

The effect of warm water footbath versus Swedish massages on hemodialysis patients' sleep quality and insomnia

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Abstract

Context: Low sleep quality as a common problem in patients undergoing hemodialysis can lead to negative impacts such as poor quality of life. Many studies were performed in order to improving sleep quality in these patients; however, few comparative studies have been conducted to compare the effects of nonpharmacological interventions on sleep disturbances of patients undergoing hemodialysis.

Aims: This study was carried out to examine the effect of warm water footbath versus Swedish massage on sleep quality and insomnia severity in patients undergoing hemodialysis.

Materials and Methods: Seventy patients undergoing hemodialysis referring to two dialysis wards affiliated to Yasuj University of Medical Sciences, Yasuj Iran have included in this randomized clinical trial from November 2015 to April 2016. The eligible patients undergoing hemodialysis were selected as convenience sampling method but randomly assigned to one of the three groups of warm water footbath ($n = 24$), effleurage ($n = 23$) and petrissage ($n = 23$). The interventions have been performed for 15 min over 2 months. Pittsburgh Sleep Quality Index and Insomnia Severity Index was used to collect data.

Statistical Analysis Used: Collected data were analyzed using SPSS, version 21, which involved running statistical tests including repeated measures ANOVA. $P < 0.05$ was considered to be a statistical significant difference.

Results: Twenty six men (41.9%) and 36 women (58.1%) completed this study (mean age: 51.01 ± 13.91). Mean global sleep quality was reported for patients in the group of warm-water footbath (14.1 ± 1.8 ; 7.15 ± 2.1 and 5.37 ± 2.4), effleurage (13.2 ± 1.7 ; 8.1 ± 2.8 and 5.82 ± 2.7), and petrissage (14.1 ± 1.9 ; 9.18 ± 2.4 and 6.4 ± 2.8) on the baseline, the end of the 1st and the 2nd month of interventions, respectively. Mean scores of insomnia severity for patients in the group of warm-water footbath (21.38 ± 3.6 ; 11.95 ± 3.2 and 9.48 ± 3.4), effleurage (19.65 ± 3.1 ; 12.5 ± 3.67 and 9.1 ± 4.7), and petrissage (21.05 ± 3.68 ; 13.81 ± 3.1 and 10.6 ± 3.6) was observed. No statistical significant ($P > 0.05$) differences were observed by sleep quality and insomnia severity among three groups.

Conclusion: Warm-water foot bath is as effective as Swedish massages for improving sleep quality and insomnia severity in patients undergoing hemodialysis. Further investigations are suggested to determine whether the same findings are replicated.

Keywords: Hemodialysis, Insomnia, Massage, Sleep quality, Baths

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INTRODUCTION

Despite the medical benefits associated with hemodialysis, patients undergoing hemodialysis suffer from sleep problems including deficits in quantity and quality of sleep.^[1] Available research evidence shows that patients undergoing hemodialysis experience poor sleep quality^[2,3] and insomnia.^[4] Poor sleep quality in patients undergoing hemodialysis has been variously found to be 60.6%,^[5] 67%,^[6] and 76.1%.^[7] In addition, compared with the general population, lower sleep quality has been reported.^[8,9]

Even if there is no unanimous consensus on the definition of sleep quality, the National Sleep Foundation recently released the key indicators of good sleep quality such as sleep duration while in bed (i.e., at least 85% of the total time), falling asleep in 30 min or less, waking up no more than once per night, and being awake for 20 min or less after initially falling asleep.^[10] Sleep disturbances can result in diminished quality of life (QOL),^[11] health-related QOL (HRQOL),^[12] cardiovascular diseases,^[13] behavioral problems, and disturbance in cognitive functioning^[14] in patients undergoing hemodialysis.

Anxiety and age,^[15] restless legs syndrome,^[16] psychiatric morbidity, sociodemographic factors,^[17] and duration of hemodialysis^[18] have also been associated with poor sleep quality in patients undergoing hemodialysis. The results of a study by Cengic *et al.*^[19] showed that, in comparison to other patients, younger and employed hemodialysis patients have better sleep quality. In addition, correlation was observed between sleep quality with gender, education level, place of residence, comorbidity including diabetes, and addiction to sedatives in patients undergoing hemodialysis.^[20]

