in a session necessitates rapid fluid removal, which in turn is associated with hemodialysis complications such as hypotension, muscle cramps, headache, nausea, and vomiting.[3] The occurrence of such complications may require premature hemodialysis termination. Such termination prevents patients from reaching the optimum dry weight and causes fluid accumulation

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Address for correspondence:
Dr. Maryam Sadat Hashemi, Nursing and Midwifery Care Research Center, Department of Critical Care, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: maryamhashemi956@gmail.com

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in the body, hypertension, ventricular hypertrophy, chronic heart failure, reduced coronary blood flow, myocardial ischemia and necrosis, arrhythmias, reduced quality of life, and increased mortality rate. Therefore, close adherence to fluid restrictions and weight management are of critical importance to the health and well-being of hemodialysis patients.[2]

Appropriate medication use is another significant factor behind treatment success among patients with chronic renal failure. End-Stage Renal Disease (ESRD) patients are estimated to take eight to twelve prescribed medications per day requiring an average of 17–25 doses per day. However, some people might take up to 15–20 drugs. Medications are taken for a wide range of conditions and depend on the individual patient but frequently include drugs for anemia, managing phosphorus levels, and treating bone disease, hypercholesterolemia, endocrine disorders, thrombosis, mental problems, sleep disorders, restless leg syndrome, gastrointestinal disorders, osteoporosis, itching, diabetes mellitus, hypertension, and frequent infections and calcifications. The management of co-morbid illnesses like diabetes and/or hypertension may also need the use of medication. Bone disease, anemia, cardiovascular problems, and hypertension are just a few of the ailments that can get worse if they don't follow the prescription regimen.[4]

Studies show that most hemodialysis patients have limited adherence to their treatment and dietary regimens and hence are at increased risk for hemodialysis complications and death.[5]

Patient education materials provided by dialysis organizations do not increase patient self-efficacy or engagement with self-management as these documents contain complex medical jargon and provide only general guidelines, not patient-specific instruction. A multi-dimensional program including novel, scalable strategies that can provide needed social support to improve patients' self-efficacy and self-management is critically needed.[6]

Peer education is among the strategies for promoting treatment adherence among patients with chronic conditions. Social cognitive theory provides a framework for understanding how peer mentoring may be a successful intervention for self-management in chronic disease, specifically amongst patients receiving in-center hemodialysis treatments. Social cognitive theory is one of the most widely used models of health behavior and has been used in multiple settings, including the clinical setting for self-management of chronic disease. Social cognitive theory, an interpersonal level health behavior theory developed by Bandura, is both an explanatory and change theory in that it provides a means to understand the problem of chronic disease self-management (e.g., lack of self-efficacy) but also suggests strategies to address the problem (e.g. social support and role models).[7]

Social cognitive theory suggests that learning occurs dynamically in the social context and is a result of the interaction of environmental factors, behavioral factors, and personal factors. The interaction between these factors is known as triadic reciprocal causation or reciprocal determinism. The environment, behavior (s), and personal factors interact and influence each other. Personal factors are the individual's ability to determine his actions based on self-determination or self-regulation and analysis of experience. Self-efficacy and knowledge influence personal factors. Environmental factors can support or discourage health behaviors and may be real or perceived. Environmental influences include observational learning or role-modeling and social support. Behavioral factors are those things that affect health directly, either by promoting health or compromising it. Knowledge and skills, also referred to as behavioral capability, influence behavior. Social cognitive theory posits that these factors are dynamically linked and that changes in any one influence and change the others.[8]

Based on Heisler's model as well as social cognitive theory, it is hypothesized that peer mentoring will increase perceived social support and knowledge, thereby increasing self-efficacy and improving self-management behaviors and health-related quality of life.[9]

In peer education, a group of patients with a certain health status share their lived experiences with other patients with the same condition and emotionally support each other. Some studies reported the effectiveness of peer education in promoting treatment adherence among patients with acquired immunodeficiency syndrome,[10-12] depression,[13] schizophrenia,[14] and bipolar disorders.[15,16] However, some other studies showed the insignificant effects of peer education on patient outcomes.[17,18] Moreover, there is a paucity of studies on the effectiveness of peer education on hemodialysis patients' treatment adherence. This study aimed to investigate the effects of peer education on treatment adherence among patients receiving hemodialysis.

