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The Effect of Progressive Muscle Relaxation Technique on Fatigue, Pain and Quality of Life in Dialysis Patients: A Clinical Trial Study

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Abstract

Background: Fatigue and pain are of the most common symptoms in dialysis patients affecting their quality of life (QoL). One of the methods to reduce pain and fatigue is the use of complementary therapies.

Aim: This study was performed aimed to determine the impact of progressive muscle relaxation on fatigue, pain and QoL of dialysis patients.

Method: This clinical trial study was performed on 60 patients undergoing dialysis in Zahedan, Iran, 2021. The subjects were randomly assigned to the intervention and control groups (n=30 in each group). Data collection tools included a demographic form, Fatigue Severity Scale (FSS), pain visual scale, dialysis quality of life questionnaire (KDQOL-SF), and a self-control checklist. In the intervention group, a progressive muscular relaxation was done in three training sessions for an hour by the researcher. The intervention group was asked to perform relaxation technique at home twice a day for 12 weeks. The control group received no intervention. Data were analyzed by SPSS (version 21). $P<0.05$ was considered statistically significant.

Results: The mean scores of fatigue, pain, QoL and its dimensions showed no significant difference between the two groups before the intervention ($P>0.05$). However, three months after progressive muscle relaxation technique, the two groups were significantly different in terms of the mean scores of fatigue, pain, and QoL ($P<0.05$).

Implications for Practice: The implementation of the relaxation technique reduces fatigue and pain and develops QoL of dialysis patients. Progressive muscle relaxation technique is recommended to be used as an intervention in nursing care.

Keywords: Dialysis, Fatigue, Pain, Progressive muscle relaxation technique, Quality of life

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Introduction

Chronic renal failure (CRF) is a major health problems and is one of the important causes of mortality and disability worldwide (1). CRF is a progressive and irreversible destruction of renal function in which the body's ability is lost to maintain metabolism and water balance and electrolyte which is caused by uremia (2). Statistics show that more than 20 million adults in the United States suffer from CRF (3). In Iran, the number of infected patients is reported to be more than 33,000 that 4,000 cases are added to this number annually (4). Among the common treatment methods of this disease, hemodialysis, peritoneal dialysis and kidney transplantation (5), hemodialysis is the most common way of treating this disease in 92% of patients, which is performed three times weekly each time for 4 hours (4). Almost 1 million people in the world undergo hemodialysis, and more than 500,000 people in America use dialysis (5).

According to statistics, 29,200 people in Iran were treated by hemodialysis up to 2016 (6) and based on the statistics of the Association of Renal Patients, about 40 to 50,000 dialysis patients live in the country (7) that the patients undergoing treatment with hemodialysis increased as 15% in Iran (6). Although dialysis is one of the main methods of controlling this disease, it has a variety of complications such as paleness, growth disorder, urinary disorder, frequent urinary tract infection, anorexia, idiopathic vomiting, mood disorders and fatigue. Fatigue is one of early complications and common complaints in dialysis patients (8,9). Fatigue is a concept that has different definitions and perceptions, some mention it as fondness or disability and an unpleasant feeling and mental complaints of boredom, which is associated with a lack of energy and weakness and aversion (10). Some other describe fatigue as a mental concept as a spectrum that on one side is physical fatigue and on the other side is fatigue (10). Almost, 60% to 90% of dialysis patients suffer from fatigue. By reducing power and hatred, it reduces the efficiency (11). Another common complication of dialysis is pain (12). According to the International Association of pain study, it is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (13). However, 54% of hemodialysis patients suffer from such muscle cramps, headaches, bone pain due to stereodystrophy and joint pain are the most common causes of pain in hemodialysis patients (12). Fatigue and pain in dialysis patients lead to decreased QOL (11,12).

Studies show that QOL in dialysis patients is lower than other chronic patients (14). The QOL is a widespread concept and a combination of understanding the individuals' physical, psychological, independence, social relationship and interaction with the environment, beliefs and personal values. QOL is related to health (15). Studies in Iran have reported low QOL of hemodialysis patients (15,16). Decreased QOL in hemodialysis patients may affect the various dimensions of their life and reduce their ability to carry out routine activities (15). Also, low QOL causes depression, social isolation, reduced daily activities, dependence and increase the economic burden (14). Changes in the QOL of patients with chronic renal failure also cause changes in their job, family and social status (17).

