

# Effects of Reflexology on Anorexia and Sleep Quality in Patients Undergoing Chemotherapy: A Randomized Clinical Trial

## Abstract

**Background:** Cancer and associated treatment methods present numerous complications, including anorexia and disturbances in sleep patterns. Consequently, the purpose of this study is to examine the impact of reflexology on the symptoms of anorexia and sleep quality among individuals afflicted with cancer. **Materials and Methods:** In this double-blinded randomized clinical trial, a total of 60 patients undergoing chemotherapy at Khansari Hospital, Arak, Iran, were selected using convenience sampling and then assigned to two groups of control and experimental using blocked randomization (30 patients in each group). The sample intervention group received reflexology in an exceedingly 4-week amount (two sessions a week), By contrast, the control group was administered a placebo treatment without exerting any pressure on the reflex points during the same time frame. Sleep quality and anorexia in patients were measured using a Pittsburgh questionnaire and visual analog scale before and right after the intervention. Eventually, the data were analyzed, and we used the tests of central tendency, dispersion, independent- and paired-samples *t*-tests, and Chi-square. **Results:** The findings of the study revealed a significant improvement in sleep quality and reduction in anorexia symptoms among patients who received reflexology treatment scores ( $p < 0.001$ ). Conversely, there was no significant difference in the control group before and after the intervention (without pressure effect on the foot points) ( $p > 0.05$ ). **Conclusions:** According to the positive effects on sleep quality and the reduction of anorexia symptoms, it is recommended to incorporate this therapeutic modality along with conventional medication for the treatment of individuals with cancer.

**Keywords:** Anorexia, nursing, sleep quality

## Introduction

Many countries suffer cancer as a major health problem.<sup>[1]</sup> There is an anticipated rise in the annual incidence of new cancer cases globally, with an estimated increase from 14 million in 2012 to approximately 22 million by the year 2030.<sup>[2]</sup> Cancer is the third leading cause of mortality in the Iranian population, accounting for 14% of all deaths. Daily, around 98 people in the nation die from this illness.<sup>[3]</sup> Chemotherapy, a commonly used treatment for cancer, causes various physical, psychological, and social complications. Anorexia and sleep quality disorders are the main problems in these patients.<sup>[1,4]</sup> Sleep disturbances can worsen in individuals diagnosed with cancer, thereby contributing to heightened feelings of resentment.<sup>[5]</sup> These disturbances can be caused by various factors such as anxiety, depression, radiotherapy, chemotherapy, fatigue, pain, and changes in biological rhythms. These disorders may

have an effect on the social performance and lifestyle.<sup>[1,6]</sup> Anorexia, a condition characterized by a diminished appetite, is prevalent in a significant proportion of individuals with cancer who seek palliative care, ranging from 30 to 80 percent. This phenomenon has a detrimental impact on their overall quality of life, leading to heightened morbidity and mortality rates.<sup>[7]</sup> Pharmacological and nonpharmacological treatments can be used to treat sleep disorders and anorexia in patients with cancer. Pharmacological treatments require a doctor's order and often cause many side

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effects, whereas nonpharmacological treatments (methods of complementary medicine) often have few side effects and can be used alone or in combination with other methods.<sup>[1,8]</sup> The majority of nonpharmacological treatments used in contemporary healthcare fall under the category of Complementary and Alternative Medicine (CAM). Most recommended CAM therapies include massage, aromatherapy massage, reflexology, relaxation therapy/simulation, hypnotherapy, and acupuncture/acupressure. Reflexology is a commonly used form of complementary and alternative medicine.<sup>[8-10]</sup> Reflexology is a particular type of hand and foot massage. The most important theory about the effect of this method is the connection between the limbs and other parts of the body through energy lines.<sup>[11-13]</sup> Because the feet are known to be the most sensitive part of the body, making them an optimal location for this therapeutic technique.<sup>[14]</sup> Stimulation of reflex points is responded by muscles, nerves, and cells, and this response can accordingly relieve stress and tension, improve blood circulation, calm the mind, boost the immune system, and convey the sense of well-being.<sup>[15,16]</sup> In many studies, reflexology reduces anxiety and stress, improves sleep quality, increases energy, causes relaxation, and promotes the feeling of well-being in patients with cancer.<sup>[17,18]</sup> In a research investigation performed by Leyla Zengin, the study demonstrated the impact of reflexology in mitigating fatigue and enhancing the sleep quality of patients receiving chemotherapy.<sup>[19]</sup> In a separate study conducted to investigate the impact of reflexology on children's health, the findings indicated that the application of reflexology did not yield a favorable outcome in terms of alleviating the digestive system and enhancing the overall quality of life among children. Consequently, further research with a larger sample size is necessary to substantiate these findings.<sup>[20]</sup> In a separate research conducted in Iran, the findings indicated that reflexology did not yield a substantial effect on the overall quality of life among individuals diagnosed with multiple sclerosis.<sup>[12]</sup> Therefore, this finding underscores the increased importance of incorporating complementary medicine into healthcare practices, and this study was performed to investigate the impact of foot reflexology on sleep quality and anorexia in patients undergoing chemotherapy.

