RESEARCH ARTICLE

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The Impact of Foot Reflexology on Nausea-Vomiting and Sleep Quality for Lung Cancer Patients Receiving Chemotherapy in Turkey

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Abstract

BACKGROUND/AIMS: The aim of this study was to determine the impact of foot reflexology on nausea-vomiting and sleep quality in patients with lung cancer receiving chemotherapy in Turkey.

MATERIALS AND METHODS: This study was conducted with a pre-test/post-test experimental design. 60 patients (30 experimental group and 30 control group) receiving chemotherapy in an oncology center were included. Patients in the experimental and control groups were selected from the population using a random sampling method. Foot reflexology was given to the experimental group. After receiving the second course of chemotherapy, foot reflexology was applied for the first time to the patients in the experimental group, twice a week for four weeks; 8 sessions in total. The "Rhodes Nausea, Vomiting and Regurgitation Scale" and the "PSQI" were used in the questionnaire, which was administered to all patients twice, after receiving the second course of chemotherapy and 4 weeks later. Chi-square, Mann-Whitney U test, the Wilcoxon test and Kruskal-Wallis analysis of variance were used.

RESULTS: The sociodemographic characteristics of the patients were as follows: 53.3% of the patients in the experimental group were 61 years or older, 80% were male, 83.3% were married. 60% of the patients in the control group were 61 years or older, 86.7% were male, 83.3% were married. Most had been diagnosed less than 6 months previously (control group 63.4%, experimental group 60.0%). Most participants had first stage lung cancer (control group 80.0%, experimental group 70.0%). It was found that there was a significant difference between the control and experimental groups in terms of their nausea-vomiting and retching mean scores of "symptom experience" (p=0.0001), "symptom formation" (p=0.0001), "symptom distress" (p=0.0001), "subjective sleep quality" (p=0.0001), "sleep latency" (p=0.019), "daytime dysfunction" (p=0.002), "sleep disturbances" (p=0.002) and their means of the PSQI (p=0.002).

CONCLUSION: Foot reflexology was found to be an effective method in reducing sleep problems together with the experience, formation and distress of nausea and vomiting for those patients with lung cancer who were receiving chemotherapy.

Keywords: Chemotherapy, lung cancer, nursing, foot reflexology

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INTRODUCTION

Lung cancer accounts for about one third (19.4%) of all cancer deaths and is the most common cancer globally.[1] Lung cancer is a type of cancer which is seen in 59.3/100,000 in males in Turkey, and its mortality rate is 30.13/100,000.[2] In lung cancer, chemotherapy is used to slow the development of cancer, to prevent its spread, and to treat and alleviate its symptoms. However, cancer and chemotherapy cause many unwanted symptoms such as nausea-vomiting, anorexia, stomatitis, diarrhea, fatigue and sleep problems. These symptoms may develop within the first few days especially after chemotherapy or a few months or years later.[3,4]

Nausea-vomiting is one of the most common symptoms for those patients who receive chemotherapy for lung cancer.[5] Chemotherapeutic agents with moderate to high emetogenic risk are frequently used in the treatment of lung cancer. Despite advances in antiemetic therapies used in the prevention and control of nausea and vomiting due to cancer and chemotherapy, it was found that almost 50% of patients who suffer from cancer tend to experience acute, delayed or expected nausea and vomiting. Furthermore, even in very effective antiemetics such as serotonin antagonists, 38-80% of patients experience nausea and vomiting in a severe way and this causes 20% of patients to postpone or refuse treatment.[6,7] Uncontrollable nausea and vomiting lead to dehydration, hypotension, loss of appetite and/or weight loss due to the absorption and excretion of the drugs used in this treatment. In addition, the frequency, duration and severity of nausea and vomiting during the day disrupt the social life of these patients, increase their fear and anxiety, create difficulties in performing their daily activities and significantly reduce their quality of life.[8-10]

Having trouble with sleeping is also one of the most common symptoms of lung cancer patients. Their sleep quality usually decreases when nausea, vomiting, anxiety, pain, shortness of breath and cough are added to their already difficult situation.[8,9,11] It was found that sleep efficiency was impaired in patients who were suffering from lung cancer and receiving chemotherapy, and the amount of sleepless time during the day and night increased.[12] Patients who do not sleep enough or those with deteriorated sleep quality experience physical, cognitive and affective depression, and their feelings, thoughts and motivations suffer. Sleep problems also lead to problems such as fatigue, loss of attention, pain, irritability and hallucinations and may cause life-threatening accidents and discrepancies at work or in everyday life.[12,13] Also, sleep problems cause abnormal cortisol synthesis and modify cytokine expression and decrease the number and activity of natural killer cells with immune system functions.[5,14] This situation causes the development of infections, worsens prognosis, and increases mortality, especially in cancer patients.[15,16]