Therefore, fatigue and pain management is an effective step to improve clinical outcomes and reduce complications of hemodialysis patients. Pharmacological and non-pharmacological interventions are used for fatigue and pain management. Most patients still suffer from fatigue and pain despite drug use. Today, much emphasis has been placed on the use of non-drug and complementary therapies in health systems (15). Complementary medicine methods often have few side effects and risks and can be used alone or along with other methods (1). Complementary therapies are comprehensive in nature and are used for the patient's physical and mental comfort (16).

The Progressive muscle relaxation technique (PMRT) is one of the non-pharmacological methods, which was introduced and used in 1983 by Edmond Jacobson. This technique is one of the nursing interventions, which has a positive and long effect on headaches, stress and chemotherapy complications. The lack of special equipment and the possibility of easy implementation by patients led to its use be increased (18). This technique requires active patient's involvement in a care and treatment plan (19). In addition, relaxation of coping techniques can increase the ability of the individual to cope with situations such as a consequence or complications of treatment (1).

Nurses are successful in using this technique for various reasons, non-invasive, and well-trained by nurses (19). Also, learning this technique is easy and has no cost for the patient, which is why the patients are encouraged to use it (18). Studies in Iran have reported that PMRT can reduce fatigue and pain and improve QOL in patients (18,8,12). Another study in Turkey reported that PRE can improve the QOL of dialysis patients and manage fatigue and pain (1). Review of the literature showed that

there is a lack of study in socio-cultural context of Sistan and Baluchestan, Iran; therefore, this study was performed aimed to determine the effects of progressive muscle relaxation technique on fatigue, pain and quality of life in dialysis patients.

Methods

This randomized controlled clinical trial study was conducted on 60 patients referring to the dialysis ward of Ali-ibn-Abi-Talib and Khatam-al-Anbia hospitals of Zahedan University of Medical Sciences, Zahedan, Iran, during April to November 2021. The research population included all patients aged >18 years, performed dialysis 2 to 3 times a week, the ability to access and control the patient during the study, having a mobile phone in person or family or a landline in place, a minimum literacy, at least 6 months passed of the first dialysis, the absence of functional disability (musculoskeletal), and no mental illness. The technique was performed at home by the patient and in the hospital.

The sample size was estimated as 12 participants in each group using the formula of "the average score of total QoL" with 95% confidence interval and α=0.05 based on the study performed by Basiri Moghadam et al. (18). Finally, 30 samples were recruited in each group to guarantee the adequacy of the sample size and possible attrition. The patients were chosen using the convenience sampling method and then randomized into the intervention and control groups (n=30 in each group). To determine the group of patients, 60 envelopes containing the name of one of the two groups were prepared and randomly distributed. As patients referred to the ward, they were assigned to one of the cards in succession (Figure 1).

