ORIGINAL ARTICLE

Comparing the effect of warmwater footbath with effleurage and petrissage massages on fatigue of patients undergoing hemodialysis

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Background: Few comparative studies have been carried out into the effects of nonpharmacological interventions on reducing fatigue in hemodialysis patients. This study compared the effect of warm footbath with effleurage and petrissage massages on fatigue in hemodialysis patients. **Materials and Methods:** Seventy patients undergoing hemodialysis referring to two dialysis centers in 2016 were included in this clinical trial study. However, 62 hemodialysis patients finally completed the study. The patients were selected through a nonrandom sampling method, but were later assigned to one of the three groups of warmwater footbath, effleurage, and petrissage massages based on randomized blocked allocation. Using a multidimensional inventory, fatigue was assessed before the commencement of the interventions, at the end of the first and the 2nd month of the interventions. The data were analyzed using statistical software of SPSS, version 25, through descriptive statistics by running median and Friedman tests with considering 95% confidence interval. **Results:** Warmwater footbath, effleurage, and petrissage resulted in a significant reduction or improvement in global fatigue and types of fatigue of patients undergoing hemodialysis at the end of the first and 2nd month of the interventions ($P = 0.001$). The results of the between-groups comparison showed that there was no significant difference ($P > 0.05$) in fatigue reduction among the three groups of warmwater footbath, effleurage, and petrissage massages in terms of the median index of fatigue scores. **Conclusion:** Warmwater footbath, effleurage, and petrissage massages have similar positive effects on fatigue in patients undergoing hemodialysis.

Key words: Effleurage massage, fatigue, hemodialysis, petrissage massage, warmwater footbath

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INTRODUCTION

Fatigue is one of the most frequent complaints of patients undergoing hemodialysis. Its prevalence rates varying from moderate to high.[1] Fatigue is a subjective and multidimensional concept that has been described as a feeling of excessive weakness or exhaustion, both physical and mental.[2] Hemodialysis patients may experience interdialysis fatigue, postdialysis fatigue (PDF), or intradialysis fatigue (IDF).[3] Most patients need 2–6 h of rest to recover from PDF.[4] About 98% of patients experience moderate-to-severe levels of PDF.[5] PDF is conceptually similar to persistent fatigue, but differs in intensity and time.[6] IDF reaches its peak at the end of the dialysis session and reaches its lowest level in the interdialysis period.[7]

Numerous factors can induce fatigue in hemodialysis patients.[8] These include sleep disorders[9] and anemia.[10] Fatigue may also lead to decreased self-care,[11] cardiovascular disorders,[12] and decreased quality of life.[6] In addition to pharmacotherapy, the effectiveness of nonpharmacological interventions such as acupressure[13] and psychosocial interventions[14] on improvement of fatigue has already been investigated.

One of the nonpharmacological interventions is warmwater footbath. This intervention induces

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relaxation by stimulating the parasympathetic and sympathetic systems. In some studies, positive effects of warmwater footbath on reducing fatigue in hemodialysis[15] and diabetic patients[16] have been reported.

Swedish massage techniques including effleurage massage and petrissage massages are other nonpharmacological interventions. Improvement of fatigue after various massage therapy techniques has been reported in patients with multiple sclerosis,[17] patients with cancer,[18] and hemodialysis patients.[19]

Nurses can play a significant role in mitigating the effects of fatigue in hemodialysis patients. Self-management techniques should be taught to patients to minimize the effects of fatigue. The effects of nonpharmacological interventions have separately been investigated; however, comparative studies into the effectiveness of these interventions are very limited. In addition to determining the effectiveness of nonpharmacological methods, studies of this nature are highly important for identifying fatigue management techniques, especially the ones which can easily be used by hemodialysis patients. Regular visits of patients undergoing hemodialysis and their prolonged presence of at least 4 hours in the dialysis ward provide a great opportunity for care providers to teach them effective self-management techniques for fatigue. Therefore, the aim of this study was to compare the effect of warmwater footbath versus effleurage and petrissage massages on fatigue of hemodialysis patients.

