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Comparing the effects of warm footbath and foot reflexology on depression of patients undergoing radiotherapy: A randomized clinical trial

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ABSTRACT

Background: Cancer diagnosis not only impacts physical health but also mental well-being, often leading to significant stress, fear, and depression among patients.The utilization of CAM has shown a rising trend, influenced by the availability of different modalities offered by healthcare services, sometimes in an ad hoc fashion. This study seeks to examine and compare the respective impacts of warm foot baths and foot reflexology on depression in patients undergoing radiotherapy.

Methods: A randomized clinical trial was conducted at Mashhad University of Medical Sciences in Iran in 2019, following CONSORT guidelines. Participants included non-metastatic cancer patients aged 18–60 undergoing a 28-day radiotherapy course. Patients were randomly assigned to receive either warm footbaths or foot reflexology as interventions, performed daily for 20 min over 21 days. The data were analyzed using appropriate statistical tests.

Results: Statistical analysis indicated no significant differences in demographic attributes between the two groups. Both interventions led to a significant reduction in depression scores post-treatment compared to pre-treatment assessments. Foot reflexology showed a greater reduction in depression scores compared to footbaths with warm water.

Conclusions: Both warm footbaths and foot reflexology are effective in alleviating depression in patients undergoing radiotherapy, with foot reflexology showing a greater impact on improving depression levels. The study recommends foot reflexology as a preferred intervention for managing depression in these patients if conditions and facilities permit.

Introduction

Cancer not only impacts physical health but also mental well-being, leading to considerable stress upon diagnosis. Stress is a broader state of mental health that encompasses various emotional responses, including anxiety, tension, and worry. The emotional response to a cancer diagnosis includes fears of losing independence, societal roles, economic stability, and facing premature death, often evoking emotions such as denial, anxiety, anger, or guilt among patients. Depression is a common symptom in cancer patients due to the challenges of the diagnosis and treatment process [1–3]. In the general population, depression rates vary widely, with approximately 4.4 % of the global population being affected [4]. However, the prevalence of depression is notably higher in cancer patients, influenced by the definition of depression used and the characteristics of the study sample [5]. Recent research suggests that between 8 % to 24 % of cancer patients in non-palliative care settings experience depression. However, in palliative care and oncology settings, the prevalence of depression is notably higher [6]. In addition, it is estimated that up to 20 % of patients may exhibit depressive symptoms at the time of cancer diagnosis [3]. While depression may be less

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common than anxiety among adults with cancer, the presence of depressive symptoms has been linked to worse cancer outcomes [7]. A *meta*-analysis revealed a 39 % increase in mortality among cancer patients diagnosed with depression and a 25 % increase in mortality risk among those displaying depressive symptoms, even after accounting for other prognostic factors [8].

The connection between depression and cancer prognosis highlights the crucial need for implementing successful approaches to identifying and addressing symptoms of depression in cancer patients [9]. Among the treatment options for depression are antidepressants, which can lead to common side effects like weight gain, changes in appetite, dry mouth, sleep disturbances, and sexual issues, among others [10]. Besides antidepressants, other methods for treating depression include psychotherapy, cognitive-behavioral therapy (CBT), lifestyle modifications such as exercise and dietary changes, and the use of other medications like mood stabilizers or antipsychotics when necessary [11]. Additionally, complementary and alternative medicine (CAM) approaches, including yoga, meditation, and acupuncture, have gained attention for their potential benefits in alleviating depressive symptoms [37,38,12–16]. CAM is often considered advantageous due to its holistic approach, minimal side effects, and focus on improving overall well-being rather than just alleviating specific symptoms [17–19].

Complementary and alternative medicine (CAM) holds significance in the field of palliative care [11]. The utilization of CAM has shown a rising trend, influenced by the availability of different modalities offered by healthcare services, sometimes in an ad hoc fashion [11,12]. As a result, it is essential to identify the most effective CAM modalities for each scenario through rigorous clinical studies comparing their efficacy [17].

