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The effect of foot reflexology massage on pruritus in hemodialysis patients

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Abstract:

BACKGROUND: Pruritus is a common skin manifestation in patients undergoing hemodialysis. Pruritus has a negative impact on the quality of life of patients receiving hemodialysis. This study was aimed to investigate the effect of foot reflexology massage on pruritus in hemodialysis patients.

MATERIALS AND METHODS: A quasi-experimental study was conducted on 90 hemodialysis patients referred to Khatam-al-Anbiya and Ali-Ebne Abi-Taleb hospitals affiliated to Zahedan University of Medical Sciences in 2019. Patients with moderate-to-severe pruritus scores obtained from the Pruritus Severity Scale (PSS) were included in the study. They were randomly divided into intervention and control groups using shuffling cards or envelopes. The intervention group received nine sessions of foot reflexology massage 3 days a week for 20 min (10 min on each foot) with an emphasis on the solar plexus point. The participants in both groups again completed the PSS 48 h after the intervention. Data were analyzed using the SPSS version 24, independent *t*-test, Chi-square test, and paired *t*-test.

RESULTS: The results of this study demonstrated that foot reflexology massage significantly reduced itching or pruritus in hemodialysis patients ($P < 0.001$). Pruritus scores in the control group were statistically significant ($P < 0.001$). There was no significant statistically difference between the two groups in terms of the pruritus scores before the intervention ($P = 0.59$).

CONCLUSION: Our findings showed that the foot reflexology massage could relieve itching or pruritus in hemodialysis patients. It is, therefore, recommended that it can be used as an effective intervention technique to alleviate itching in hemodialysis patients.

Keywords:

Kidney, massage, pruritus, reflexology

Introduction

Renal failure (RF) is a medical condition characterized by with the accumulation of the toxic metabolic waste products in the body when the kidneys fail to function and cause the fluid and electrolyte disorders or acid–base balance, leading to elevated creatinine levels in the blood.^[1] The number of hemodialysis patients is estimated to reach 3,500,000 by 2020. The annual growth rate of this disease is nearly 12% in Iran, which is greater than the global mean.^[1] As reported by the Nephrology and Kidney Transplantation Research Center

of Iran, approximately 29,000 patients with chronic RF were treated at the end of 2007, 14,000 (48.5%) of whom were under hemodialysis. At the end of 2011, the number of patients with chronic kidney disease (CKD) was about 40,000 in Iran.^[2] The number of hemodialysis patients increased by 15%–17% per year in Iran has necessitated more attention to their problems.^[3] Hemodialysis is considered as an appropriate alternative therapy for patients with RF, accompanied by several complications, such as psychosocial problems (e.g., job loss, the decrease in income, decreased energy, reduced sexual desire, a decline in movement,

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and reduced life expectancy), physical problems (e.g., anemia, restless legs syndrome, musculoskeletal disorders, and gastrointestinal disorders), and skin disorders (e.g., pruritus or itching) which can reduce the quality of life (QoL) in these patients and cause depression.^[4] Dryness and itching are considered as the most common skin manifestations in hemodialysis patients.^[5] Pruritus not only disturbs the sleep-wake cycle, but also contributes to the anxiety, depression, and disruption of daily life and it can also have a negative impact on the people's QoL.^[4,5] Furthermore, numerous studies have reported that pruritus often occurs in patients with chronic RF (15%–49%) and is present in the majority (50%–90%) of patients with end-stage renal disease on dialysis, which is more common in hemodialysis patients than those with peritoneal dialysis (42% vs. 32%, respectively).^[6] Another study conducted in Iran showed that pruritus was observed in 41.9% of dialysis patients, and its intensity was mild, moderate, and severe, in 51.4%, 11.4%, and 37.7% of patients, respectively.^[2] Although the pathophysiology of pruritus in patients with chronic RF is still unknown, various hypotheses have been proposed to justify it.^[7] Causes of pruritus include dry, atrophic skin, the proliferation of pili muscles, atrophy of the sebaceous glands, sweating, secondary hyperparathyroidism, calcium accumulation, magnesium and phosphorus in skin, iron deficiency anemia, the accumulation of bile acids, and the sensitivity to dialysis fluid.^[8] Other causes of pruritus are as follows: dry, atrophic skin of uremic pruritus, skin pH, and peripheral neuropathy.^[9,10] Therefore, several theories have been proposed to relieve itching or pruritus, including the intravenous administration of lidocaine or heparin, oral administration of activated charcoal, a low-protein diet, magnesium free dialysis, electrical needle stimulation, parathyroidectomy, and ultraviolet radiation.^[11]