METHODS

Study design and participants

This was a clinical trial study which was conducted in Yasuj city, Iran, 2016. Ninety-four hemodialysis patients were assessed for eligibility; however, 70 eligible patients were included and 24 patients were excluded. There was no possibility to select randomly the patients and no statistical formula was used for calculating the sample size due to the limited study population limited (two centers for hemodialysis). Therefore, all patients referred to the two centers were assessed for eligibility and eligible patients were selected through nonprobability sampling method (convenience method), but they were randomly assigned to one of the three groups of warmwater footbath (Group 1 or B), effleurage massage (Group 2 or C), and petrissage massage (Group 3 or A) using randomized block allocation [Figure 1]. Since there were three groups in this study, we created six blocks, namely, ABC, ACB, BAC, BCA, CAB, and CBA based on the factorial rule (3! = 3 × 2 × 1 = 6). There were three participants in each

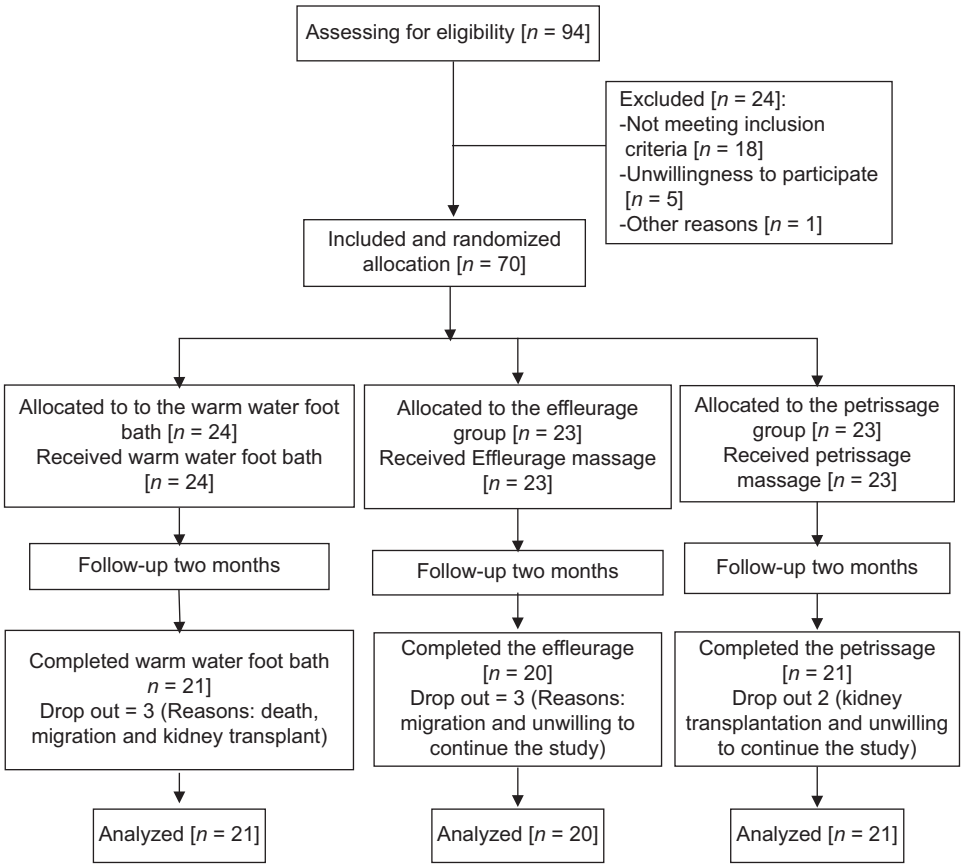

Figure 1: CONSORT flowchart of the study

block with a ratio of 1:1:1 for each group. However, their arrangement was varied. We selected blocks from these six blocks as replacement random sampling up to all eligible patients were allocated to one of the above three groups.

Inclusion and exclusion criteria

Inclusion criteria were the final diagnosis of the end stage of renal disease, at least 6 months of hemodialysis treatment, having arteriovenous (AV) fistula, the ability to perform the interventions, lack of the lower limbs amputation, lack of diabetic foot, and skin lesions of the back, neck, and legs. Patients' unwillingness to participate in the study and taking hypnotic drugs were considered as exclusion criteria.