Reflexology is a gentle and safe form of complementary therapy that is widely favored among individuals with serious health conditions, notably those diagnosed with cancer [20]. Foot reflexology encompasses the technique of applying pressure, typically with the thumb and fingers, on specific reflex points located on the feet. Proponents of reflexology suggest that manipulating these points can influence the physiological responses of corresponding organs [21]. This therapy aims to enhance patient comfort through the induction of physiological alterations; by exerting pressure on these reflex areas, numerous nerve endings in the soles are activated, triggering the release of endorphins. This process helps block the transmission of pain signals, promotes comfort, reduces tension, and fosters a sense of tranquility [22]. Reflexology is particularly beneficial for radiotherapy patients as it provides a non-invasive method to alleviate both physical and emotional symptoms associated with the treatment, including pain, fatigue, and stress. The regular sessions of reflexology can contribute to a more relaxed state, thereby potentially improving the overall quality of life and mental health of patients undergoing such intense treatment regimens.

Foot bathing is a commonly utilized nursing intervention practiced in various countries, which entails soaking the feet in water maintained at temperatures ranging from 40 °C to 43 °C for durations spanning from 10 to 30 min [23]. Research has demonstrated the beneficial impact of foot bathing in enhancing autonomic function [24], as well as improving sleep quality and promoting relaxation [25].

While both warm foot baths and foot reflexology have shown efficacy in alleviating depression among patients [26,27], there is currently a lack of research comparing the effects of these two interventions on depression levels in patients undergoing radiotherapy. This study seeks to examine and compare the respective impacts of warm foot baths and foot reflexology on depression in patients undergoing radiotherapy.

Methods

Trial design

In 2019, a randomized clinical trial was carried out at Mashhad University of Medical Sciences in Iran. The study adhered to the CONSORT guidelines, outlined in Fig. 1. Participants were selected from cancer patients receiving radiotherapy and residing at the guest house affiliated with the Reza Oncology and Radiotherapy Center in Mashhad, Iran (Fig. 1).

Participants

The study included conscious individuals aged 18–60 with non-metastatic cancer undergoing a 28-day radiotherapy course, who resided at the guest house of the Reza Oncology and Radiotherapy Center and provided a contact number for follow-up.

Exclusion criteria encompassed patients with peripheral vascular thrombosis, Berger's disease, diabetes, foot wounds or infections, reduced peripheral sensation, neurologic disorders leading to foot spasms in water immersion (such as multiple sclerosis), concurrent chemotherapy, major stressful events (e.g., death of a close family member, divorce, major financial loss, or severe illness of a close relative), disease exacerbation necessitating specialized care, radiotherapy postponement, confirmed metastasis, or alterations in treatment protocols. Major stressful events were assessed through patient interviews and consultations with attending psychologists using standardized tools such as the Holmes and Rahe Stress Scale.

Intervention

In both groups, the intervention started on the seventh day of radiotherapy and continued every night for 21 days. The duration of the intervention was about 20 min, which was one hour before sleep (between 21:00 and 22:00).

Footbath group

In the footbath group, patients submerged their feet up to a depth of 10 cm in water within a plastic container measuring 40 × 27 × 45 cm (Limon brand, model 3 manufactured in Iran) at a temperature range of 41–42 °C for a duration of 20 min each night, one hour before their regular bedtime (between 21:00 and 22:00), commencing from the seventh day of radiotherapy and continuing for a period of two weeks. The researcher monitored the water temperature using a thermometer (TROTEC brand, model BT20 manufactured in Germany).

Reflexology group

In the foot reflexology group, patients received a 20-minute massage with olive oil (Ghonche brand, refined model produced in Iran) each night, starting from the seventh day of radiotherapy and lasting for two weeks. The reflexology session was conducted by a researcher with a certification obtained after completing 30 h of theoretical and practical training. The researcher focused on massaging specific areas connected to the first metatarsal bone, solar plexus, toe, pituitary gland, and pineal gland. Each foot received a 10-minute massage, including one minute of general foot massage followed by three minutes of targeted massage for each area. The massage techniques employed encompassed effleurage (gentle circular strokes), petrissage (kneading movements), friction (rubbing strokes), vibration (gentle shaking movements), and tapotement (light tapping). The researcher maintained a pressure of 4–5 kg by calibrating hand pressure using a digital scale before each session. Positioned on a chair at the foot of the bed, the researcher instructed the patient to lie supine to enable access to the soles of both feet. Prior to the massage, the researcher removed all hand accessories and ensured trimmed nails for optimal comfort.