Materials and Methods

This study was part of a Ph.D. dissertation in nursing in Isfahan University of Medical Sciences. This part was a randomized controlled trial. This trial has been registered with the code IRCT20171212037847N1 in the Iranian Clinical Trials System. The study setting was Noor and Hazrat-e Ali Asghar teaching hospital, Isfahan, Iran. The population of the study consisted of all 130 patients with chronic renal failure who regularly attended to receive hemodialysis. The sampling was done from July to September 2020 with a confidence level of 95% and a power of 80%; the sample estimation showed that at least 32 patients were needed for each group. The sample size estimation formula was $n = [(Z_1+Z_2)^2(2S^2)]/d^2$, where Z_1 was the z-score of a confidence level of 95% (=1.96), Z_2 was the z-score of a power of 80% (=0.84), S was the

standard deviation of treatment adherence in each group, and *d* was the minimum significant difference between the groups in terms of treatment adherence which was set at 0.7 of *S* in this study. As some patients might withdraw from the study, we increased the sample size to 38.

Patients were included in the study if they were receiving hemodialysis for at least 3 months and had no cognitive problems or memory impairments participation in peer education programs.[19] Exclusion criteria were voluntary withdrawal from the study, incomplete answer to study data collection tools, or hospitalization or kidney transplantation during the study. Among all 130 patients who were referred to the setting for hemodialysis, 27 did not meet inclusion criteria and 18 refused participation. Therefore, 85 patients were eligible for the study; from them, a random sample of 76 patients was selected. In the present study, the socio-economic level of the patients in different hemodialysis centers of Isfahan was different, and this variable was evaluated as confounding. Thus, the patients of the intervention and control groups were selected from one center (Hemodialysis Center of Noor and Hazrat Ali Asghar Hospital (Khorshid)). In order to prevent the dissemination of information, the patients of both the groups were selected from the list of even and odd day patients. The patients undergoing hemodialysis go to the hemodialysis unit 3 times a week. Some patients underwent hemodialysis on even days (Saturday, Monday, and Wednesday) and some others on odd days (Sunday, Tuesday, and Thursday). Therefore, the patients were not in contact with each other, and no information was transferred between them.

The patients of even and odd days were allocated to the intervention and control groups using a coin toss. Thus, a person who was not part of the research team tossed a coin; if heads were up, the patients of the even days would be placed in the intervention group, and if tails were up, the patients of the odd days would be placed in the intervention group. After coin tossing, heads were up and, thus, the patients undergoing hemodialysis on even days (Saturday, Monday, and Wednesday) were included in the intervention group and the patients undergoing hemodialysis on odd days (Sunday, Tuesday, and Thursday) were included in the control group.

Then, a list of even and odd day patients was prepared and the patients of these groups were randomly selected by a person who was not part of the research team by shuffling the cards. In order to randomly select the patients, the names of the patients were written on the cards; then, the cards were mixed with each other and one card was taken out and its allocation was recorded and that card was returned to the other cards. The cards were mixed again and another card was taken out. This process continued until reaching a random sequence according to the sample size (38 subjects in each).

Blinding and concealment of random allocation were not applicable in this study. In order to prevent information dissemination, the patients of the intervention and control groups were selected from the list of even and odd day patients. The patients undergoing hemodialysis go to the hemodialysis unit 3 times a week. Some patients underwent hemodialysis on even days (Saturday, Monday, and Wednesday) and some others on odd days (Sunday, Tuesday, and Thursday). Therefore, the patients were not in contact with each other, and no information was transferred between them.

Patients in the control group were provided with just routine care measures, while their counterparts in the intervention group also received peer education. Several patients were initially selected as mentors to provide peer education to other patients in the intervention group. Selection criteria for mentors were close treatment adherence and good self-management as determined by the head nurse, staff nurses, and nephrologists in the study setting. The peer mentors were trained by the researcher according to the educational needs of dialysis patients, based on a review of the literature.