Insomnia is also a common problem in patients undergoing hemodialysis.^[18] Insomnia includes trouble falling asleep, staying asleep, or waking too early, which could result in daytime impairment.^[21] Patients undergoing hemodialysis have reported problems such as staying up overnight (90%), difficulty falling asleep (60%), and daily drowsiness (60%).^[22] Insomnia can have adverse effects on the body systems and functions, including mental function, psychological health,^[23] and survival of patients undergoing hemodialysis.^[24]

Early diagnosis of sleep disorders and proper interventions could improve QOL in patients undergoing hemodialysis.^[11] However, based on the research evidence gleaned so far, sleep disorders in patients undergoing hemodialysis still persist.^[25] Even if pharmacological therapy has been

effective in improving sleep quality,^[26] nevertheless, hemodialysis patients' kidneys are unable to excrete drug metabolites and thus waste them. Therefore, they are prone to kidney toxicity or general side effects. For example, long-term use of benzodiazepines may lead to dependency, withdrawal, and emotional changes.^[27] Moreover, some nonpharmacological interventions have also produced promising results.^[28] For example, for improving sleep quality in patients undergoing hemodialysis, cognitive-behavioral therapy^[14] and Auricular Acupressure^[29] have turned out to be somewhat effective.

One of the nonpharmacological therapy interventions for improving sleep quality is massage therapy. World Health Organization has dubbed massage "green medicine," which is due to its remarkable effectiveness, affordability, and nontoxic side effects.^[30] As one of the most common massages, Swedish massage includes effleurage, petrissage, tapotement, and vibration techniques.^[31] The benefits of massage therapy have been reported by literatures. For example, the effectiveness of the intradialytic massage therapy in the improvement of leg cramps^[32] and reflexology in alleviating fatigue, pain, and cramps^[33] in patients undergoing hemodialysis have been reported. Khojandi *et al.*^[34] concluded that reflexology massage and stretching exercises can reduce restless leg syndrome severity in patients undergoing hemodialysis.

Warm-water foot bath is also a noninvasive intervention. In addition to neurological and psychological effects, it can induce a sense of comfort and relaxation in patients.^[35] Fatigue Relief^[36] and arteriovenous puncture-related pain^[37] have been reported following warm-water foot bath in patients undergoing hemodialysis. Uchiyama Tanaka investigated the effects of thermal therapy on plasma brain natriuretic peptide (BNP) level in patients undergoing hemodialysis using hot water bottles. He concluded that this therapy could reduce plasma BNP level and improve patients' symptoms and their ability to perform daily activities.^[38] The result of a study by Ren *et al.*^[39] showed that herb foot bath therapy can effectively improve the sleep quality of patients undergoing hemodialysis and their symptoms.

Assessing sleep-related problems of patients undergoing hemodialysis is an important part of nephrology nurses' responsibility. They can do many interventions to improve the sleep quality of patients undergoing hemodialysis. If not remedied, poor sleep quality could bring about negative effects on QOL and HRQOL of patients undergoing hemodialysis. Review literatures showed that many studies were performed in order to improve sleep quality in patients

undergoing hemodialysis; however, few comparative studies have been performed to compare the effects of nonpharmacological interventions on sleep disturbances in patients undergoing hemodialysis. Therefore, this study aimed to determine the effect of warm-water footbath versus Swedish massage on sleep quality and insomnia severity of patients undergoing hemodialysis.

MATERIALS AND METHODS

Design and participants

This study is a randomized clinical trial. A total of ninety four patients undergoing hemodialysis referring to two dialysis wards affiliated to Yasuj University of Medical Sciences, Yasuj, Iran were assessed for eligibility criteria from November 2015 to April 2016. Out of these, seventy patients met the eligibility criteria and were included in the study. The eligible patients were selected using convenience sampling method. Then, they were randomly assigned to one of the three groups of warm water foot bath or A group ($n = 24$), effleurage or B group ($n = 23$), and petrissage or C group ($n = 23$) massage, using randomized blocked allocation method. Because there were three groups in this study, we created six blocks, namely, ABC, ACB, BAC, BCA, CAB, and CBA based on the factorial rule ($3! = 3 \times 2 \times 1 = 6$). There were three participants in each block. However, their arrangement varied. We selected blocks from these six blocks using replacement

random sampling. Eight patients were later dropped out because of kidney transplantation ($n = 2$), death ($n = 1$), emigration ($n = 2$), and personal decision to withdraw from the study ($n = 3$). Finally, sixty two patients undergoing hemodialysis completed this study [Figure 1].