Outcomes

A demographic survey was employed to gather data on patients' demographic attributes and medical history, including age, gender,

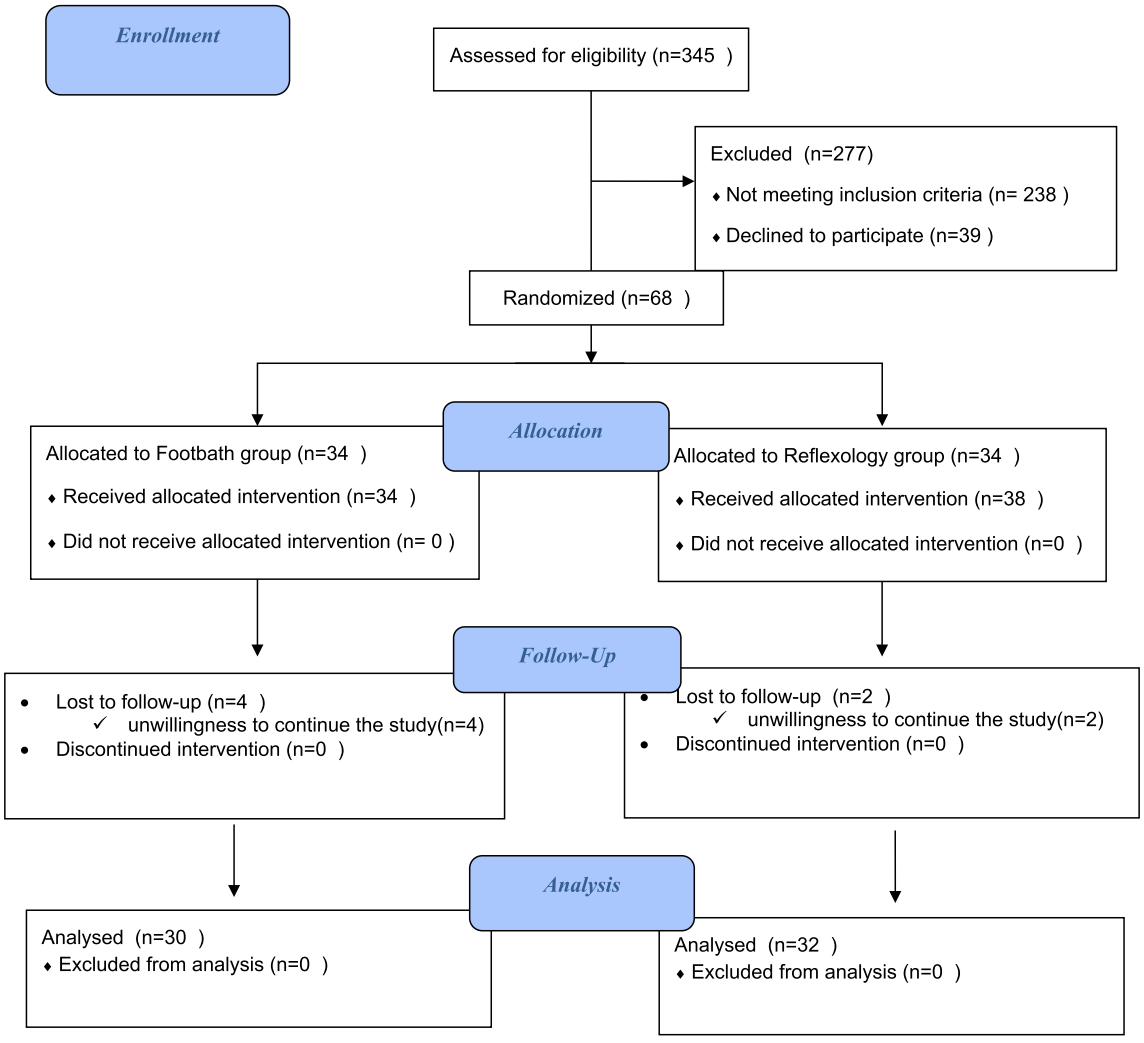

Fig. 1. The CONSORT checklist of study.

marital status, and type of cancer. This survey was completed based on the information gathered during interviews or from patients' medical records. The Beck's Depression Questionnaire was utilized to evaluate the severity of depression. This questionnaire consists of 21 questions categorized into cognitive, physical, and behavioral sections, providing a comprehensive assessment of depression from a cognitive standpoint. Each question is rated from zero to 3, resulting in a total score ranging from zero to 63. Depression levels are classified as follows: no depression (scores 0–13), mild depression (scores 14–19), moderate depression (scores 20–28), and severe depression (scores 29–63). The validity of this questionnaire was validated in a study by Beck and colleagues, and its reliability was reported by Mohsen Abadi and Fathi Ashtiani [28]. In the present research, the questionnaire's reliability was assessed to be 0.81 [29].