Before the heads of the groups began to train other patients, educational workshops were held for them by the research team (corresponding author) Khurshid in Hospital to improve their knowledge and information. The group heads received 8 sessions (12 hours) of training. Training sessions of the group heads were held three times a week (each session lasted for 1.5 hours) in the morning after the dialysis of them. In order to consolidate the information, training packages (including training manuals and workshop CDs) were provided to the group heads.

The contents of the educational materials that were taught to the group leaders were as follows: the first session, familiarizing the group leaders with their duties and how to encourage other patients to self-manage and share their information and experiences; the second session, how to communicate effectively; the third session, the diet of patients undergoing hemodialysis treatment; the fourth session, vascular access care; the fifth session, self-care in kidney transplant; the sixth session, self-care in the use of drugs; the seventh session, stress management techniques; and the eighth session, strategies for improving adaptation skills. The titles of the topics that were taught in this workshop, were in order to prepare the heads of groups, for the support of peers. Upon successful completion of the training, each peer mentor receives a certificate as a certified mentor. Recognizing the importance of continuing education following the initial training, refresher courses were conducted on a quarterly basis. These sessions featured discussions among mentors about their current experiences and a focused review of communication skills.

After patients in the intervention group were grouped to form five six-person and two four-person small groups. Each

mentor was allocated to one group to hold group discussions among group members and provide them with education about dietary regimens, medications, vascular access routes for hemodialysis, care measures before and after kidney transplant, and coping strategies [Table 1]. Mentors supervised groups and encouraged group members to participate in group discussions and share their information and experiences. All members of each group, including its mentor, were almost homogenous in terms of their gender, age, marital status, income level, educational level, hemodialysis protocol, and hemodialysis day. Peer education sessions were held twice weekly for 8 weeks, resulting in 16 sessions in total. Each session lasted around 2 hours.

The primary outcome in this study was treatment adherence, which was assessed both before and after the intervention via the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ). This questionnaire was developed in 2009 by Kim *et al*. The first section pursues general information about patients' ESRD and RRT-related history (5 items), and the remaining four sections ask about treatment adherence to HD treatment (14 items), medications (9 items), fluid restrictions (10 items), and diet recommendations (8 items). These four final sections directly measure adherence behaviors (14, 17, 18, 26, 31, and 46) and patients' knowledge and perceptions about treatment (11, 12, 22, 23, 32, 33, 41, and 42). Responses to the ESRD-AQ utilize a combination of Likert scales and multiple choice as well as a 'yes/no answer format [Table 2].

Most items are scored on a five-point Likert-type scale, and some items are weighed according to their clinical importance.[20] Kim *et al*. reported great validity and reliability for the questionnaire with test-test intra-class correlation coefficients of 0.83[21] Borji *et al*.[22] also reported the acceptable validity and reliability of the Persian translation of the questionnaire with a test-retest correlation coefficient of 85%.

Table 1: The topics that were taught to the team members by the group leaders

Description of the meeting	The topic of the meeting
The diet of patients undergoing hemodialysis treatment	Appropriate diet for kidney failure patients
Vascular access care	Discussion about the care of fistula, graft, and PC* , how to take care of vascular access
Self-care in kidney transplantation	Pre- and post-transplant care
	Suitable diet for kidney transplant patients
	How to prevent transplant rejection
	Medicines used by kidney transplant patients for self-care in fifth kidney transplant
Self-care in the use of drugs	Self-care in the use of drugs used by patients (Venofer, Eprex, Rena Gel, and blood pressure control drugs)
Stress management techniques	The stress management techniques
Improving adaptation skills	How to adapt to the disease

Pc: Permcath

Data analysis in this study was conducted using the SPSS software (v. 16.0). The groups were compared with each other respecting marital and employment status via the Chi-square test and respecting educational status and income level via the Mann-Whitney U test. Moreover, within- and between-group comparisons respecting treatment adherence mean scores were done via the paired- and independent-sample tests, respectively. *p* values were considered statistically significant if they were less than 0.05.