Inclusion and exclusion criteria

The inclusion criteria included age range of 18–75 years, underwent hemodialysis for at least 6 months, score of sleep quality ≥ 5 as poor quality sleep, moderate or severe level of insomnia severity, ability to get sitting, supine and prone positions to perform interventions, not having medications for sleep disorders, lack of lower extremity amputation or skin lesions such as redness, and lack of wound in the area of back, neck and feet. Unwillingness to participate in the study, lack of inclusion criteria, and low scores of sleep quality were considered as exclusion criteria.

Measures

The Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI) were used to measure sleep quality and insomnia severity, respectively. The PSQI assesses sleep quality over the preceding month. It consists of 18 self-rated questions and five items which are independently rated by a partner or a roommate. Only self-rated questions are included in the scoring and are used to generate the seven subscales: Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances,

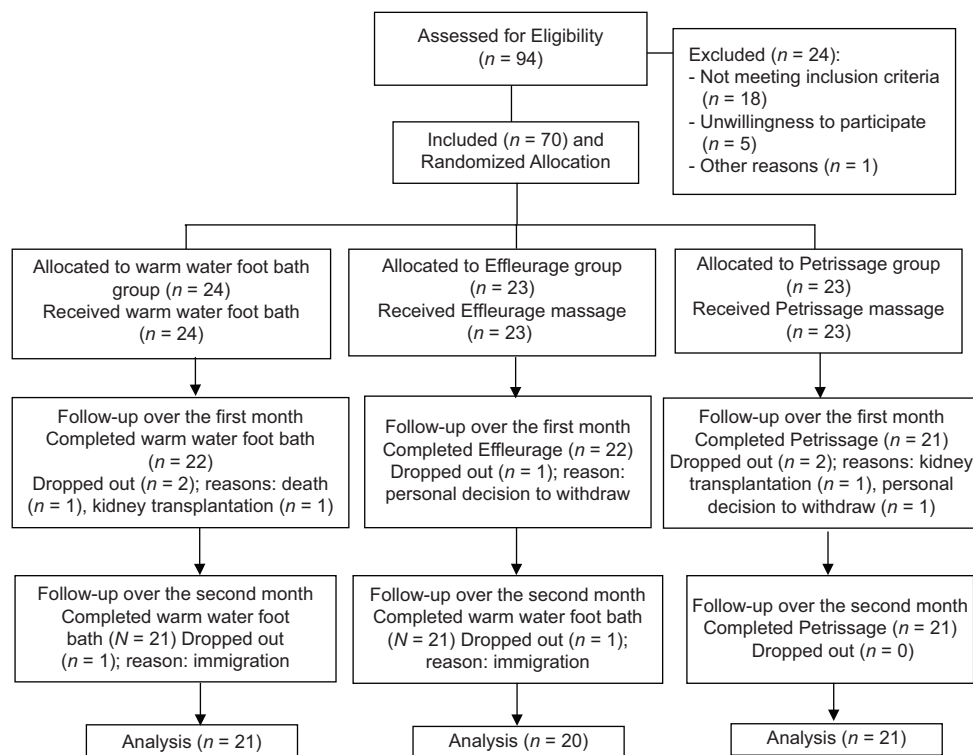


Figure 1: The CONSORT flow chart of the study

use of sleep medications and daytime dysfunction. Subscale scores range from 0 to 3 (0 = very good; 1 = fairly good; 2 = fairly bad, and 3 = very bad or poor sleep quality). According to the instruction of the PSQI, global scores of the PSQI range from 0 to 21. Based on this range, a global score of 5 or greater indicates poor sleep quality. The validity and reliability of the Persian version of this index have been established.^[40] For the purposes of the current study, the reliability of the index was determined using the test–retest method, which turned out to be $r = 0.86$.

The ISI is a self-report tool to measure patients' insomnia severity in nighttime sleep over the previous 2 weeks. This index assesses seven items: Difficulty falling asleep, difficulty staying asleep, problem waking up too early, satisfaction with the current sleep pattern, interference with daily functioning, impairing the QOL, and being worried about the current sleep problem, based on a 5-point Likert scale (0 = never and 4 = very high). According to the instruction of the ISI, the global score ranges from 0 to 28. The global score of the ISI is also classified as no clinically significant insomnia (0–7), sub-threshold insomnia (8–14), moderate severity or clinical insomnia (15–21), and severe insomnia (22–28).^[41] The validity and reliability of the Persian version of the ISI measure have already been determined.^[42] For the purposes of the present study, the reliability of the measure was established using the test–retest method of determining reliability, which was found to be $r = 0.94$.