## Materials and Methods

This study is a double-blinded randomized clinical trial (IRCT20130424013110N8) conducted between August 2020 and April 2020. The participants consisted of 60 patients receiving chemotherapy at Khansari Hospital, Arak, Iran. Both the data analyst and the study participants in both groups are blinded to the allocation of the intervention and control groups. The sample size was determined by considering the power of the test 80% and the significance level of 5%. Based on the results of the study by Unal and Akpınar (2016),<sup>[21]</sup> the number of samples was calculated as 60 (N = 30 in each group).

The participants for this study were selected through convenience sampling and then assigned to two groups of control and experimental using blocked randomization, so that the block size was determined to be 4 (A, A, B, B) (code A for the intervention cluster and code B for the control group). The inclusion criteria included (a) being in the age range of 30-60 years, (b) having a history of a minimum of one course of chemotherapy, (c) having no foot issues or wounds, and (d) not receiving any other nondrug sedation treatments. The exclusion criteria were (a) reluctance to continue involvement in the research, (b) leg sores, (c) patient discharge, and (d) death of the patient.

Demographic Information Questionnaire, Visual Analog Scale (VAS), and also the Pittsburgh Sleep Quality Index Questionnaire (PSQI) were the tools used in this study. The PSQI exceedingly measures sleep quality in a 1-month period as a self-reported questionnaire. The PSQI consists of nineteen items, generating seven dimensions (subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction).<sup>[18]</sup> Every item is scored from zero to three on a 4-point Likert scale, and every item is combined to create seven "component" scores. The seven-part scores are then added to yield an overall score starting from 0 to 21 because lower scores denote higher sleep quality. The specificity, sensitivity, and Cronbach's alpha constant of the Persian version of this questionnaire are 93%, 100%, and 89.36, respectively.<sup>[22]</sup> The VAS is a measurement tool used to assess appetite. It consists of a 10-cm straight horizontal line, with "0" representing a complete lack of appetite and "10" indicating a very strong appetite. This tool has been assessed in terms of reliability and validity in various studies. The reliability of this tool was approved by Shahinfar *et al.*<sup>[23]</sup> with a Cronbach's alpha of 0.88. In addition to validity and reliability, the most important feature of this tool is its simplicity of use. In this study, patients self-reported the level of anorexia. After the acquisition of written informed consent, questionnaires were distributed. Then at the beginning and before the intervention, a demographic information questionnaire, the levels of anorexia, and sleep quality were completed in both groups. Questionnaires were distributed and completed by the researcher. The experimental group received 8 sessions of reflexology in a 4-week period (two sessions a week) during the intervention phase, each session lasted for 30 minutes. In each session, 15 minutes of reflexology was performed for each foot, of which 5 minutes were allocated to general massage of the sole and 10 minutes were allocated to massage of the reflex points of the brain (pituitary gland, hypothalamus, and pineal gland), gastrointestinal tract (small and large intestine, stomach, and liver), and the solar plexus. A researcher trained in the field conducted the intervention. In the control group, patients merely received 30 minutes of dorsum touch in each session without applying any pressure to the reflex points. After

completion of the intervention (at the end of the fourth week), patients in both groups completed the PSQI and the VAS again. In this research, the data were analyzed through descriptive and inferential statistics using International Business Machines (IBM) SPSS Statistics V21. The tests used included measures of central tendency, dispersion, independent- and paired-samples *t*-tests, and Chi-square. The level of significance was considered as  $p < 0.05$ .