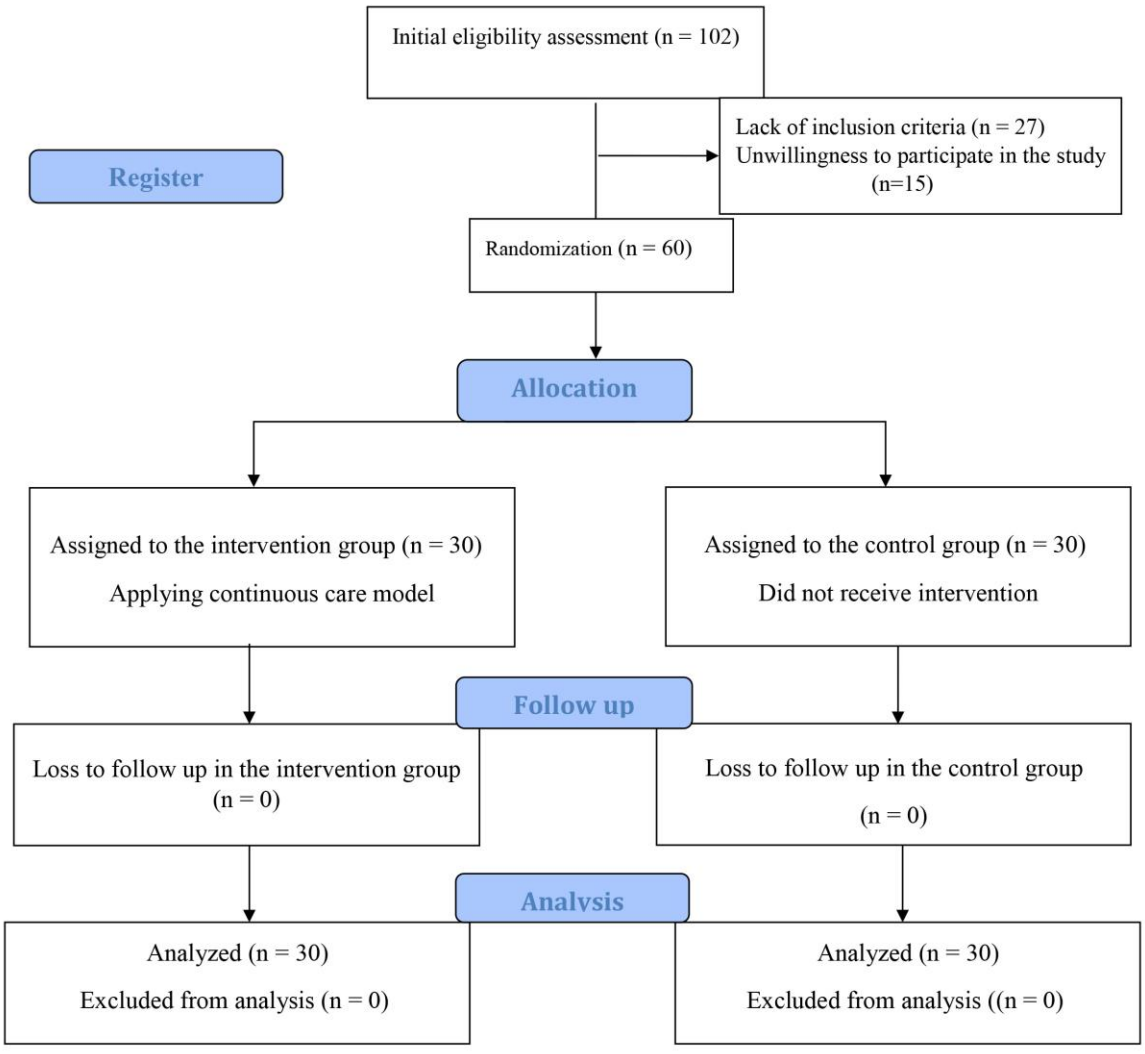

Figure 1. Flowchart of the design, groups, and participants in the study

Data collection tools included a demographic form, Fatigue Severity Scale (FSS), pain visual scale, specific QOL questionnaire (KDQOL-SF) and self-reporting checklist (time, date, and days of the week). FSS is a short questionnaire for measuring fatigue levels, including 9 sentences with respect to the severity of symptoms. The range of scores is 1 to 7. Score 1 indicates a severe opposition with the sentence and score 7 indicates a severe agreement with the sentence. To obtain the overall score of the questionnaire, the total score of each individual is calculated. The higher score reflects the severity of fatigue. The range of scores is 9 to 63. The total score less than 36 indicates the lack of fatigue and the total score ≥36 indicates fatigue. It is a standard and inner internal and reliable tool for measuring fatigue intensity (20). The Persian version of the questionnaire was studied by Salehpour et al. in Multiple Sclerosis (MS) patients that reported the internal consistency scores of the questionnaire by Alpha Cronbach 0.93 (21). In the study of Zakerimoghadam et al., the internal consistency of the tool was reported by Alpha Cronbach 0.91 (22).

The Visual Analogue Scale of pain is used to determine the severity of pain, the most commonly used pain measurement tool in the world. The most important feature of this tool is the horizontal linear from zero to 10. A score of 1-3 indicates mild pain, 4-7 moderate pain and 8-10 severe pain. The validity and reliability of this tool were confirmed in various studies (23). This scale is a modified form of Johnson numerical ranking scales that have good structural validity and have a positive correlation for pain intensity assessment (24).