Interventions

Interventions were performed two times a week over a period of 2 weeks in the dialysis wards before starting dialysis and then continued for 2 months at home. In the 1st week, the interventions were carried out by the second and third authors of the article. In the 2nd week, patients' caregivers were also trained to conduct the interventions. All the interventions continued at home an hour before the patients went to sleep every night over a period of 2 months. The patients' fidelity to the interventions was assessed in a number of ways by the second researcher. At times, in the dialysis units, the patients were specifically asked to provide details about the interventions. Sometimes, as a follow-up, the researcher called the patients and asked them to provide details about the interventions. As a last resort, the patients were asked to complete a self-report form about the interventions. Patients in each group were also provided with a pamphlet detailing how interventions should be performed in that particular group.

Warm water footbath was performed according to the relevant guidelines.^[43] A container with dimensions of

45 cm × 27 cm × 40 cm filled with warm water with a temperature of 42°C–43°C and a depth of 10 cm was provided. First, the patient was instructed to sit on a chair, and then put his/her feet in the container for 15 min. The water temperature was controlled through a thermometer. In case of a drop in temperature, warm water was added to maintain the temperature between 42°C and 43°C. Upon the completion of the intervention, the patient was instructed to dry his/her feet using a towel and go to bed.

A massage therapist provided training in Swedish massage for a male nurse (the third author of article) who did the interventions for the male patients and the second author of article (female nurse) for the female patients. The trained nurses subsequently performed the massage techniques based on the suggested protocol. Effleurage massage was performed in a comfortable prone position so that no pressure was applied on the shunt or fistula. After baring the patient's back and lumbar, the masseur placed the palms of both hands on the patient's back (i.e., starting point) and moved them slowly towards the lumbar, shoulders, and neck (i.e., end point), while his/her fingers were moving toward the shoulder and returning from the shoulder to the back. The masseur's palm and fingers were in touch with the patient's body so that the patient could feel a continuous and smooth movement. Hand pressure during the massage of the back (i.e., starting point) toward the shoulder and the neck area (i.e., end point) was slightly higher. However, when returning to the starting point, the massage involved less pressure. The movement was repeated 15–20 times over a period of 15 min based on the suggested protocol.^[44]

Petrissage massage – including a set of the muscular grabbing and squeezing actions – was conducted by the masseur. After the patient was placed in a sitting or prone position, his/her shoulder and neck were bared. In the first movement (i.e., the grabbing action), the palms of the masseur's hands were placed on the patient's shoulder and neck so that the thumb and other fingers formed the letter C. This was done to allow the muscles (not the skin) of these areas to be easily separated from the bone and to be slowly pushed or grabbed. In the second movement, i.e., squeezing or grabbing together with rotation, in addition to grabbing, the muscles of the shoulder, neck, and lumbar areas were rotated all the time toward the opposite side of the thumb and were rotated inward or outward. In other words, the thumb squeezed the muscles towards other fingers and vice versa. The frequencies of movements were 15–20 times over a period of 15 min according to the respective guidelines.^[44]

Data analysis

The data were collected at three times as baseline or prior to the interventions, the end of the 1st month and the 2nd month of the interventions. The collected data were analyzed, using SPSS version 21 (IBM SPSS Statistics v21 x86/x64). $P < 0.05$ was considered to be significant for the statistical analyses. Before the analysis of the dependent variables including sleep quality and insomnia severity, it was necessary to examine their distribution. The results of the normality test were indicative of normal distribution. Repeated measures analysis of variance (ANOVA) was run to compare mean scores. Since the assumption of compound symmetry or Mauchly's test of Sphericity was not met, the results of Epsilon Correction (Greenhouse-Geisser) were reported. It should be noted that data collectors and data analysts were blind to the assignment of the patients to different groups.

Ethical considerations

The purpose of the study was first explained to the patients by one of the researchers, and subsequently written informed consent was obtained from those who expressed their willingness to participate in the study. Detailed information about the principles of voluntariness to participate in this study and confidentiality of the information obtained was also communicated. The interventions were carried out in a quiet and suitable room. The study was registered on the site of the Iranian Registry Clinical Trials (IRCT) with registration number: IRCT2015031021425N1 and was approved by the Research Ethics Committee of Yasuj University of Medical Sciences.