Dialysis may also have little effect on pruritus relief in patients with chronic RF.^[2] Kidney transplantation is the definitive cure for pruritus.^[7] Despite advances in dialysis techniques and the treatment of pruritus in hemodialysis patients, the medications are commonly used to relieve pruritus. Drug therapy has partially reduced itching in hemodialysis patients. However, a medication may be dangerous or defective due to drug-induced renal impairment which can result in the accumulation of the drug or its metabolites in the body. Drug metabolites may cause constipation, osteomalacia, encephalopathy, and cardiovascular diseases (CVDs) in hemodialysis patients.^[12] On the other hand, these treatments will incur additional costs for the patient. Therefore, nonpharmacological approaches that are readily available and cost-effective due to lower complications can serve to treat hemodialysis patients. Regardless of cause, the pathophysiological response of pruritus

to stimulation or irritation follows a similar pathway.^[13] One theory that has been proposed in this regard is the intensity theory of pain. According to the intensity theory of pain, low-level activation of nociceptors can induce itching, whereas a higher stimulation rate can provoke pain.^[14] Neurophysiological studies have confirmed the existence of very sensitive, rapidly adapting nerve endings that elicit only the tickle and itching sensations. Moreover, these nerve endings are observed almost exclusively in the superficial layers of the skin, which is only tissue elicited from the feelings of tickle and itch. These sensations are transmitted by very small type C, unmyelinated fibers similar to those that transmit pruritus, slow type of pain.^[15] Thus, a similar pattern of sensitization of peripheral sensory neurons during chronic pain and itching supports support the combination of itch and pain research and also suggest that well-established therapeutic techniques for pain can also be validated in chronic itch conditions.^[16] One of these therapies is the use of complementary or alternative medicine (CAM). The CAM has recently received much attention.^[17] Many complementary therapies are used for the patients with chronic RF, including therapeutic touch, massage therapy, counseling strategies, music therapy, and reflexology massage.^[18] Complementary therapies such as reflexology massage may be effective in reducing the signs and symptoms of this disease. Evidence of reflexology treatments can also be traced back four thousand years ago to China and 2330 BC to Egypt.^[19] Reflexologists believe that our feet and hands act as mirror images of the body.^[20] Foot reflexology is an avenue for human touch, can be performed anywhere, requires no special equipment, is noninvasive, and does not interfere with patients' privacy.

Numerous studies to date have investigated foot reflexology massage as a noninvasive nursing intervention to reduce the problems for dialysis patients. However, to our knowledge, no studies have examined the effects of foot reflexology massage on pruritus. Therefore, the aim of this study was to investigate the effect of foot reflexology massage on pruritus in hemodialysis patients referred to hospitals affiliated to Zahedan University of Medical Science during 2019.

Materials and Methods

A quasi-experimental study was conducted on 90 hemodialysis patients referred to Khatam-al-Anbiya and Ali-Ebne Abi-Talib hospitals affiliated to Zahedan University of Medical Sciences in 2019. Ethical approval for this study was obtained from the ethical committee of the research council of the Zahedan University of Medical Sciences (Ref No.: IR.ZAUMS.REC.1398.186). A permission letter was obtained from the Deputy of Research of Comprehensive Specialized

Hospitals (Khatam-al-Anbiya and Ali-Ebne Abi-Taleb Hospitals) and allowance was provided by the medical directors.