Measure

Multidimensional Fatigue Inventory designed by Smets *et al*.[20] was used. This inventory has 20 items with 5-point Likert scale in five subscales of general fatigue, physical fatigue, mental fatigue, reduced activity, and reduced motivation. The scores range from 1 (strongly agree) to 5 (strongly disagree). The global scores range from 20 to 100. Higher scores indicate more fatigue. The validity and reliability of the Persian version of this inventory has been reviewed and approved by Saffari *et al*.[21] The reliability of the instrument was re-established through internal consistency by the authors of this article. Cronbach's alpha coefficient was found to be $\alpha = 0.83$.

Procedures

Interventions were first performed as twice a week for 2 weeks in the dialysis ward by the second and fourth authors of this article. Then, the patients' caregivers were trained how to perform the interventions at home. All three interventions continued at home over 15 min twice a week for 2 months. The patients were required to perform the interventions at night and before going to bed. This was due to the fact that sleep disorders have been associated with fatigue. Educational pamphlets about the procedures of the interventions were prepared and were handed out to the patients. The patients' adherence was assessed through a self-report checklist as well as the second author of this article.

Container with a depth of 10 cm has been filled with warm water and then the patients were required to place his/her feet in it for 15 min. To perform effleurage massage, the patient was first placed in a comfortable position on the back, so that no pressure was applied to his/her fistula. After stripping the patient's back and waist, the massager placed both palms on the patient's waist (starting point). Then, he moved his hands gently to the back, shoulders, and neck (endpoint), and as the fingers moved forward to the patient's shoulder, it returned from the shoulder down to the patient's waist. All the massager's palms and fingers were in constant contact with the areas of the body being massaged. The pressure of the hand during the massage gradually increased from the waist area (starting point) to the shoulder and neck area (endpoint).

Petrissage massage includes a set of movements of grasping and squeezing the muscle being massaged by one or both hands. After the patient was placed in a sitting position or on his back, his shoulders and neck were stripped. In the first grip, the palms of both the hands were used to massage the patient's shoulders and neck, so that the thumb formed a C-shaped configuration with the other fingers. This was performed to make sure that the muscles (but not the skin) of these areas can be easily detached from the bone to slowly apply the pressure and grasp. In the second movement, that is, grasping or grabbing with rotation, the muscles of the shoulders, neck, and back were grabbed and pulled toward the two opposite sides of the fingers and were also rotated either inward or outward each time. In other words, the muscle was pulled toward the other fingers and vice versa. The number of movements for petrissage and effleurage massages was 15–20.[22]

Statistical analysis

The data were collected at three times of before interventions (i.e., baseline), the end of the 1st month, and the end of the 2nd month of the interventions. The collected data were analyzed using IBM SPSS Statistics, for Windows, Version 26.0. Armonk, NY: IBM Corp. Chi-square test was used for nominal variables. Analysis of variance (ANOVA) test was used for quantitative data. The results of repeated measures ANOVA were reported for between and within-subject comparisons of outcome variable. Normality of data was assessed by Kolmogorov–Smirnov test. $P < 0.05$ was considered statistically significant. The data collector and statistical analyst were blinded to the patients in the three groups.

Ethical considerations

The principles of confidentiality and informed participation were ensured. Interventions in the first 2 weeks in the dialysis ward were performed in an isolated room. Patients' privacy was respected. This study was approved by the Ethics Committee of Yasuj University of Medical Sciences with ID Code 93050003 and IRCT registration number: IRCT2015031021425N1.

RESULTS

Seventy eligible patients were included in this study; however, 62 (88.57%) patients completed the interventions. Eight subjects have lost due to kidney transplantation ($n = 2$), death ($n = 2$), migration ($n = 3$), and withdrawal from the study ($n = 1$); the data collected from

62 participants (warmwater footbath, n = 21; effleurage massage, n = 20; and petrissage massage, n = 21) were finally analyzed [Figure 1]. The result of the study showed that the total mean of duration of ESRD diagnosis and the mean duration of hemodialysis therapy were 42.1 ± 29 (min-max, 7–100 months) and 30.5 ± 20.7 (min-max, 6–77 months), respectively. No significant differences were observed by demographic characteristics [Table 1].