Today, reflexology applications which are applied to reduce/prevent nausea, vomiting and sleep problems in cancer patients are noteworthy.[17-19] Reflexology is "a technique that helps the normalization of body functions by a hand application to the reflex points on the hands, feet and ears associated with all of the glands, organs and body parts." In addition, reflexology is a "special pressure technique and energy balancing system". It is applied to the reflex points by applying pressure by rubbing and squeezing movements.[20-22] It is reported that reflexology, which is increasingly used in the field of health, creates a strong therapeutic effect between the patient and the nurse, reduces pain, facilitates adaptation to the disease and increases the power of adaptation and it has been reported to reduce the nausea-vomiting of cancer patients and improve their quality of life.[22,23]

Foot reflexology is often preferred due to the proximity of the pressure points to the skin surface in the feet.[24] In this application, the blocked energy is dissolved in certain parts of the body with special scrubbing movements applied to the feet and this energy is disseminated to every living tissue and every cell and the self-healing power of the body is activated.[24-26] Crystalline waste materials such as calcium and uric acid are eliminated by blood and lymphatic circulation with this application and so comfort and relaxation are provided. It has been stated that symptoms of nausea and vomiting decreased after foot reflexology applications in breast cancer patients with stage I-III disease despite antiemetic treatment.[23-28] In addition, it has been determined that the foot reflexology application can be used as a support in alleviating sleep problems in breast, stomach, liver, and ovarian cancer patients as well as cancer patients of unknown origin, increasing their sleep satisfaction, eliminating fatigue and promoting quality sleep.[20,21,27-30]

Results based on the previous literature demonstrate that foot reflexology is an effective complementary therapy method in the management of symptoms, improving physical and spiritual well-being, and improving the quality of life in cancer patients.[31,32] In this context, this paper explains the effects of the foot reflexology applications on nausea, vomiting and sleep quality in lung cancer patients receiving chemotherapy. This nursing study provides evidence of the benefits of foot reflexology on nausea-vomiting and the sleep quality of lung cancer patients.

Study Hypothesis

1. H_1: There is a difference between the experimental and control groups in terms of the effect of the foot reflexology application on the experience, occurrence and distress of nausea and vomiting symptoms in lung cancer patients receiving chemotherapy.

2. H_1: There is a difference between the experimental and control groups in terms of the effect of foot reflexology on sleep quality in lung cancer patients receiving chemotherapy.

MATERIALS AND METHODS

Study Design

This study was conducted with a pre-test/post-test experimental design.

Participants Setting and Subjects

The participants of this study were lung cancer patients in the oncology center of a university hospital in the northeast of Turkey. The size of the sample was determined using the OpenEpi program. Statistical analysis was performed with a confidence interval of 95% and a power analysis of 80%. It was planned to include 34 patients in the experimental group and 34 in the control group. However, 8 patients were withdrawn from the study; 2 died, 2 had problems with transportation, and 4 were transferred to another oncology center. Therefore, the study was conducted with 60 patients with lung cancer who were receiving chemotherapy in the oncology center of a university hospital and diagnosed with stage 1 to stage 3 cancer.

The criteria required for participation were as follows: being 18 years of age or over, being conscious, being able to speak Turkish, receiving their second chemotherapy treatment, having a life expectancy of longer than six months, knowing their cancer diagnosis, being patients who had received chemotherapy agents whose emetogenic risk was either moderate (Doxorubicin, Mitoxantrone, etc.), high (Methotrexatea, Cisplatin, etc.) or very high (Cisplatin Dacarbazine etc.), those who were experiencing sleep problems, who did not have a diagnosis of any psychiatric disorder, who did not have any foot impediments (open wound, fracture or infection on the foot), who stated that they had experienced symptoms of nausea-vomiting and sleep problems after their first course of chemotherapy and who agreed to participate in this study. The participants were divided into experimental (n=30) and control (n=30) groups. It took four weeks to complete the study process for both groups. The patients in the experimental and control groups were selected from the population using a random sampling method.