Ethical considerations

Written informed consent was obtained from all participants. The purpose of the study was explained to study participants before providing informed consent form. Informed consent form includes information shared by subjects who understand the information given, and they voluntarily agree to participate in this study. The researchers assured confidentiality of subjects by desisting from writing names, initials or hospital numbers, Information shared by the subjects included the following: The research procedure, purposes of the study, risks and anticipated benefits, and a statement offering the subjects the opportunity to ask questions and to withdraw at any time from the research. The ethical statement was carried out in accordance with the principles of the declaration of Helsinki.

Then patients who met the inclusion criteria were randomly assigned to either an intervention group or a control group. Shuffling cards or envelopes were used for randomization. In order to randomly assign the participants into both groups, 90 envelopes were prepared containing 45 blue and 45 green cards. The severity of pruritus was then measured using pruritus severity scale (PSS).

The study inclusion criteria were as follows: Age between 18 and 65 years, those undergoing hemodialysis for at least 3 months, three times a week for 3–4 h, having healthy feet, those with diabetes duration <10 years, and a pruritus score of 17 or above based on the PSS. The study exclusion criteria included the following: presence of foot ulceration or a previous history of surgery of the sole of the foot, having a mental disorder that disables the patient's self-protection, a history of neuromuscular disorders, a history of skin allergy, being pregnant, those undergoing peritoneal dialysis, being absent for two consecutive sessions during the study, hemodynamic complications during hemodialysis (e.g., hypotension leading to changes in one's mood), and being sensitive touch or tickling. The sample size was calculated based on similar studies.^[10] In this study, the total sample size was 90 ($n = 45$ for each group) [Chart 1]. Data collection tools included demographic information form, clinical information, and PSS based on the method proposed by Duo,^[21,22] and interview. Pain intensity was measured and recorded in both groups at the beginning of the study. Patients with a pruritus score of 17 or above were included in the study. The intervention was performed three times per week for 3 weeks. The severity of pain or itching was measured and recorded in both groups 48 h after the final intervention. The intervention group

received foot reflexology massage as follows: The patients were first laid back, and then the researcher performed a 10-min massage on their foot (including 2 min of general foot massage, 3 min of 3 min of massage performed on the three reflexology areas of solar plexus, then 2 min rest and 3 min of massage performed on the three reflexology areas of solar plexus). The applied pressure was about 3–4 kg/cm², using the thumb. All statistical analysis was performed using SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp. Using the descriptive statistics, frequency, percentage, mean, standard deviation, minimum, and maximum were determined. The Shapiro–Wilk test was used for the data normality. The paired *t*-test was used to compare the after-before mean values between the intervention and control groups. The independent *t*-test was used to compare the means between both groups. Chi-square test was employed to compare the frequency of qualitative variables between the two groups.

The $P = 0.05$ was considered statistically significant. This study was not limited.

Foot reflexology massage of the soles of the feet as a method that is not harmful to patients is may help reduce the itching in hemodialysis patients.

Results

No statistically significant differences were observed between two groups with respect to sex, marital status, age, the use of antihistamine, the use of calcium carbonate, and underlying diseases [Table 1]. There was not statistically significant difference between the two groups in terms of phosphorus levels and duration of dialysis [Table 2]. 42.2% of participants in intervention group and 73.3% of control group subjects were literate. The results of the independent *t*-test showed that there was a statistically significant difference between the two groups with respect to literacy level ($P = 0.001$). The mean and standard deviation of itching scores in the intervention group decreased from 25.4 ± 5.19 before the intervention to 1.47 ± 2.53 after the intervention, which were statistically significant ($P < 0.001$). The mean itching scores in the control group increased from 22.29 ± 5.1 – 24.58 ± 4.66 , which were statistically significant ($P < 0.001$). No statistically significant difference was found between the two groups in terms of pruritus scores before the intervention ($P > 0.05$) [Table 3].