### Ethical considerations

This study protocol was approved by the Research Ethics Committee of Arak University of Medical Sciences (Ethics No. IR.ARAKMU.REC.1398.095). Before participation, patients were provided with a comprehensive explanation of the study methodology and objectives, and the anonymity of the questionnaires and the confidentiality of personal data were ensured. Then, written informed consent was obtained from all participants.

### Results

The 91 patients were assessed for being eligible to participate in this study. However, 27 patients were excluded from the study because they lack inclusion criteria, and 4 patients were excluded because they refused to participate in the study. Finally, 30 patients were allotted to the intervention group and 30 patients were in the control group [Figure 1].

The average age of patients within the experimental group was  $50.43 \pm 14.67$  and in the control group was 49.13 (15.30) years. The bulk of the participants (76.60%) were married. Of 60 participants, 45 (75%) patients had a sickness length of less than one year. The level of education for most participants was a diploma or lower than a diploma 86.70% in the intervention group and 76.70% in the control group) [Table 1]. Independent *t*-test results showed that the intervention and control groups were not significantly different before the intervention in terms of mean score of sleep quality ( $p > 0.05$ ). However, they were significantly different after the intervention, specifically that the mean score of sleep quality was significantly improved in the intervention group compared with that in the control group ( $p < 0.05$ ) [Table 2]. In the experimental group, the mean score of anorexia was 6.30 (3.06) before the intervention and 2.67 (2.24) after the intervention. Paired-samples *t*-test showed significantly different mean scores of anorexia before and after the intervention ( $p < 0.05$ ), whereas in the control group, a paired *t*-test showed no significant differences in the mean scores of anorexia before and after the intervention ( $p > 0.05$ ) [Table 3].