Data Collection Tools

The "Patient Information Form", "Rhodes Scale of Nausea-Vomiting and Retching (RINVR)" and the "Pittsburgh Sleep Quality Scale (PSQI)" were used as the data collection tools.

Patient information form: The patient information form, which was created by the researcher as a result of a literature review[25,33-35] consisted of two parts, with 14 questions in total. Seven questions in the first part evaluated the sociodemographic characteristics (age, gender, marital status, education level, place of residence, occupation, and monthly income level) of the patients. Seven questions in the second part were included to determine the disease variables (diagnosis period, cancer stage, disease, nausea and vomiting and sleep problems, knowledge of the effects and side effects of chemotherapy, and the presence of any other chronic diseases).

Rhodes Scale of Nausea-Vomiting and Retching: RINVR was developed by Rhodes and McDaniel,[36] and its validity and reliability tests were again carried out by Rhodes and McDaniel,[36] Items 1, 3, 6 and 7 are reverse-rated. For each response, minimum distress is scored as 0 and maximum distress is scored as 4. The patient's experience of nausea and vomiting in each of the eight items is collected. The highest possible result is 32 and this indicates the most severe symptom formation score. The Cronbach alpha of the RINVR is 0.98.[36] The adaptation of this scale to the Turkish population was conducted by Genc[25] The Cronbach alpha internal consistency coefficient of this scale was found to be 0.95. The Cronbach alpha internal consistency coefficient of the RINVR for this study was found to be 0.92.

Pittsburgh Sleep Quality Scale: It was developed in 1989 by Buysse et al.[37] to evaluate sleep quality in psychiatric practice and clinical trials. The PSQI assesses sleep quality over the past month. Nineteen of the 24 questions that PSQI contains are self-report. Five questions are answered by a roommate or spouse. The last five questions are used only for clinical information and are not included in the analyses. Question 19 is about whether a roommate or partner's comment is taken into account when determining the total and component scores of the PSQI. Self-reporting questions include various factors related to sleep quality. They are related to the frequency and severity of sleep duration, sleep latency and sleep-related specific problems. Eighteen items are grouped into seven components, some of which are indicated by a single item, while others are obtained by grouping several items. Each item is rated from 0 to 3 points. The sum of the seven components gives the total PSQI score. The total score has a value between 0 and 21. A high total score indicates poor sleep quality. Furthermore, if the PSQI global score is greater than five, it indicates poor sleep quality. The validity and reliability studies of this scale for our country were carried out by Yücel Ağargün et al.[38] and the Cronbach alpha reliability coefficient of the scale was found to be 0.80. The PSQI Cronbach alpha internal consistency coefficient was found to be 0.74 in this research.

Researcher's Foot Reflexology Competence: In Turkey, a certificate from a program which includes 40 hours of theoretical and practical training is required for nurses in order to be able to perform Foot Reflexology. Therefore, one of the researchers received a certificate by participating in a course conducted by the "İstanbul Reflexology-Psychology Center", which included a 40-hour theoretical and practical training program between December, 2015 and January, 2016.

Procedure

Control group: This study was first started with the control group patients. Those patients who met the research criteria and agreed to participate in this study were included. After the data of the patients in the control group were completed, the patients in the experimental group were analyzed. Control group and experimental group patients did not see each other and were not affected by each other. These participants were contacted after their second chemotherapy treatment. The "Patient Information Form", "RINVR" and "PSQI" were used. The researcher did not apply foot reflexology to the control group. "RINVR" and "PSQI" were applied again to the patients in the control group after four weeks.

Experimental group: When patients were admitted to the Oncology Center for their second chemotherapy treatment, the "Patient Information Form", "RINVR" and "PSQI" were applied. Then, the first foot reflexology application was performed on these patients during their second chemotherapy treatment. A total of eight-foot reflexology sessions were performed twice a week for a total of four weeks for the experimental group patients. The foot reflexology application was applied to both feet for a total of 30 minutes**.** Although the frequency and number of reflexology applications performed on cancer patients vary in different studies, it is recommended to perform an average of four to eight sessions of 30 minutes in order to affect the organs, ladders and other parts of the body and to open any blockages.[20,28,30,39] "RINVR" and "PSQI" were re-administered after the eighth session of reflexology for these patients.