Ethical considerations

This article is extracted from the nursing doctoral thesis .In this study, a sequential exploratory mixed approach (qualitative-quantitative) was used. The qualitative phase of the study was conducted from 2015 to 2017. In the first phase of the research, a descriptive qualitative study was conducted in which semi-structured in-depth interviews were conducted with 35 patients undergoing hemodialysis treatment, patient family members, and health team members. One of the parts of the intervention program proposed by the panel of experts in quantitative phase was the training of patients by peer groups, which was registered on the IRCT system in 2017, and due to the conditions of the covid, it was not possible to implement and implement the work in 2019-2020..Our participants could voluntarily participate in or withdraw from the study. Written informed consent was obtained from each patient who agreed to participate in the study.

Results

Thirty-eight patients were recruited for each study group. During the study, four patients from the control group voluntarily withdrew from the study and one was hospitalized. In addition, three patients from the intervention group voluntarily withdrew from the study, one patient received a kidney transplant, and two patients incompletely filled out the study questionnaire. Thus, five patients from the control group and six from the intervention group were excluded. Finally, 33 patients in the control group and 32 in the intervention group completed the study [Figure 1].

Patients in both groups were mostly married and unemployed and had a below-diploma education. Statistical analyses indicated no significant differences between the groups in terms of patients' demographic characteristics. An independent *t*-test was used to confirm the similarity of quantitative demographic characteristics (age and duration of hemodialysis treatment) in the two groups. The Chi-score test was used for qualitative variables (gender,

Table 2: Scoring of end-Stage Renal Disease Adherence Questionnaire (ESRD-AQ)

Section Name	Question Numbers	Targeted Area in the Item	To Recorded Value of (Points)
Section 1: General Information (5 items)	1, 2, and 3	Fact related to previous Renal Replacement Therapy (RRT) history	No value
	4 and 5	Fact related to transportation situation to get HD	No value
Section 2: HD* Treatment (14 items)	6 and 7	act related to HD schedule	No value
	8	Perception of patients on HD schedule	No value
	9 and 10	Information about counseling on HD	No value
	11	Perception on importance of HD adherence	No value Analyze responses using descriptive statistics
	12	Understanding level on importance of HD	No value Analyze responses using descriptive statistics
	13	Perception of patients on HD	No value
	14	Frequency of missing HD during last month	Response category 1→300 Response category 2→200 Response category 3→100 Response category 4→50 Response category 5→0
	15	Reason for missing HD	No value (Note: If patients missed HD due to medical reasons (if the answer is 4, 6, or 7), adjust scores from question number 14 and give a full credit (300 points)
	16	Supplementary question for Question 15 (psychophysical symptoms)	No value
	17	Frequency of shortening HD during last month	Response category 1→200 Response category 2→150 Response category 3→100 Response category 4→50 Response category 5→0
	18	Duration of shortening HD during last month	Response category 1→100 Response category 2→75 Response category 3→50 Response category 4→25 Response category 5→0
	19	Reason for shortening HD treatment	No value (Note: If patients shortened HD due to medical reasons (if the answer is 2, 5, 6 or 11), adjust scores from question number 17 & 18 and give a full credit (200 and 100 points)
Section 3: Medication (9 items)	20 and 21	Information about counseling on medication	No value
	22	Perception on importance of medication adherence	No value Analyze responses using descriptive statistics
	23	Understanding level on importance of medication	No value Analyze responses using descriptive statistics
	24 and 25	Fact related to difficulty with taking medicines	No value
	26	Frequency of missing medication during last month	Response category 1→200 Response category 2→150 Response category 3→100 Response category 4→50 Response category 5→0
	27	Reason for missing medication	No value (Note: If patients missed medication due to medical reasons (if the answer is 6 or 7) adjust scores from the question number 26 and give a full credit (200 points).
	28	Supplementary question for Question 27 (psychophysical symptoms)	No value

Contd...

Table 2: Contd...