The results of the study showed that all three interventions of footbath massage, exfoliation, and petrissage have improved the fatigue of hemodialysis patients. The mean scores of global fatigue and its subscales indicated that there was a statistically significant differences in each group (i.e., within-subject factor) by the time of measure (P = 0.001); however, there was no statistically significant differences for global fatigue and its dimensions among the three interventions by group (i.e., between-group comparison). In other words, the three interventions of footbath, effleurage, and petrissage massages similarly improve fatigue on hemodialysis patients [Table 2].

DISCUSSION

Comparison of the effect of warmwater footbath and effleurage and petrissage massages in reducing fatigue in hemodialysis patients showed that all three interventions could reduce fatigue in hemodialysis patients. However, no significant difference was observed among them.

The present study supports the reported positive effects of warmwater footbath in relieving fatigue in patients with chronic kidney disease in the studies by Shafeik *et al*.[23] and Das *et al*.[24] In addition, reducing body toxins and improving the quality of life, reducing fatigue, expression of increased comfort, and feeling of satisfaction caused by warmwater footbath have been reported in the literature.[23] Although no specific study has been reported on the effect of effleurage and petrissage on hemodialysis patients, the effects of other massage therapy are consistent with the results of our study. For example, it has been reported that slow-stroke back massage reduces fatigue in patients undergoing hemodialysis[25] and that foot reflexology combined with back massage[20] and foot massage[26] brings about a similar effect. It is believed that massage techniques will improve fatigue due to various physiological, biochemical and mechanical mechanisms such as accelerating blood flow, increasing the excretion of metabolites,[27] stimulating the parasympathetic system, making a sense of relaxation and comfort, reducing muscular and connective tissue stress.[28] Furthermore, as a nonpharmacological intervention, warmwater footbath reduces fatigue by increasing the expansion of leg vessels, relaxing muscles, improving local blood flow, and increasing joint range of motion.[29]

Despite the agreement between the results of the above studies with those reported in the present study, methodological differences such as the research instruments used for measuring fatigue and the duration of interventions should be taken into account when the findings are looked upon from a comparative perspective and when generalizing the findings. It has been suggested that ecological momentary assessment in dialysis patients can promote understanding of patients' fatigue and its variation over time. The experience of fatigue in people with different chronic diseases is different in terms of etiology and pathophysiology. Patients with chronic diseases do not use similar management techniques to cope with fatigue.[30]

Although the relationship between biopsychosocial and clinical factors with fatigue has been reported, there is still no clear etiology or predictors of fatigue in hemodialysis patients. Lack of certain etiology and nonobjectivity of the concept of fatigue can lead to inadequate diagnosis and treatment of fatigue in patients undergoing hemodialysis.[8] This helps not only to better understand fatigue in hemodialysis

Table 1: The patient's characteristics in the three groups

Variable	Groups			*P*
	Footbath (*n*=21)	Effleurage massage (*n*=20)	Petrissage massage (*n*=21)	
Age (year), mean±SD	56±12.7	47.2±14.5	49.6±13.7	0.1*
Hemoglobin (g/dL), mean±SD	10.6±1.9	10.6±1.6	10.4±2.5	0.7*
Duration of ESRD (month), mean±SD	41.5±29.7	41.1±30	43.5±28.6	0.9*
Duration of treatment with HD (month), mean±SD	31.6±19.8	27.9±17.9	31.7±24.5	0.8*
Number of HD sessions (per week), mean±SD	2.5±0.5	2.3±0.7	2.4±0.5	0.6*
Duration of HD sessions (h), mean±SD	3.6±0.4	3.5±0.5	3.7±0.5	0.3*
Sex, *n* (%)				
Male	10 (47.6)	11 (55)	15 (71.4)	0.2**
Female	11 (52.4)	9 (45)	6 (28.6)	
HD shifts, *n* (%)				
Morning	14 (66.7)	10 (50)	15 (71.4)	0.3**
Afternoon	7 (33.3)	10 (50)	6 (28.6)	

ESRD=End stage of renal disease; HD=Hemodialysis; SD=Standard deviation ; *ANOVA test, no significant; **Chi-square test, no significant.