Foot Reflexology Practice

The foot reflexology application was performed by the researcher in a special room in the oncology center. First of all, the patients were informed about the foot reflexology application. The patient's feet were placed in a way to make eye contact with the patient, and the patient's feet were placed in a sitting position with the practitioner's chest level. After lubricating the feet with olive oil, the reflexology application was started with the right foot first. Initially, five minutes of warm-up and relaxation exercises were performed on the feet. In order to send a message to the whole body, the solar plexus point

was pressed 8-10 times with the thumb. Pressure was applied to the pituitary gland and hypothalamus reflex points on the big toe with caterpillar movements for one minute, and pressure was applied to the spleen and thyroid reflex points via pressing, pulling and caterpillar movements. A friction movement was performed with the thumb on the reflex point of the adrenal glands for one minute. The reflex points relating to nausea-vomiting and sleep problems were pressed for one minute. The reflex points reflecting the intestine were pressed via the caterpillar movement using the thumb. For three minutes, compression was applied to the spinal cord reflex points in the form of a worm walk with the thumb from top to bottom. The reflex points of the uterus, vagina, ovaries and fallopian tubes were compressed for three minutes. Finally, the application was completed by pressing the solar plexus again. All applications on the right foot were repeated on the left foot. These applications took a total of 30 minutes for both feet (Figure 1).[40]

Ethics Committee Approval

Permission was obtained from the Karadeniz Teknik University Faculty of Medicine Clinical Research Ethics Committee (approval number: 24237859\291, date: 31.05.2016) in order to carry out this research. Written approval was also obtained from the institution where this study was conducted (approval number: 64960800\799, date: 31.05.2016). Informed consent forms outlining the aims and procedures of this study were obtained from all participants who were guaranteed confidentiality. This study conformed to the principles of the Declaration of Helsinki.

Statistical Analysis

The SPSS (IBM) for Windows 23.0 program was used. Descriptive data were indicated as minimum, maximum, mean, standard deviation, number and percentage. Chi-square was used for the comparison of categorical variables of the groups, and Mann-Whitney U, Wilcoxon and Kruskal-Wallis Variance Analysis tests were used to evaluate differences between continuous variables with a significance level of $p<0.05$.

RESULTS

This study included a total of sixty patients (30 control, 30 experimental) who were suffering from lung cancer. Those participants who were 61 years or older made up 53.3% of the experimental group and 60% of the control group. The majority of the participants were male (control group = 86.7%, experimental group = 80.0%;) and married (83.3%). The educational level in the 2 groups were different (53.3% of the participants in the experimental group had primary education; 36.7% of the participants in the control group were literate); 73.3% of the participants in the experimental group and 63.3% of those in the control group were employed. A significant proportion of participants in both groups were living in a village (control group = 46.7%, experimental group = 43.3%). Most had been diagnosed less than 6 months previously (control group = 63.4%, experimental group = 60.0%). Most participants had first stage lung cancer (control group = 80.0%, experimental group = 70.0%). There was found to be no significant difference between the control and experiment group in terms of their descriptive characteristics ($p>0.05$) (Table 1).

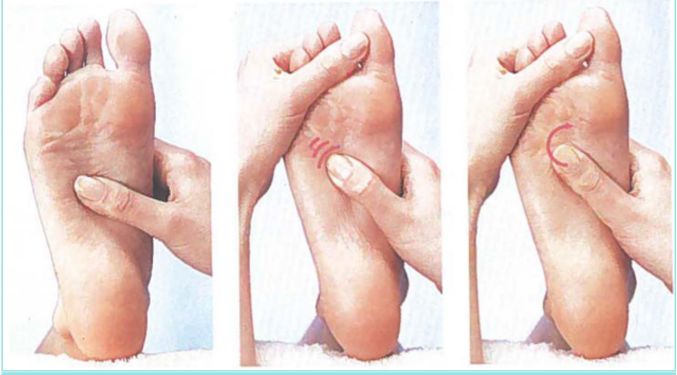

Figure 1. Some movements used in foot reflexology.[40]

The RINVR mean scores of the control group were higher than those of the experimental group, with the experimental group having better RINVR (symptom experience, symptom formation and symptom distress) mean scores for all subscales than the control group (Table 2).

There were statistically significant differences between the experimental and control groups in the RINVR symptom experience of nausea ($p=0.0001$), vomiting ($p=0.0001$), retching ($p=0.0001$), total ($p=0.0001$); symptom formation of nausea ($p=0.0001$), vomiting ($p=0.003$), retching ($p=0.0001$), total ($p=0.0001$); and symptom distress of nausea ($p=0.0001$), vomiting ($p=0.002$), retching ($p=0.0001$), total ($p=0.0001$) (Table 2).