RESULTS

Sixty and two patients undergoing hemodialysis with a mean of age 51.01 ± 13.91 years old (range; 26–75) completed the interventions. Twenty and six (41.9%) patients were male and 36 patients (58.1%) were female. Mean values for the duration of ESRD diagnosis, hemodialysis therapy, and numbers of hemodialysis sessions per week were 47.16 ± 41.38 months (range: 7–180), 32.51 ± 27.24 months (range: 6–144), and 2.43 ± 0.59 times (range: 1–3), respectively.

Mean scores of global sleep quality were reported for patients in the group of warm-water footbath 14.1 ± 1.8 ; 7.15 ± 2.1 and 5.37 ± 2.4 at the times of baseline, the end of the 1st month and the 2nd month of interventions, respectively. These values for patients in the group of effleurage were 13.2 ± 1.7 , 8.1 ± 2.8 , and 5.82 ± 2.7 and for patients in the group of petrissage were 14.1 ± 1.9 , 9.18 ± 2.4 , and 6.4 ± 2.8 , respectively [Figure 2].

The same results were found for insomnia severity. Mean scores of insomnia severity at baseline time was 21.38 ± 3.6 for warm water foot bath, 19.65 ± 3.1 for effleurage massage and 21.05 ± 3.68 for petrissage massage. These values for the three groups at the end of the second month of interventions were 9.48 ± 3.4 , 9.1 ± 4.7 , and 10.6 ± 3.6 , respectively [Figure 3].

Between-group comparison using repeated measures ANOVA indicated that the three groups did not significantly differ from each other in terms of global sleep quality ($P = 0.37$), subscales of sleep quality ($P > 0.05$), and insomnia severity ($P = 0.32$) [Table 1]. Within-group comparisons also showed that the patients in the three groups significantly ($P < 0.05$) scored better sleep quality and lower insomnia severity at the end of the 1st month and the 2nd month of the interventions, compared to the time of baseline [Table 2].

DISCUSSION

This study compared the effect of warm water footbath versus Swedish massage on sleep quality and insomnia severity of patients undergoing hemodialysis. The results showed that warm water footbath, effleurage, and petrissage massages could improve sleep quality of patients undergoing hemodialysis and diminish their insomnia severity. In other words, similar changes were observed following the three interventions. This means that warm water footbath is as helpful as effleurage and petrissage massages.

Effectiveness of warm water footbath has been the subject of considerable controversy. Improved sleep latency and sleep duration following warm water footbath^[43,45] has already been reported, which is consistent with the findings of the current study. On the other hand, in some studies, no positive changes were observed for sleep quality^[46] following warm water footbath. This controversy may be attributed to the fact that in such studies, the adopted methodology such as the study population, sample size, measures, time, and duration of interventions were different from those in the current study.

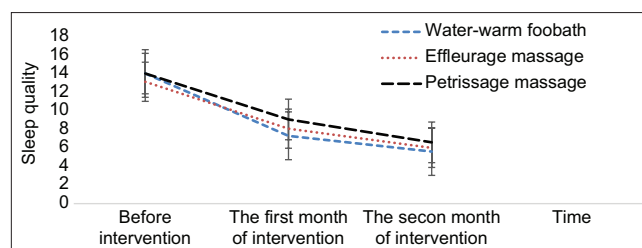
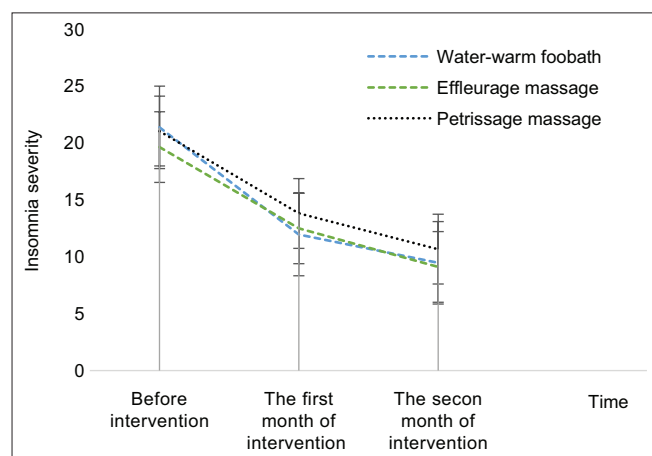