Section Name	Question Numbers	Targeted Area in the Item	To Recorded Value of (Points)
Section 4: Fluid Restriction (10 items)	29 and 30	Information about counseling on fluid restriction	No value
	31	Fluid restriction: Self-monitoring (Frequency)	Response category 1→200 Response category 2→150 Response category 3→100 Response category 4→50 Response category 5→0
	32	Perception on importance of fluid restriction	No value Analyze responses using descriptive statistics
	33	Understanding level on importance of fluid restriction	No value Analyze responses using descriptive statistics
	34 and 35	Fact related difficulty with limiting fluid intake	No value
	36	Types of difficulty following fluid restriction (additional question to #35)	No value
	37 and 38	Information on weighing at home (not mandatory requirements for all ESRD** patients)	No value
Section 5: Dietary Restriction (8 items)	39 and 40	Information about counseling on dietary recommendations	No value
	41	Perception on importance of dietary recommendations	No value Analyze responses using descriptive statistics
	42	Understanding level on importance of dietary recommendations	No value Analyze responses using descriptive statistics
	43 and 44	Fact related to difficulty with following dietary recommendations	No value
	45	Types of difficulty following fluid Restriction (Additional question to #44)	No value
	46	Dietary restriction: Self-monitoring (Frequency)	Response category 1→200 Response category 2→150 Response category 3→100 Response category 4→50 Response category 5→0

*HD: Hemodialysis. **ESRD: End-Stage Renal Disease

education level, and income). In order to compare the mean treatment compliance score of patients before and after the intervention in the intervention group, paired *t*-test was used. To compare the mean compliance score of the patients before and after the intervention in the control group, a paired *t*-test was used. An independent *t*-test was used to compare the average score of treatment adherence of patients in the control and intervention groups before the intervention. An independent *t*-test was used to compare the average score of treatment adherence of patients in the control and intervention groups after the intervention ($p > 0.05$; Table 3).

There were no significant between-group differences in terms of the pre-test mean scores of Adherence to regular attendance at hemodialysis sessions ($t = 0.19$, $p = 0.85$), Adherence to the prescribed medications ($t = 0.46$, $p = 0.64$), Adherence to fluid restrictions ($t = 0.24$, $p = 0.81$). The same finding was observed after the intervention, except for the mean score of the adherence to fluid restrictions dimension which was significantly greater in the intervention group ($t = 2.86$, $p = 0.006$). Moreover, no significant changes were observed in the mean scores of treatment adherence dimensions in the control group. However, in the intervention group, the mean scores of the adherence to regular attendance at hemodialysis sessions ($t = 3.79$, $p < 0.001$) and the adherence to fluid restrictions dimensions were significantly greater than their pre-test values ($t = 4.47$, $p < 0.001$) [Table 4].

Discussion

This clinical trial aimed to investigate the effects of peer education on treatment adherence among patients receiving hemodialysis. The results of the study illustrated that peer education significantly improved adherence to regular attendance at hemodialysis sessions and adherence to fluid restrictions but had no significant effects on adherence to the prescribed medications and adherence to dietary restrictions. Adherence to regular attendance at