The PSQI subscale mean scores of the experimental group was lower than those of the control group, with the experimental group having better PSQI mean scores for all subscales than the control group (Table 3).

There were statistically significant differences between the experimental and control groups in the PSQI subscales of subjective sleep quality ($p=0.0001$), sleep latency ($p=0.019$), sleep disturbances ($p=0.012$), daytime dysfunction ($p=0.002$), and PSQI total ($p=0.002$) (Table 3).

DISCUSSION

Our results showed that the experimental group had significantly better RINVR subscale mean scores than the control group in terms of symptom experience, symptom formation, and symptom distress related to nausea, vomiting and retching. Similar improvements were previously reported from foot reflexology. Yang[41] determined in a study conducted with breast cancer patients receiving cancer chemotherapy that nausea and vomiting decreased for the patients in the experimental group after a total of four sessions of foot reflexology. It was found in Özdelikara and Tan[28] study on the impact of foot reflexology on nausea, vomiting and fatigue related to cancer chemotherapy in patients with breast cancer that total score averages of nausea, vomiting and retching symptoms of the patients in the experimental group decreased and the difference after the application was found to be statistically significant between the groups. In addition, it was reported in different study that foot reflexology reduced pain, fatigue, anxiety and depression symptoms in patients receiving cancer chemotherapy and was also effective indirectly in reducing nausea and vomiting.[42] Our results are consistent with other studies in the literature showing that foot reflexology, which we performed for lung cancer patients twice a week for a total of eight sessions, relieves patients who experience nausea,

Table 1. Descriptive and disease characteristics of the patients in the experimental and control groups (n=60)

Descriptive and disease characteristics		Experimental group, n (%)	Control group, n (%)	p
Age	40-60 years	14 (46.7)	12 (40.0)	0.602[a]
	≥61 years	16 (53.3)	18 (60.0)	
Gender	Female	6 (20.0)	4 (13.3)	0.488[a]
	Male	24 (80.0)	26 (86.7)	
Marital status	Married	25 (83.3)	25 (83.3)	1.000[b]
	Single/widowed/divorced	5 (16.7)	5 (16.7)	
Education	Literate	9 (30.0)	11 (36.7)	0.384[b]
	Primary education	16 (53.3)	10 (33.3)	
	High school	4 (13.3)	6 (20.0)	
	University	1 (3.4)	3 (10.0)	
Employment	Employed	22 (73.3)	19 (63.3)	0.405[a]
	Unemployed	8 (26.7)	11 (36.7)	
Cancer duration	≤6 months	18 (60.0)	19 (63.4)	0.777[b]
	7-12 months	6 (20.0)	6 (23.3)	
	≥13 months	6 (20.0)	4 (13.3)	
Cancer stage	I. stage	21 (70.0)	24 (80.0)	0.359[b]
	II. stage	7 (23.3)	3 (10.0)	
	III. stage	2 (6.7)	3 (10.0)	
The presence of chronic disease	Yes	18 (60.0)	14 (46.7)	0.301[a]
	No	12 (40.0)	16 (53.3)	

[a]: chi-square test, [b]: Fisher's exact test.

vomiting, and retching. These results confirm that there is a difference between the experimental and control groups in terms of the effect of the foot reflexology application on the experience, occurrence and distress of nausea, vomiting and retching symptoms in lung cancer patients receiving chemotherapy.

The results of the current study also proved that the experimental group had significantly better PSQI subscales compared to the control group in terms of subjective sleep quality, sleep latency, sleep disorder, daytime dysfunction and the PSQI total mean scores. Subjective sleep quality, which is one of the PSQI subscales, shows how patients fully evaluate their sleep quality. In Turkey, it is stated that chemotherapy-related fatigue decreased and the quality of sleep increased after foot reflexology was applied to breast cancer patients.[28]

In our study, the mean sleep latency scores of the patients in the experimental group were found to be significantly lower and this means that these patients fell asleep in a shorter time. In other words, our reflexology practice relieved the experimental group patients and made it easier for them to fall asleep. In the study of Demiralp et al.[43], relaxation exercises were applied to cancer patients receiving chemotherapy and it was found that patients in the experimental group had lower sleep latency mean scores after exercise.