Figure 2: Mean scores for sleep quality by group/time

Table 1: Between-group comparison for mean scores of sleep quality subscales

Sleep quality/time	Group (mean±SD)			Repeated measures ANOVA test		
	Water-warm footbath	Effleurage	Petrissage	Effect size	Observed power	P value group/time
Subjective sleep quality						
T1*	2.7±0.5	2.5±0.5	2.8±0.4	0.04	0.4	0.2
T2*	1.2±0.5	1.3±0.6	1.3±0.5			
T3*	0.9±0.7	0.8±0.6	1.2±0.5			
Sleep disturbance						
T1	2.1±0.5	2.1±0.3	2±0.3	0.02	0.2	0.5
T2	1.3±0.4	1.4±0.5	1.5±0.5			
T3	1±0.2	1.1±0.3	1.1±0.3			
Sleep duration						
T1	1.9±0.5	1.7±0.4	2.1±0.4	0.08	0.5	0.2
T2	1.1±0.3	1.2±0.4	1.6±0.5			
T3	0.9±0.4	1±0.4	1.2±0.5			
Sleep latency						
T1	2.8±0.4	2.6±0.7	2.6±0.8	0.05	0.4	0.2
T2	1.5±0.7	1.6±0.8	1.8±0.8			
T3	0.8±0.8	1±0.7	0.9±0.8			
Daytime dysfunction						
T1	3±0.2	2.9±0.3	2.9±0.3	0.02	0.2	0.6
T2	1.6±0.6	1.7±0.6	1.8±0.6			
T3	1.2±0.8	1.4±0.6	1.3±0.6			
Sleep efficiency						
T1	1.6±0.8	1.3±0.9	1.6±0.9	0.03	0.3	0.4
T2	0.7±0.4	0.8±0.6	0.8±0.5			
T3	0.7±0.4	0.7±0.4	0.6±0.5			

*T1: Baseline, T2: The end of the first month of intervention, T3: The end of the second month of intervention, ANOVA: Analysis of variance, SD: Standard deviation

**Figure 3: Mean scores for insomnia severity by group/time**

To explain improved sleep quality and reduced insomnia following warm water footbath, it can be said that the use of an external source such as warm water footbath could increase local skin temperature and induce a psychological sense of comfort, help patients undergoing hemodialysis to fall asleep and stay asleep, and finally lead to improved sleep quality.

The findings of the present study are also in line with reported sleep quality following effleurage and petrissage massages in both nonhemodialysis and patients undergoing hemodialysis. For example, the benefits of massage therapy for sleep quality of patients with cardiac surgery^[47] and

fibromyalgia^[48] have been reported. A similar study has also reported improvement in sleep quality in patients undergoing hemodialysis after massage therapy.^[49] A study by Unal *et al.*^[50] reported improved sleep quality and reduced fatigue in patients undergoing hemodialysis following foot reflexology and back massage therapy. Improved sleep quality following the vibration and massage therapy^[51] and hot stone massage therapy^[52] have also been observed. The benefits of massage therapy are attributed to biochemical and physiological effects such as increasing local blood flow, skin, and muscle temperature, neurological effects such as increasing pain threshold as well as psychological effects such as improving mood status.^[30]

Although all three interventions statistically improved the quality of sleep and reduced the severity of insomnia and there was no significant difference among patients who received warm water footbath and those who received Swedish massages, however, the observed effect sizes of our study indicate the fact that it is difficult to make a clinical judgment due to low sample size as a main limitation which will be mentioned later. Therefore, further studies with more samples are required to make a better clinical judgment in this area. If future studies confirm that warm water foot bath will be as helpful as massage therapy, it can be said that the use of warm water footbath is more convenient for patients undergoing hemodialysis than Swedish massages. Patients undergoing hemodialysis may unable to receive massage