Discussion

The present study aimed to investigate the effect of foot reflexology massage on pruritus in hemodialysis patients referred to hospitals affiliated to Zahedan University of Medical Sciences in 2019. Regarding demographic

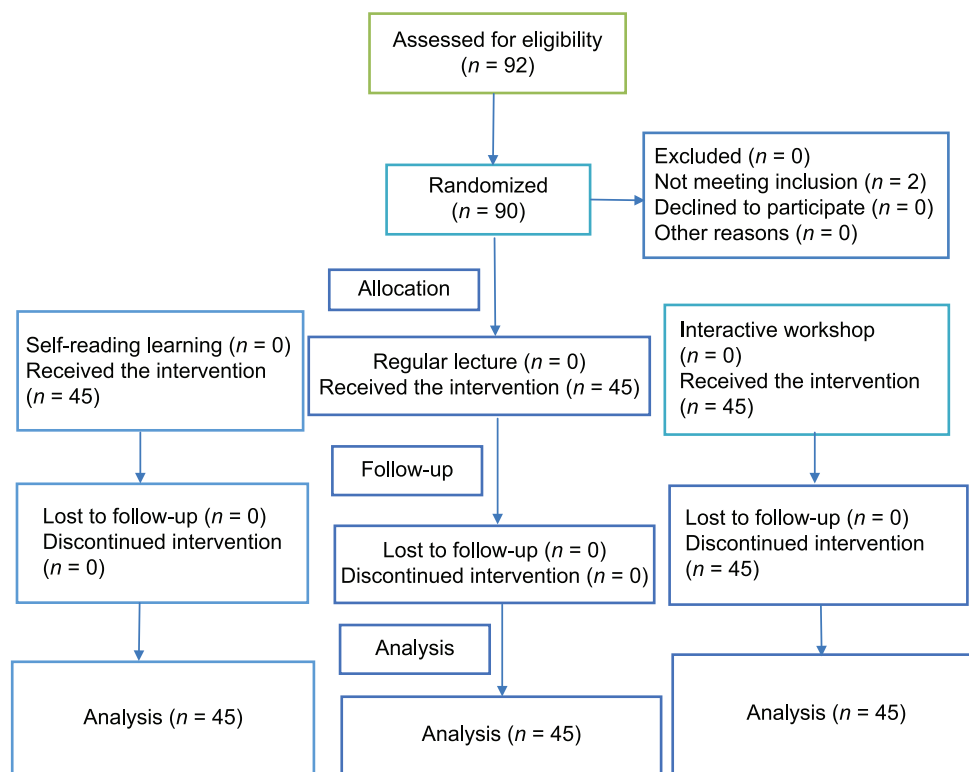


Chart 1: Consort chart

Table 1: Background and health-related variables of participants in the intervention and control groups before intervention

Variable	Group, frequency (%)		The Chi-square test result (P)
	Intervention group	Control group	
Male	23 (51.1)	24 (53.3)	0.83
Female	22 (48.9)	21 (46.7)	
Married	38 (84.7)	37 (82.2)	0.77
Single	7 (15.6)	8 (17.8)	
Housewife	23 (51.1)	19 (42.2)	0.39
Others	22 (48.9)	26 (57.8)	
Diabetes	10 (22.2)	12 (26.7)	0.79
Hypertension	15 (33.3)	15 (33.3)	
Diabetes - hypertension	7 (15.6)	4 (8.9)	
Other diseases	13 (28.9)	14 (31.1)	
Illiterate	26 (57.8)	12 (26.7)	0.001
Literate	19 (42.2)	33 (73.3)	
The use of calcium carbonate			
Yes	34 (75.6)	35 (77.8)	0.06
No	11 (24.4)	10 (22.2)	
The use of antihistamine			
Yes	13 (28.9)	7 (15.6)	0.12
No	32 (71.1)	38 (84.4)	

findings, the results of Chi-square test showed that 47 participants were male and 46 were female, of whom 23 were males and 22 females in the intervention group, 24 males and 21 females in the control group.

The mean age of participants in the intervention group was 43.96 ± 15.88 years. The mean age of participants in

the control group it was 45.07 ± 14.52 years.