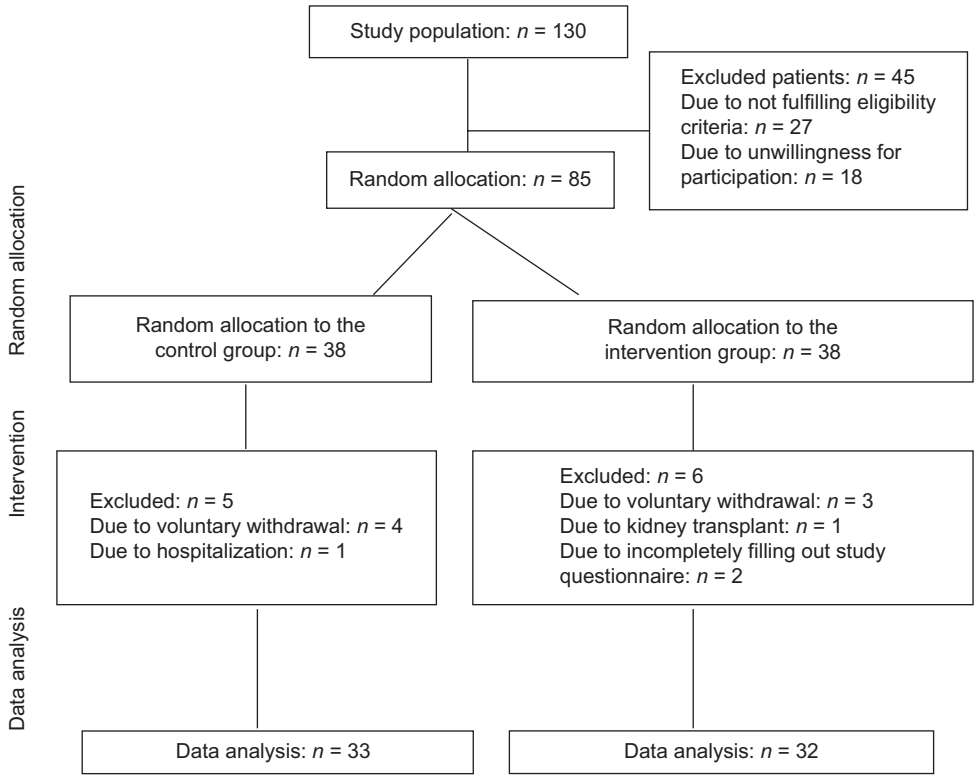

Figure 1: The flow of participants in the study

Table 3: Participants' demographic characteristics

Group Characteristics		Intervention	Control	χ^2	*p*
Marital status	Single	4 (12.50%)	6 (18.18%)	2.13*	0.55
	Married	25 (78.10%)	25 (75.75%)		
	Widowed	1 (3.10%)	1 (3.03%)		
	Divorced	2 (6.30%)	1 (3.03%)		
Employment status	Employed	4 (12.50%)	7 (21.21%)	1.06*	0.79
	Unemployed	17 (53.10%)	16 (48.48%)		
	Disabled	6 (18.80%)	6 (18.18%)		
	Retired	5 (15.60%)	4 (12.21%)		
Educational status	Illiterate	4 (12.50%)	6 (18.18%)	0.009**	0.99
	Below diploma	25 (78.10%)	22 (66.66%)		
	Associate and bachelor's	3 (9.40%)	4 (12.21%)		
	Master's and higher	0 (0%)	1 (3.03%)		
Income level	Adequate	16 (50%)	17 (51.51%)	0**	1
	Inadequate	16 (50%)	16 (48.48%)		

* Chi square, **Mann-Whitney U

hemodialysis sessions and adherence to fluid restrictions are dimensions on which patients have greater control and hence, can significantly be improved through enhancing their knowledge, perceived social support, and self-efficacy. However, adherence to dietary restrictions and adherence to prescribed medications are more complicated and are determined not only by patients' personal characteristics but also by family members; therefore, their improvement may need long-term multi-component interventions which actively involve family members in patient care.

According to Bandura's Social Learning Theory, learning is the result of interactions among people, the environment, and society.[23] Self-efficacy is the most important factor behind chronically ill patients' self-management. It is defined as individuals' beliefs in their own abilities to control their actions, functions, and life events.[24] Bandura's theory holds that people can learn how to modify their lifestyle by observing the behaviors of a role model. They usually model themselves on individuals who are similar to them in age, gender, race, ethnicity, and socioeconomic

Table 4: Within- and between-group comparisons regarding the mean (SD) scores of treatment adherence dimensions

Group Dimensions		Intervention Mean (SD)	Control Mean (SD)	Independent-sample *t* test	*p***
Adherence to regular attendance at hemodialysis sessions	Before	66.14 (17.10)	66.94 (15.44)	0.19	0.85
	After	71.91 (16.01)	66.94 (16.05)	1.23	0.22
	paired-sample *t* test	3.79	1.36		
	*p**	0.001	1	0.46	0.64
Adherence to the prescribed medications	Before	45.99 (8.93)	46.78 (3.58)	0.47	0.64
	After	46.72 (8.59)	45.94 (3.78)		
	paired-sample *t* test	0.61	1.81		
	*p**	0.55	0.08		
Adherence to fluid restrictions	Before	47 (10.78)	47.55 (6.81)	0.24	0.81
	After	51.90 (8.88)	46.65 (5.31)	2.86	0.006
	paired-sample *t* test	4.47	1.35		
	*p**	0.001	0.19		
Adherence to dietary restrictions	Before	47.91 (9.31)	47.35 (1.91)	0.32	0.75
	After	47.88 (6.96)	46.44 (2.71)	1.82	0.08
	paired-sample *t* test	0.22	1.68		
	*p**	0.83	0.10		