Table 2: Mean scores of global fatigue and types of fatigue on the three groups by time

Outcomes/times	Group			*P*-value of group
	Footbath (*n*=21)	Effleurage massage (*n*=20)	Petrissage massage (*n*=21)	
General fatigue				
Baseline[a]	17±1.5	17.1±1.7	17.3±1.5	0.308
1st month[b]	11.9±2.1	12.1±1.9	12.6±1.6	
2nd month[c]	8.4±2	8.3±1.7	9.4±2.1	
P-value of time	0.001	0.001	0.001	
Physical fatigue				
Baseline[a]	18±1.5	17±1.6	17.2±1.4	0.632
1st month[b]	12.3±1.9	12.5±2.1	13.2±1.5	
2nd month[c]	9.4±2.6	9.8±2.5	10.5±2.3	
P-value of time	0.001	0.001	0.001	
Mental fatigue				
Baseline[a]	13.9±2.4	13±2.4	13±2.6	0.720
1st month[b]	9.7±2.4	9.5±1.8	10.2±2.3	
2nd month[c]	7.1±3.1	7.5±2.3	8.5±2.9	
P-value of time	0.001	0.001	0.001	
Reduced activity				
Baseline[a]	17.1±1.7	16.6±2.2	17.6±1.7	0.066
1st month[b]	12.6±1.5	12.4±2	13.5±1.6	
2nd month[c]	9.3±2.3	9.4±1.9	10.5±2	
P-value of time	0.001	0.001	0.001	
Reduced motivation				
Baseline[a]	14.2±2.6	13.4±2.5	13.2±3.2	0.735
1st month[b]	10±2	9.8±1.7	10.4±2.5	
2nd month[c]	7.6±2.4	7.7±1.9	8.8±2.4	
P-value of time	0.001	0.001	0.001	
Global fatigue				
Baseline[a]	80.2±7.3	77.1±8	78.4±7.2	0.364
1st month[b]	56.5±7.9	56.3±7.9	59.9±7.7	
2nd month[c]	41.8±11.4	42.8±9.2	47.7±10.5	
P-value of time	0.001	0.001	0.001	

[a]Baselines means preintervention, [b]1st month conveys the end of the 1st month of interventions, [c]2nd month means the end of the 2nd month of interventions

patients but also to develop therapeutic measures or targeted interventions to reduce fatigue.[9]

The findings of this study should be complemented with further research evidence due to lack of comparative studies in this regard. If the same effect of effleurage, petrissage and warmwater footbath is confirmed, it would seem that a warmwater footbath is a simpler method than the other two methods because of hemodialysis patients have complained of dry skin and uremic pruritus as well as due to the presence of arteriovenous fistula, shunt or Shaldon catheter. Many patients undergoing hemodialysis can do warmwater footbath themselves at home following patients training by dialysis nurses.

Strengths, limitations, and recommendations

Randomized allocation and long duration of interventions are the strengths of our study. However, this study also has limitations that should be considered when generalizing the findings. First, the sample size was small. It was not possible to include more participants. Second, there was no specific questionnaire for assessing fatigue of hemodialysis patients. Tools are generally self-reported and subjective that patients' cognitive status can affect their responses. The used tool in our study was an evaluative type. The evaluative tools measure the severity of fatigue; however, the discriminative tools are used to distinguish patients with fatigue from those without it. Therefore, the combined use of such questionnaires may be helpful to make better clinical judgment about fatigue in hemodialysis patients.

CONCLUSION

Both Swedish massages including effleurage and petrissage and warmwater footbath alleviate fatigue in patients undergoing hemodialysis. In terms of effectiveness, warmwater footbath has similar effects to Swedish massages. This study requires further research to make better clinical judgment about their effectiveness. Subject to confirmation by future studies, it is possible to advise warmwater footbath either alone or in combination with other interventions to improve fatigue in hemodialysis patients.

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Conflicts of interest

There are no conflicts of interest.

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