In different studies, it was stated that physical problems such as dyspnea, pain, fever and cough caused sleep disorders in cancer patients.[44-46] In our study, the patients in the experimental group experienced less sleep disorders after foot reflexology. Sleep disorders include waking up at midnight or early in the morning, waking up to go to the toilet, uncomfortable breathing, coughing during sleep, excessive feelings of warmth and feelings of heat, nightmares and pain during sleep. In the literature, it is stated that the foot reflexology application improves sleep quality by reducing levels of fatigue and pain in cancer patients.[29,47]

Daytime dysfunction shows how often patients force themselves to stay awake during a ride, a meal, or during a social activity and the extent to which day-to-day work is problematic to do. In our study, the experimental group patients had less difficulty in performing daytime functions. Le GuenY et al.[48] found that sleep efficiency was impaired in lung cancer patients and the amount of sleepless time during the day and night increased.

In our study, the mean PSQI total score of the experimental group patients decreased significantly and they had better sleep quality after the foot reflexology application. In parallel with our study, Park et al.[49] reported that sleep quality was improved and pain sensation decreased in breast cancer patients after foot reflexology. Nazik et al.[50] applied progressive relaxation techniques to cancer patients who were receiving chemotherapy and found the mean PSQI pre-test score in the experimental group to be 11.70±1.87, the final test score was 4.93±2.13, and the difference between the groups was significant. These results supported the idea that "there is a difference between the experimental and control groups in terms of the effect of foot reflexology on sleep quality in lung cancer patients receiving chemotherapy". In line with our current study and the literature, it can be concluded that foot reflexology can be safely applied to lung cancer patients by nurses/doctors or reflexologists who are trained in the relevant field.

Table 2. The comparison of the subscales measures of RINVR in the experiment and control group patients after the foot reflexology application

RINVR* sub-scales			Before reflexology	After reflexology	p**
			Mean ± SD	Mean ± SD	
Symptom experience	Nausea	Experimental	7.1±3.12	3.5±1.81	0.0001[a,γ]
		Control	5.7±3.40	7.6 ±3.30	0.003[b,γ]
		p***	0.1[δ]	0.0001[a,δ]	-
	Vomiting	Experimental	3.9±2.26	2.1±1.83	0.0001[a,γ]
		Control	3.1±3.24	4.9±3.52	0.006[b,γ]
		p***	0.073[δ]	0.0001[a,δ]	-
	Retching	Experimental	4.5±2.39	2.2±1.20	0.0001[a,γ]
		Control	4.3±2.33	4.6±2.50	0.217[γ]
		p***	0.604[δ]	0.0001[a,δ]	-
	Total	Experimental	15.5±6.63	7.9±3.93	0.0001[a,γ]
		Control	13.0±7.43	17.2±7.98	0.001[b,γ]
		p***	0.123[δ]	0.0001[a,δ]	-
Symptom formation	Nausea	Experimental	4.9±2.16	2.3±1.27	0.0001[a,γ]
		Control	4.2±2.40	5.0±1.96	0.026[b,γ]
		p***	0.195[δ]	0.0001[a,δ]	-
	Vomiting	Experimental	1.9±1.77	0.7±1.09	0.001[b,γ]
		Control	4.2±2.40 (1.7±2.39)	2.7±2.74	0.065[γ]
		p***	0.372[δ]	0.0001[a,δ]	-
	Retching	Experimental	2.4±1.13	2.2±1.20	0.539[γ]
		Control	2.4±1.25	4.6±2.50	0.0001[a,γ]
		p***	0.939[δ]	0.0001[a,δ]	-
	Total	Experimental	9.2±3.70	4.2±2.55	0.0001[a,γ]
		Control	8.2±4.99	10.1±4.88	0.02[b,γ]
		p***	0.212[δ]	0.0001[a,δ]	-
Symptom distress	Nausea	Experimental	2.4±1.10	1.2±0.71	0.0001[a,γ]
		Control	2.2±1.28	2.7±1.06	0.034[b,γ]
		p***	0.568[δ]	0.0001[a,δ]	-
	Vomiting	Experimental	2.3±1.13	1.3±0.99	0.0001[a,γ]
		Control	1.6±1.25	2.3±1.32	0.009[b,γ]
		p***	0.012[*,δ]	0.0001[a,δ]	-
	Retching	Experimental	2.1±1.15	1.1±0.57	0.0001[a,γ]
		Control	2.2±1.22	2.5±1.38	0.091[γ]
		p***	0.863[δ]	0.0001[a,δ]	-
	Total	Experimental	6.9±2.99	3.6±1.71	0.0001[a,γ]
		Control	6.1±3.09	7.5±3.12	0.005[b,γ]
		p***	0.397[δ]	0.0001[a,δ]	-

*RINVR: Rhodes Index of Nausea, Vomiting and Retching, **intergroup, ***correlation test between group, [a]p<0.001, [b]p<0.05, [δ]: Mann-Whitney U test; [γ]: Wilcoxon Signed-Rank test, SD: standard deviation.