Our results showed that the percentage of literate patients in the control group was higher than the intervention group, which might be due to random sampling and having no effect on the research results. The mean phosphorus levels in both groups indicated

Table 2: Duration of dialysis and phosphorus level of the participants in the intervention and control groups before intervention

Variable	Mean±SD of both groups		Independent t-test result (P)
	Intervention group	Control group	
Duration of dialysis by year	3.92±3.14	3.77±3.28	0.79
Phosphorus level	5.5±1.24	5.5±1.18	0.56

SD=Standard deviation

Table 3: Pruritus severity scores of the participants in the intervention and control groups before and after intervention

Group	Duration (mean±SD of pruritus scores)			Paired t-test result
	Before the intervention	After the intervention	Changes	
Intervention group	25.4±5.19	1.47±2.53	-23.93±5.6	t=28.63, df=44, P=0.001
Control group	22.29±5.17	24.58±4.66	2.28±1.8	t=-8.51, df=44, P=0.001
Independent t-test	t=2.84, df=88, P=0.59	t=-29.2, df=88, P=0.001	t=-29.86, df=88, P=0.001	

SD=Standard deviation

that increased phosphate levels might be effective in relieving the patients t. There was no age difference between the two groups. 77.8% of participants in the intervention group consumed calcium and 75.6% of the control group subjects consumed calcium carbonate.

Overall 28% participants in the intervention group and 15.6% in the control group used antihistamines to treat itching before the intervention. No statistically significant difference was found between the two groups in terms of duration of dialysis. There was no significant difference between the two groups with respect to marital status and employment.

A total of 90 metallurgical patients were divided into the intervention and control groups based on the criteria for entry into the study. Overall, 45 patients were placed in each group and examined before and 48 h after the intervention. The results of the present study showed that participants in both groups had a significant average score of itching in favor of moderate-to severe itching before the intervention. Also, the mean pruritus scores of the participants in the control group showed increased severity of itching in this group after 3 weeks. The mean pruritus scores of the participants in the intervention group were changed from 25.4 ± 5.19 to 1.47 ± 2.53. These changes showed that foot reflexology massage reduced the mean pruritus intensity score of patients, indicating an improvement in the itching status in the intervention group. Comparing the mean itching scores of the intervention group before and after the intervention showed a significant difference. In order to meet the purpose of the study, itching scores of the participants in both groups were compared before and after the intervention. The mean and standard deviation of the pruritus severity scores of participants showed that participants in the control group had pruritic disorders before and after the intervention and this process has been progressive. The itching severity

score was decreased in the intervention group after the intervention.

Our findings showed that reflex massage of the sole of the foot could reduce the pruritus severity in hemodialysis patients. Refractory massage causes the secretion of endorphins and reduces pain. Itching receptors are the same as slow pain receptors.^[15] It can be said that foot massage reduced and relieved itching in hemodialysis patients by stimulating the secretion of endorphins.

Shahgholian *et al.*, conducted a study titled “ Effect of Aromatherapy on Pruritus Relief in Hemodialysis Patients ” and found that the mean pruritus scores after aromatherapy and before aromatic aromatherapy were decreased in both groups, which is not statistically significant.^[23] Aromatherapy with and without aromatics can significantly relieve itching in hemodialysis patients, which confirms our results Khorsand *et al.* (2019) conducted a study entitled “The effect of massage with violet oil on the severity of itching and dry skin in hemodialysis patients” and the results showed that massage with violet oil reduces the severity of itching and dry skin in these patients.^[24] which was consistent with our findings. In their study, Nazemzadeh *et al.* (2019) investigated the effect of foot reflexology massage on pain intensity in patients with chronic low back pain and the results demonstrated that foot reflexology massage could reduce pain intensity in these patients.^[25] As itching receptors are known as slow pain receptors; therefore, findings of their study are consistent with the findings our study. But their study population was different from that of our study. We did not find any studies showing that foot reflexology massage is effective in reducing itching in dialysis patients.

Conclusion

Pruritus is a common skin manifestation in patients undergoing hemodialysis. It not only disturbs the

sleep-wake cycle, but also contributes to the anxiety, depression, and disruption to activities daily of living. Itching negatively affects QoL of patients receiving hemodialysis. Foot reflexology massage may be effective in the reduction of severity of itching in hemodialysis patients; therefore, it is recommended that this technique can use to reduce the itch severity in hemodialysis patients and eliminate the negative effects which may have on their QoL.

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Conflicts of interest

There are no conflicts of interest.

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