### Discussion

In this study, we endeavored to determine the effect of

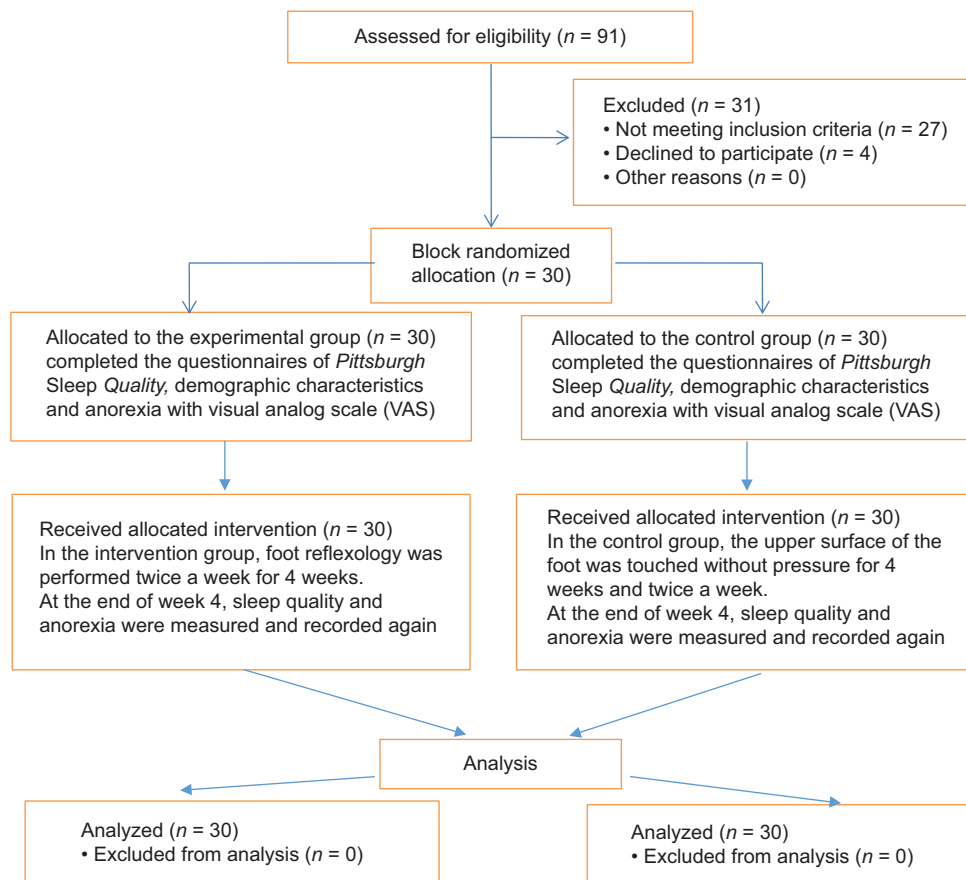


Figure 1: The CONSORT flow diagram of the patients' recruitment

**Table 1: Comparison of demographic characteristics in the control and intervention groups**

Variable	Intervention group (n=30) n(%)	Control group (n=30) n(%)	p*
Gender	Male	15 (50)	1 *
	Female	15 (50)	
Educational level	Illiterate	5 (16.70)	0.136**
	Less than diploma	13 (43.30)	
	Diploma	8 (26.70)	
	Collegiate	4 (13.30)	
Marital status	Single	1 (3.30)	0.515**
	Married	25 (83.30)	
	Divorced	1 (3.30)	
	Wife died	3 (10)	
Occupation	Unemployed	7 (23.30)	0.738**
	Retired	7 (23.30)	
	Employee	2 (6.70)	
	Housewife	12 (40)	
	Student	2 (6.70)	
		4 (13.40)	
Duration of Cancer (years)	<One year	21 (70)	0.799*
	1-2 years	4 (13.30)	
	2-3 years	1 (3.30)	
	>3 years	4 (13.3)	
The type of cancer	PANCREAS	3 (10)	0.904*
	LANPHOM	4 (13.30)	
	CRC	8 (26.70)	
	OVARIYAN	2 (6.70)	
	AML	3 (10)	
	Breast	4 (13.30)	
	Lung	2 (6.70)	
	Liver	4 (13.30)	
Age	50.43 (14.67)	49.13 (15.30)	0.595***

All values are expressed as number (percentage) or mean (SD). \*Chi-square. \*\*Fisher exact test. \*\*\*Independent-samples *t*-test

**Table 2: Comparison of sleep quality score among control and intervention groups before and after intervention**

Group	Before	After	p*
	Mean (SD)	Mean (SD)	
Intervention	13.53 (5.57)	3.06 (2.16)	<0.001
Control	13.60 (3.13)	12.93 (2.67)	0.324
p**	0.934	<0.001	

\*Paired *t*-test. \*\*Independent-samples *t*-test

**Table 3: The mean scores of anorexia severity in the intervention and control groups**

Group	Before	After	p*
	Mean (SD)	Mean (SD)	
Intervention	6.30 (3.06)	2.67 (2.24)	<0.001
Control	6.10 (3.42)	6.20 (3.23)	0.813
p**	0.735	<0.001	

\*Paired *t*-test. \*\*Independent-samples *t*-test

foot reflexology on anorexia and sleep quality in patients with cancer undergoing chemotherapy. Based on the results of this study, it was found that the two groups were not significantly different in terms of demographic

characteristics. In addition, it was determined that there was no statistically significant difference between the two groups before the intervention in terms of the mean scores of anorexia and sleep quality. The results of this study showed that foot reflexology can positively affect the sleep quality in patients with cancer undergoing chemotherapy. The effect of this method has also been investigated on other patients' sleep quality.