*Paired-sample *t* test. **Independent-sample *t* test

status. This modeling helps them accept that they can do a certain activity because a person like them is doing that. Such acceptance improves their self-efficacy. Accordingly, when patients see that another patient with the same conditions can do self-care activities, they may feel greater self-efficacy in doing the same activities and, therefore, may show closer adherence to treatments.[19] Consistent with our findings, a study shows that self-efficacy training based on Bandura's Self-Efficacy Theory significantly improved adherence to fluid restrictions among hemodialysis patients.[25]

Perceived social support is another factor behind treatment adherence. Studies show that inadequate perceived social support is among the most significant predictors of poor treatment adherence.[26] Perceived social support has significant roles in diminishing the negative effects and psychological strains associated with diseases. It is also a facilitator of patients' engagement in health-related behaviors and self-care activities.[27] Accordingly, peers' emotional support for each other reduces their sense of social isolation, strengthens their perceived social support, and thereby, improves their self-efficacy and self-management.[19]

The results of this study also showed that peer education had no significant effects on hemodialysis patients' adherence to dietary restrictions. An explanation for this result may be the fact that adherence to dietary restrictions necessitates family members' collaboration with hemodialysis patients on making proper diet foods. Previous studies also reported the significant role of family support in hemodialysis patients' adherence to dietary regimens.[28] Yet, most hemodialysis patients are concerned about their family members' inadequate support. The family members of these patients usually suffer from different tensions due to the long-term course of chronic renal failure, hemodialysis-related complications, and the need for major lifestyle modifications. Therefore, they may gradually become unable to support their ill members. The resultant lack of family support can negatively affect hemodialysis patients' treatment adherence.[29,30]

Another result of this study was the insignificant effect of peer education on hemodialysis patients' adherence to the prescribed medications. Similarly, Kosse *et al*. found the ineffectiveness of MP3 messaging and peer support on adherence to corticosteroid therapy among patients with asthma. They noted that peer support would have no significant effects on self-efficacy when patients are experiencing denial or invulnerability. Therefore, these patients initially need behavioral therapy.[31] Another study also reported the insignificant effects of peer monitoring on self-efficacy and satisfaction with perceived social support. Of course, the results of that study should be used cautiously due to its small sample size.[31] It is noteworthy that treatment adherence is a multifactorial phenomenon which is affected by numerous factors such as lack of knowledge, forgetfulness in taking medications[32] healthcare providers' interactions with patients,[33] stress, anxiety, depression,[34] side effects of medications, and the taste of medications.[35,36] However, in contradiction to our results, most previous studies reported that peer support significantly improved medication adherence among patients with acquired immunodeficiency syndrome,[37] tuberculosis,[38] and schizophrenia.[14] This contradiction may be due to the more complex treatment regimens of chronic renal failure compared with acquired immunodeficiency syndrome, tuberculosis, and schizophrenia. Patients with chronic renal failure use a wide range of medications for the management

of diabetes mellitus, hypertension, hypercholesterolemia, and hemodialysis-related complications. More than 25% of these patients need to take at least 25 medications each day. Such polypharmacy can considerably affect their adherence to medications.[26] Another factor behind the ineffectiveness of our intervention in improving medication adherence may be low family support. A study showed that peer education was effective in improving medication adherence only among those patients who had adequate family support.[39]

The lack of long-term follow-up of the study in the form of longitudinal studies was the limitation of the study. Given time limitations, the effect of peer education on treatment compliance was examined 8 weeks after the intervention; however, a long-term study of these variables over a longer period of time could have provided researchers with more accurate information.

Currently, many hemodialysis patients have fluid overload and do not follow the fluid intake restrictions, which increases their complications during dialysis (hypotension during dialysis, muscle cramps, cardiac arrest), hypertension, left ventricular hypertrophy, heart failure, and increased mortality of patients. Peer group training can improve the adherence of patients to treatment.

Conclusion

The results of this study demonstrate that peer education can significantly improve hemodialysis patients' adherence to attendance at hemodialysis sessions and adherence to fluid restrictions. Peer education is a simple and inexpensive experience-based approach and, therefore, is recommended to improve treatment adherence among patients with chronic illnesses.

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Conflicts of interest

Nothing to declare.

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