The standard QOL questionnaire for kidney patients (KDQOL-SF) is used to measure QOL of kidney patients in two specific and general subscales. The questionnaire was designed by Hayes et al. This questionnaire contains 79 questions, 36 questions related to the general dimension and 43 questions related to the specific QOL of dialysis patients. General dimension includes public health (6 questions) with score 1-5, physical performance (10 questions) with score 1-3, physical pain (2 questions) with score 1-6, emotional role (3 questions) with score 1-2, social performance (2 questions) with score 1-5, vitality (4 questions) with score 1-6, mental health (5 questions) with score 1-6 and playing physical role (4 questions) with score 1-2. The dedicated dimension consists of kidney disease (4 questions) with score 1-5, cognitive function (3 questions) with score 1-5, the quality of social interactions (3 questions) with score 1-5, symptoms (12 questions) with score 1-5, effect of kidney disease (8 questions) with score 1-5, sexual issues (2 questions) with score 1-5, sleep (4 questions) with score 1-5, social support (2 questions) with score 1-4, work status (2 questions) with score 1-2, patient's satisfaction (1 question) with score 1-7, satisfaction of personnel care (2 questions) with score 1-5 and overall health grading (1 question) with score 0-10. According to the KDQOL-SF ™ standard instructions, a score of 0 to 100 is assigned to each dimension (25). The reliability and validity of this tool was studied by Yekaninejad et al. as Cronbach's alpha 0.73 to 0.93 reported in different dimensions of the questionnaire (26). Rahimi et al. reported a correlation coefficient of 0.9 in a study of the halving method and thus confirmed the reliability of the tool (27).

The researcher referred to the dialysis ward of Ali ibn- Abi Talib and Khatam al-Anbia Hospitals after obtaining the necessary licenses from the Deputy of Research and Technology and the University Ethics Committee and the introduction of the hospital authorities and the permission to conduct the research. Sampling was initially available in the method, so that each patient undergoing dialysis who met the inclusion criteria was studied. The written consent was obtained from eligible patients. Then, the participants received explanations about the objectives and procedures of the study.

If the patient was placed in the intervention group, the researcher completed the questionnaire of demographic characteristics, fatigue, pain and quality of life for patients through the interview. Then, the PMRT was performed in 3 sessions for an hour, on the day after dialysis that its time was determined with coordination to the patient and family. The technique was trained at the patient's home with the presence of the patient and a family member (child or spouse). If the patient was not able to independently perform the technique during the designated sessions, training continued until full learning and performing the techniques independently.

The first session was training technique, the second session was implementation of the technique by patient in the presence of the researcher (if needed, repeat the training of technique) and the third session was training and asking the patient and answering to the questions of the patient during the practice of the relaxation technique at home and performing the technique by the patient in the presence of the researcher. The audio file was placed in the intervention group with the researcher voice and educational book with an image which contains the first and second steps of relaxation. The

intervention group was asked to perform relaxation exercises two times daily (at morning and evening) for 12 weeks. Each step of relaxation takes about 20 minutes. The family member was also asked to monitor the implementation of techniques at home.

Before the intervention, the researcher was theoretical and practical trained the relaxation technique in several stages under the supervision of a clinical psychologist. Performing the technique is so that at first the patient closes his eyes, as much as possible in a quiet place, and focuses on breathing, five times deep breath and fills the lungs from air and empties it. After this stage, the patients performed muscles' contraction and expansion respectively for 14 groups of facial muscles (forehead, eyelids, jaws, and lips), neck muscles, fingers and palms, forearm, arm and shoulder, back, waist, chest, abdomen, buttock, thigh, legs, and feet. The contraction of each muscle lasts 5 seconds and its expansion lasts for 10 seconds. Also, the patients should not tighten their muscles during muscle contraction. But the contraction is sufficiently adequate. At the end, the patient relaxes its entire body, dropping 5 deep breaths, and slowly open their eyes, and return to normal status (28). During this period, to ensure the implementation of the relaxation technique on the prescribed days, a checklist was provided to the patient's family member to record the day, hour and duration of the technique. Also, in order to solve possible problems in the implementation of the technique, the researcher made a phone call to the patient or family member twice a week to ensure the implementation of the technique and the completion of the checklist. After 12 weeks, the researcher completed the fatigue, pain and QOL questionnaire for the intervention group.

If the patient was assigned to the control group, the demographic information questionnaire, fatigue, pain and QOL were completed by the researcher, and did not receive any interventions except routine care. Post-test was completed over 12 weeks through the phone call by the researcher that its time and place was determined based on the desire and view of the patient and his family . At the end of the intervention, the audio file was placed in the control group with the image of the first and second steps of relaxation.. Data were presented as mean, standard deviation, and percentage. Data were analyzed by descriptive statistics, Shapiro-Wilk tests (to determine the normality of the variables), Chi-square, Fisher test, paired t-test, Independent t, and covariance analysis. All analyses were performed by SPSS software (version 21) (IBM Corp, Armonk, NY, USA). $P<0.05$ was considered statistically significant.