Another study conducted in 2016 indicated that reflexology can improve the sleep quality of patients undergoing hemodialysis.<sup>[21]</sup> Another study conducted in 2019 also demonstrated that reflexology has a positive impact on the sleep quality of individuals diagnosed with lymphoma.<sup>[24]</sup> Similarly, a study in 2020 indicated the foot reflexology massage can effectively improve the quality and quantity of sleep in patients with burn injuries<sup>[25]</sup> that these findings align with the current research. Another study conducted in 2020 found that foot reflexology may alleviate pain and fatigue, as well as enhance sleep quality in patients who have undergone kidney transplantation.<sup>[26]</sup> A study conducted in 2020 demonstrated that foot reflexology can be used to enhance the sleep quality and duration of postpartum women after a natural delivery.<sup>[27]</sup> These studies indicate that

foot reflexology can have beneficial effects on the nervous system and blood circulation, leading to valuable outcomes. One theory within the realm of reflexology posits that its impact on the nervous system and blood circulation can be attributed to the breakdown of lactic acids. This breakdown facilitates the restoration of energy and promotes healthy blood flow, thereby enhancing overall blood circulation. In addition, reflexology is believed to impede the transmission of pain impulses by obstructing their entry points, resulting in a reduction of pain and a sense of tranquility and stability within the nervous system.<sup>[28,29]</sup> In a study conducted in 2019, the primary aim was to examine and explore the impact of reflexology on constipation and the quality of life of individuals with Multiple Sclerosis (MS). The findings revealed that although reflexology demonstrated improvements in constipation, it did not significantly influence the quality of life of patients.<sup>[12]</sup> This outcome contrasts with the results of our study, which focused on sleep quality.

In a separate investigation performed in 2021, the objective was to examine the impact of reflexology on the sleep quality and delirium experienced by patients after cardiac surgery, and the findings of this study indicated that reflexology did not yield any significant effects on the sleep patterns of these patients,<sup>[30]</sup> and it is plausible that the dissimilarity can be attributed to the limited sample size and the brief duration of the intervention used in the aforementioned study, which this outcome contrasts with the results obtained in our study. This lack of compatibility between reflexology and certain individuals can be attributed to the area of application, type, depth, and number of reflexology sessions as well as the existing comorbidities. The results of various studies show it can be stated that reflexology induces a sense of calm in an individual. The results of this study demonstrated that patients' level of anorexia decreases after reflexology. Few studies have investigated the effect of CAM therapies on anorexia in patients with cancer. There are also a few studies on other patients, which revealed that CAM therapies such as massage, acupuncture, and acupressure have a positive effect on anorexia in other patients, and it leads to the improvement of the nutritional pattern.<sup>[31]</sup> In addition, acupuncture has the potential to provide a feeling of contentment and tranquility, resulting in enhanced nourishment for the individual.<sup>[32]</sup> Within this study, the level of anorexia was examined in patients with cancer undergoing chemotherapy, and it should be stated that the causes of anorexia in these patients may be different from the ones in other patients. In patients with cancer undergoing chemotherapy, activation of inflammatory pathways of the hypothalamus as a result of inflammation (stimulator of anorexia) of intestines or diarrhea-related dehydration can account for anorexia.<sup>[33,34]</sup> Regarding the differences in the samples and the mechanism of anorexia, it would be difficult to compare our study and the above studies. A review study conducted in 2021 found that foot

reflexology did not show significant effectiveness in reducing nausea and vomiting.<sup>[35]</sup> These findings contradict the outcomes of our study. The limited sample size and the possibility of requiring more reflexology sessions in the studies may explain this outcome. Based on the findings, it seems that foot reflexology can be used as a CAM therapy along with pharmacological and other modern treatments to improve anorexia and sleep quality in patients with cancer. However, despite that the positive effects of this method have been confirmed in most patients, more comprehensive researches need to be conducted in this area. One of the limitations was the possible effect of confounders on the dependent variables of the study. To eliminate this limitation, patients were selected randomly. Another limitation is not having a follow-up period to check the long-term effects of the desired interventions. Their effects are temporary or not temporary.

## Conclusion

The utilization of foot reflexology as an intervention promotes sense of calm and improves anorexia and sleep quality in patients with cancer. Because the results of this study cannot completely suggest the utilization of foot reflexology, it is imperative for the healthcare personnel, particularly the nursing staff, to acquire knowledge and skills in using complementary medicine interventions, with a specific emphasis on reflexology, to enhance anorexia and sleep quality in patients with cancer.

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## Conflicts of interest

Nothing to declare.

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