Content validity of the Persian version of Beck's Depression Questionnaire was evaluated by ten nursing faculty members from the School of Nursing and Midwifery at Mashhad University of Medical Sciences with PhD degrees in nursing, and their feedback was considered in the final analysis. The reliability of the Persian version of Beck's Depression Questionnaire was determined to be 0.86 through test–retest with 10 participants.

Beck's depression questionnaire was completed on the seventh day of radiation therapy (pre-test) and on the twenty-eighth day of radiation therapy (post-test) by patients in a quiet room next to the radiotherapy department.

Sample size and randomization

The initial estimation of the sample size was carried out by analyzing similar studies and considering factors like comparison of means, 95 % confidence level, and 80 % test power. Initially, a sample size of 29 per group was calculated. However, to accommodate potential dropout rates, 34 patients were recruited for each group. During the course of the study, individuals from both the footbath and reflexology groups dropped out for various reasons. Consequently, a total of 62 participants, with 30 in the footbath group and 32 in the reflexology group, remained in the study.

Qualified patients were randomly assigned to either the footbath or reflexology groups using randomly generated sequences obtained from a randomization website.

Statistical methods

Data analysis was conducted utilizing SPSS 20 software. Descriptive statistics such as frequency distribution, mean, and standard deviation were employed to present and summarize the data. In addition, inferential statistics including the chi-square test, exact chi-square test, independent *t*-test and Paired *T*-test were utilized to assess the hypotheses. The normality of quantitative variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. All statistical analyses were carried out at a confidence level of 95 % and a significance level of 0.05.

Results

The average ages of participants in the reflexology and footbath groups were 44.3 ± 10.9 and 46.9 ± 9.5 years, respectively. In the reflexology group, 59.4 % of patients (N=19) were women, while in the footbath group, 46.7 % (14 individuals) were women. Statistical analysis indicated that there was no significant difference between the two groups concerning age, gender, marital status, and type of cancer ($p < 0.05$) (Table 1).

The mean depression scores and standard deviations were calculated for patients in both the Reflexology and Footbath groups. Prior to the intervention, the mean depression score for the Reflexology group was 11.53 (SD=0.9) and for the Footbath group was 11.23 (SD=1.0), with a non-significant P-value of 0.227. After the intervention, the mean depression score for the Reflexology group decreased to 8.9 (SD=0.8) and for the Footbath group decreased to 9.5 (SD=0.7), with a significant P-value of 0.006. The difference between post-test and pre-test scores was −2.5 (SD=0.7) for the Reflexology group and −1.70 (SD=0.7) for the Footbath group, with a highly significant P-value of less than 0.001 for both groups. The results of the intragroup tests also showed a significant reduction in depression scores for both the Reflexology and Footbath groups, with P-values less than 0.001 (Table 2).

Discussion

The present study compared the effects of warm foot baths and foot reflexology on depression in patients undergoing radiotherapy. Both interventions were found to improve depression, with foot reflexology being more effective. The enhanced effectiveness of foot reflexology may be due to its relaxing and stress-relieving effects, as it stimulates specific points on the feet connected to various body parts and systems, thereby regulating mood and emotional well-being.

Several studies have reported similar findings regarding the benefits of foot reflexology and foot baths. Wei-Li Wang et al. (2020) found that foot reflexology significantly improves symptoms of depression, anxiety, and sleep quality in adults, consistent with our results [30]. Sinem Göral Türkcü et al. (2021) also demonstrated that reflexology effectively reduces anxiety and depression levels in women with cancer, improving their quality of life [31]. These findings align with our study, indicating the mental health benefits of reflexology through relaxation and emotional support.

Choi et al. (2015) reported lower levels of fatigue and depression in the foot reflexology group compared to the control group, which supports our observation of significant depression reduction in the reflexology group [32]. Noh et al. (2019) found that foot reflexology reduces anxiety and depression in cancer patients without any associated harm, further validating the safety and effectiveness of this intervention [33].

Table 1
Sociodemographic characteristics of the patients.