Results

The results of Shapiro-Wilk Test showed that data had normal distribution; therefore, parametric tests were used. The findings showed that the mean of age in the intervention group was 42.66 ± 13.25 years and in the control group was 46.76 ± 13.42 years. The mean of dialysis duration in the intervention group and control was 4.12 ± 2.24 and 3.29 ± 2.23 hours, respectively and mean

Table 1. Distribution of demographic characteristics of patients dialysis in two groups of intervention and control

Variable		Control group		Intervention group		P Value
		Frequency	Percent	Frequency	Percent	
Sex	Female	13	46.9	15	50	0.79*
	Male	17	53.1	15	50	
Patient's academic level	Illiterate and primary school	17	56.7	15	50	0.32**
	Diploma	9	30	10	33.3	
	University	4	13.3	5	16.7	
marital status	Single	6	20	7	23.3	0.50*
	Married	24	80	23	76.7	
Ethnicity	Fars	15	50	15	50	0.61*
	Baloch	15	50	15	50	
Job status	Employee	15	50	18	60	0.34*
	Free and other	15	50	12	40	

* Chi-square test ** Fisher test

Table 2. Comparison of mean of fatigue, pain, quality of life scores in dialysis patients before and after the implementation of progressive muscle relaxation in two intervention and control groups

Variables	Group	Mean ± Standard deviation		P-value *
		Before	After	
Fatigue	Intervention	47.86± 9.42	35.26 ± 11.78	p <0.001
	Control	46.16± 8.09	46.53 ± 7.57	p=0.81
P-value**		P=0.45	p<0.001	
Pain	Intervention	4.10±2.69	3.13 ± 1.63	p < 0.05
	Control	5.40±1.67	5.20±1.71	p=0.26
P-value**		P=0.29	p<0.001	
General dimension of quality of life	Intervention	55.81± 6.07	72.93 ± 8.74	p<0.001
	Control	55.60± 8.14	55.79 ± 8.09	p= 0.99
P-value**		P=0.82	p<0.001	
Specific dimension of quality of life	Intervention	53.04± 7.94	69.51 ± 3.79	p<0.001
	Control	56.58± 6.34	56.73 ± 6.41	P= 0.81
P-value**		P=0.28	p<0.001	
Total quality of life	Intervention	55.29± 5.40	71.34 ± 6.99	p<0.001
	Control	57.75± 6.86	57.92 ± 6.87	P=0.12
Test **		P=0.60	p<0.001	

*Paired-Samples T-Test ** Independent-Samples T-Test

of number of dialysis sessions per week in the intervention and control group was 2.60 ± 0.56 and 2.63 ± 0.55, respectively. There was no significant difference between the two groups in terms of mean age, duration of dialysis and number of sessions per week (P>0.05). As Table 1 indicated, there was no significant difference between the two groups in terms of other individual variables.

The mean of fatigue, pain and QoL and its dimensions before the intervention did not differ significantly between the two groups (p>0.05), but 3 months after the intervention, the mean score of fatigue, pain, QoL and its dimensions were significantly different between the two groups (P≤0.001) (Table 2). The results of levin test showed that based on the assumptions about the normality and homogeneity of variances and also the assumption of regression homogeneity suggesting that the interaction between the independent variable and the associated variable was not significant, there was necessary condition to use the analysis of covariance. The result of the analysis of covariance test by controlling the pre-test and group effect showed that the relaxation technique in the intervention group could significantly reduce the mean score of fatigue, pain and increase the quality of life and its dimensions in dialysis patients (p<0.001) (Table 3).