Table 2: Within-group comparison of mean differences of sleep quality subscales

Sleep quality/time	Group				Pettrissage	
	Water-warm footbath		Effleurage		Mean difference	P
	Mean difference	P	Mean difference	P		
Subjective sleep quality						
T2-T1*	-1.5	0.0018	-1.2	0.001	-1.4	0.001
T3-T1*	-1.8	0.001	-1.7	0.001	-1.5	0.001
T3-T2*	-0.3	0.05	-0.5	0.001	-0.1	0.3
Sleep disturbance						
T2-T1	-0.8	0.001	-0.7	0.001	-0.6	0.001
T3-T1	-0.7	0.001	-0.9	0.001	-1	0.001
T3-T2	-0.1	0.05	-0.2	0.2	-0.4	0.05
Sleep duration						
T2-T1	-0.8	0.001	-0.6	0.001	-0.6	0.002
T3-T1	-1	0.001	-0.6	0.001	-0.9	0.001
T3-T2	-0.2	0.2	0	-	-0.7	0.05
Sleep latency						
T2-T1	-1.3	0.001	-1	0.001	-0.7	0.001
T3-T1	-2	0.001	-1.7	0.001	-1.5	0.001
T3-T2	-0.7	0.001	-0.5	0.05	-0.8	0.001
Daytime dysfunction						
T2-T1	-1.3	0.001	-0.9	0.001	-0.8	0.001
T3-T1	-1.7	0.001	-1.5	0.001	-1.6	0.001
T3-T2	-0.4	0.001	-0.6	0.05	-0.8	0.001
Sleep efficiency						
T2-T1	-0.9	0.001	-0.9	0.001	-0.8	0.001
T3-T1	-1.3	0.001	-1	0.001	-1.2	0.001
T3-T2	-0.2	0.1	-0.1	0.8	-0.4	0.05

T2-T1 is mean scores at the end of the first month of interventions minus mean scores of the baseline, T3-T1 is mean scores at the end of the second month of interventions minus mean scores of the baseline, T3-T2 is mean scores at the end of the second month minus mean scores of the end of the first month of the interventions

therapy due to physical conditions such as arteriovenous shunt, fistula, and Shaldon catheter. Furthermore, warm water foot bath does not require special equipment or professional training compared with massage therapy. These patients are able to do warm water footbath either alone or with the support of their caregivers in their homes when they are trained by nurses of hemodialysis ward.

The present study is one of the very few studies which have been compared the effects of warm-water foot bath with Swedish massage on the sleep quality of patients undergoing hemodialysis. Randomized allocation and relative prolonged intervention could be cited as its strengths. Nonetheless, there are some limitations which should be kept in mind when it comes to generalizing the findings. First, the sample size of the present study was relatively small, which was due to the fact that it was impossible to select more patients undergoing hemodialysis due to the limited population. Therefore, more large-scale studies with patients undergoing hemodialysis or nonhemodialysis are recommended to make more informed clinical judgments.

As a second limitation, for practical reasons, it was not possible for the researchers to directly observe the interventions at home settings. In addition, even if hemodialysis patient's fidelity to the implementation of the specified intervention in their homes was checked

through various means, the interventions were not carried out according to the plan all the time, and minor deviations from the plan are conceivable. Therefore, replication of the study under more controlled conditions is recommended.

Finally, sleep quality is a subjective concept, which makes its evaluation difficult. We used the PSQI to evaluate sleep quality and the ISI to assess insomnia severity. Although these tools are valid and reliable, they involve self-reporting and patient's mental and cognitive status may affect their responses to the items. Even if we were aware of this shortcoming, it was not possible for us to use physiological or objective instruments such as Polysomnography and Actigraphy or ambulatory monitoring to better clinical judgment, which was due to the high costs associated with the latter instruments. Therefore, more studies are required to evaluate the clinical effectiveness of the abovementioned interventions using both objective and subjective measures.

CONCLUSION

Warm-water foot bath was as effective as Swedish massage including effleurage and petrissage massage to improve sleep quality and insomnia severity of patients undergoing hemodialysis. These findings may be opened a new avenue for further investigations to determine whether the same findings are replicated. This means that we need

to examine the effectiveness of alternative therapies, as the comparative studies on the effectiveness of drugs are conducted. If the results of this study are confirmed by future researches, warm water footbath can be suggested to patients undergoing hemodialysis as a simple method to improve their sleep quality. In this case, nurses will be able to sharing with hemodialysis patients who to alternative choices to improve sleep quality or the patients who are unable to take chemical drugs or are allergic to them.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

Ardashir Afrasiabifar (1 author), methodologist, statistical analyst and supervisor of the research process, (35%), Shekoofeh Hamzhiakia (2 author), senior researcher, data collection, introduction, discussion of the manuscript (35%), Asadolah Mosavi, (3 author) assistant researcher, introduction, discussion of the manuscript (15%), Sima Mohammad Hossini (4 author), assistant researcher, introduction, discussion of the manuscript (15%).

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