Characteristics		Group		P value
		Reflexology	Footbath	
Average Age (year)		Mean(SD)	Mean(SD)	P=0.327*
		44.34 ± 10.91	46.93 ± 9.51	
		N(%)	N(%)	P=0.316**
Gender	Male	13(40.6)	16(53.3)	
	Female	19(59.4)	14(46.7)	
Marital Status	Single	10(31.2)	8(26.7)	P=0.846***
	Married	22(68.8)	22(73.3)	
Type of cancer	Breast	13(40.6)	7(23.3)	P=0.752***
	Lung	7(21.9)	8(26.7)	
	Digestive system	9(28.2)	13(43.3)	
	Bladder	2(6.3)	2(6.7)	
	Gynecologic	1(3.1)	0(0.0)	

*Independent *t*-test ** Chi-square *** Exact chi-square.

Table 2
The mean and standard deviation of the depression score of the studied patients in the two groups of Reflexology and Footbath.

Depression score	Footbath Mean(SD)	Reflexology Mean(SD)	P-value
Pre test	11.23 ± 1.0	11.53 ± 0.9	P=0.227
Post test	9.5 ± 0.7	8.9 ± 0.8	P=0.006
The difference between post-test and pre-test	−1.70 ± 0.7	−2.5 ± 0.7	P<0.001
The result of the intragroup test	P<0.001	P<0.001	

*Independent *t*-test ** Paired *T*-test.

Regarding foot baths, Hsu et al. (2018) showed that foot baths significantly reduce the severity of depression and suicidal ideation in patients, with a relationship between the frequency of foot baths and reduced anxiety levels [26]. Hyun-Jung Park et al. (2021) demonstrated that thermal therapies with underground water foot baths improve chronic pain, depression, and anxiety, with physical relaxation leading to mental relaxation [34]. Bok Soon Kim et al. (2021) found that scented foot baths significantly lower physical and psychological stress, suggesting that the combined physical and emotional benefits of foot baths contribute to improved well-being [35].

Additionally, Kshetrimayum Rebis et al. (2019) reported a significant increase in well-being scores among elderly participants receiving warm water foot baths, indicating the intervention's ability to enhance relaxation, physical comfort, and overall well-being, consistent with our findings [36].

Both foot reflexology and warm water foot baths have been shown to reduce depression and improve mental health, with foot reflexology being relatively more effective. Thus, while both methods are beneficial, foot reflexology is preferred if the necessary conditions and facilities are available.

The strengths of this study include its focus on patients undergoing radiotherapy, a population in great need of psychological support, and the comparison of two different methods (foot baths with warm water and foot reflexology) for their impact on depression. This study provides clear results demonstrating the effectiveness of both methods in improving the mental condition of patients.

However, this study had several limitations. Environmental factors such as light, sound, and various activities may have different effects on the factors under investigation, potentially impacting the reliability of the results. The withdrawal of some participants from both study groups may have affected the power of inference and the credibility of the final results. Controlling for the stability and adherence to the study protocol for some patients was challenging, impacting the study results. Finally, the absence of a control group without any intervention raises the question of whether the level of depression could have decreased over the 21 days with regular patient care alone. It is possible that standard care practices and support mechanisms available at the facility, such as support groups or other forms of psychosocial support, could have contributed to the observed decrease in depression levels. Future studies should include a control group to better isolate the effects of the interventions.

Conclusion

The results of the present study showed that both foot baths with warm water and foot reflexology can improve depression in patients undergoing radiotherapy. However, the effect of foot reflexology on improving the depression status of patients undergoing radiotherapy is greater than foot baths with warm water. Therefore, it is recommended to perform foot reflexology if conditions and necessary facilities are available.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics Approval and Consent to Participate.

This study was approved by the ethics committee of Mashhad University of Medical Sciences (IR.MUMS.NURSE.REC.1398.022) and complied with the Declaration of Helsinki; informed consent has been obtained from the subjects. The study purpose and importance were explained to participants, who met the inclusion criteria, and they signed the written informed consent form. Patients were informed that they are free to leave the study anytime without any effect on their treatment plan should they wished to do so. All methods were performed in accordance with the relevant guidelines and regulations, which are aligned with the Declaration.

Consent for Publication.

Not applicable.

Conflict of Interest.

The authors declare that there is no conflict of interest in the publication of this article.

Author's Contributions

All authors have read and approved the manuscript. Study design: MR, SRM; data collection and analysis: HBT, MR; manuscript preparation: MN, SM.

Availability of Data and Materials.

The datasets generated in the present study are available from the corresponding author upon reasonable request.

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