Table 3. The results of covariance analysis related to scores of fatigue, pain and quality of life in dialysis patients after the intervention by controlling the pre-test effect

Variables		sum of squares	df	mean square	F	P-value	Effect size
Fatigue	Pretest	1725.72	1	1725.72	24.80	<0.001	0.30
	Group	2255.58	1	2255.58	32.42	<0.001	0.36
Pain	Pretest	43.89	1	43.89	21.14	<0.001	0.27
	Group	33.69	1	33.69	16.22	<0.001	0.22
General dimension of quality of life	Pretest	12750.33	1	12750.33	74.51	<0.001	0.56
	Group	1221.03	1	1221.03	42.7	<0.001	0.61
Specific dimension of quality of life	Pretest	12684.62	1	12684.62	66.88	<0.001	0.54
	Group	6656.65	1	6656.65	32.42	<0.001	0.38
Total quality of life	Pretest	11143.89	1	11143.89	21.14	<0.001	0.27
	Group	3324.69	1	3324.69	27.48	<0.001	0.25

Discussion

This study was conducted aimed to determine the effect of PMRT on fatigue, pain and QoL of dialysis patients. Based on the obtained results, the application of PMRT in dialysis patients significantly reduced fatigue in these patients. This finding is consistent with the results obtained in some previous studies.

In this regard, Basiri Moghadam investigated the effect of PMRT on fatigue of hemodialysis patients and showed that performing relaxation significantly reduced fatigue in the intervention group compared to the control group (18). Additionally, Koushan et al. investigated the effect of Benson relaxation technique on fatigue of hemodialysis patients and showed that performing relaxation significantly reduced fatigue in the experimental group (29). Furthermore, Ahmadi et al. investigated the effect of relaxation technique in MS patients, which showed that performing relaxation significantly reduced fatigue in these patients (30). Kaplan et al. in their study showed that the implementation of relaxation technique reduced fatigue in dialysis patients (1). The results of the study by Izgu et al. indicated that the relaxation technique reduces the fatigue of patients with type 2 diabetes (31). Also, complementary medicine therapies reduced fatigue in hemodialysis patients (32).

The results of the present study showed that the pain scores were statistically significant in the intervention group after the implementation of the PMRT. This finding is consistent with the results obtained in some previous studies. Rambod et al. showed that Benson relaxation technique significantly reduced pain in the test group (33). Moreover, Balouchi et al. in their study showed that the implementation of relaxation decreased pain in the intervention group (34). Jensen et al. also showed that PMRT reduced pain in MS patients (35). The relaxation technique stimulates the release of endorphins in the brain and leads to a feeling of relaxation in the muscles and provides levels of analgesia for 15 to 60 minutes (36).

The results of the present study showed that PMRT increased the general QOL of dialysis patients in the intervention group compared to the control group. In this regard, Feizi et al. showed that Benson's relaxation technique had significantly increased the general dimension of QOL in the intervention group (37). The results of Shariati et al. indicated that Benson relaxation in patients with breast cancer significantly increased the general dimension of QOL in the intervention group (38). This is consistent with the results of the present study.

According to the results of the present study, PMRT increased the specific dimension of QOL of dialysis patients in the intervention group compared to the control group. Some studies showed that PMRT affects all aspects of QOL and increases the QOL (15, 39) that is consistent with the results of the present study. While in the study of Feizi et al., this difference was not significant in the specific dimension of QOL (37) that does not match the results of this study. The reason can be the duration of relaxation technique and the frequency of the intervention in the present study (3 months and daily by the patient).

The results of the present study showed that PMRT increased the QOL of dialysis patients in the intervention group compared to the control group. This finding is consistent with the results obtained in some previous studies. In this regard, the findings obtained by Rambod's study showed that Benson's relaxation technique increased the QOL of dialysis patients in the intervention group (33). Also, Mahmoodi et al. examined the effect of muscle relaxation technique on the QOL of post-myocardial infarction patients. Their results showed that the implementation of relaxation significantly increased QOL in the intervention group (40). Moreover, Feizi et al. reported that Benson technique resulted in a significant increase in the total QOL in the intervention group (37). In the study of Yildirim and colleagues, the relaxation technique increased the total QOL in dialysis patients (41). But in the study of Dikmen and colleagues, the relaxation technique could not increase the QOL of cancer patients (42) that was not consistent with the results of the present study. These inconsistencies may be attributed to different types of community.

One of the limitations of this study was that the patient performed the technique at home. To ensure that the relaxation technique was performed on the prescribed days, a checklist was provided to the patient's family member to record the day, hour and duration of the technique performed by the patient.

Implications for practice

Nurses as the main audience of this study can use relaxation technique in their daily care program for hemodialysis patients in order to manage their fatigue and pain affecting the quality of life in these

patients. Therefore, the relaxation technique is an easy and cost-free approach and can be used to reduce fatigue and pain in dialysis patients.

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Conflicts of interest
The authors declared no conflict of interest.

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