Study Limitations

This study was a single-site experimental study. The sample size was relatively small. Therefore, our results cannot be generalized to the population. The questionnaire was conducted only with those patients who were receiving their second chemotherapy treatment. This study only followed up these chemotherapy patients for up to four weeks; thus, the sustained effect of the application in this study needs to be tested further.

CONCLUSION

In this study, the positive effects of reflexology practice applied by nurses on nausea, vomiting, retching and sleep quality in lung cancer patients were emphasized. In line with the results we have obtained, we can make the following recommendations:

MAIN POINTS

- to increase the awareness of nurses about foot reflexology in the management of nausea, vomiting and sleep problems of patients receiving cancer chemotherapy,

Table 3. The Pittsburgh Sleep Quality Index mean score distributions according to foot reflexology practices of the patients in the experimental and control groups (n=60)

PSQI*		Before reflexology	After reflexology	p**
		Mean ± SD	Mean ± SD	
Subjective sleep quality	Experimental	1.7±0.68	1.3±0.53	0.0001[a,γ]
	Control	1.9±0.91	2.1±0.84	0.218[γ]
	p***	0.322[δ]	0.0001[a,δ]	-
Sleep latency	Experimental	2.5±0.78	1.8±0.79	0.0001[a,γ]
	Control	2.1±1.05	2.3±1.02	0.206[γ]
	p***	0.156[δ]	0.019[b,δ]	-
Sleep duration	Experimental	0.9±1.09	0.6±0.97	0.024[b,γ]
	Control	1.2±1.33	1.1±1.29	0.732[γ]
	p***	0.401[δ]	0.093[δ]	-
Habitual sleep efficiency	Experimental	2.0±1.08	1.5±1.14	0.01[b,γ]
	Control	1.4±1.43	1.8±1.35	0.026[c,γ]
	p***	0.057[δ]	0.542[δ]	-
Sleep disturbances	Experimental	1.8±0.65	1.3±0.53	0.0001[a,γ]
	Control	1.6±0.061	1.6±0.61	0.739[γ]
	p***	0.227[δ]	0.012[b,δ]	-
Use of sleeping medications	Experimental	1.0±1.14	0.6±0.76	0.013[c,γ]
	Control	0.93±1.23	0.8±1.1	0.535[γ]
	p***	0.48[δ]	0.922[δ]	-
Daytime dysfunction	Experimental	1.67±1.18	0.73±1.01	0.002[b,γ]
	Control	1.7±1.18	1.63±1.1	0.743[γ]
	p***	0.896[δ]	0.002[b,δ]	-
PSQI total	Experimental	11.83±4.16	8±3.33	0.000[a,γ]
	Control	11±5.3	11.47±4.43	0.467[γ]
	p***	0.480[δ]	0.002[b,δ]	-

[δ]: Mann-Whitney U test; [γ]: Wilcoxon Signed-Rank test, SD: standard deviation.

- to extend foot reflexology practices in the management of nausea, vomiting, retching and sleep problems of patients receiving cancer chemotherapy and to reflect this in patient care,
- to include foot reflexology treatment for patients receiving cancer chemotherapy and evidence-based studies on this subject in the nursing education curriculum.

ETHICS

Ethics Committee Approval: Permission was obtained from the Karadeniz Teknik University Faculty of Medicine Clinical Research Ethics Committee (approval number: 24237859\291, date: 31.05.2016) in order to carry out this research. This study conformed to the principles of the declaration of Helsinki.

Informed Consent: Informed consent forms outlining the aims and procedures of this study were obtained from all participants who were guaranteed confidentiality.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: H.P., S.H., Design: H.P., S.H., Supervision: H.P., S.H., Fundings: H.P., S.H., Materials: H.P., S.H., Data Collection and/or Processing: H.P., S.H., Analysis and/or Interpretation: H.P., S.H., Literature Search: H.P., S.H., Writing: H.P., S.H., Critical Review: H.P., S.H.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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