

RESEARCH ARTICLE
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The Effects of Reflexology on Postpartum Sleep Quality: A Randomized Controlled Trial

Refleksolojinin Doğum Sonu Uyku Kalitesi Üzerine Etkileri: Randomize Kontrollü Bir Çalışma

ABSTRACT

Aim

Poor sleep quality is one of the major problems in the postpartum period. Reflexology is a useful nursing intervention that can improve sleep quality and reduce sleep problems. The aim of this study was to determine the effects of foot reflexology on the improvement of the sleep quality of postpartum women following vaginal birth.

Method

This single-blind, randomized controlled trial was conducted between July 2016 and March 2017 with the intervention group (n= 24) and control group (n= 30). In the intervention group, four sessions of foot reflexology was applied for 15 minutes on each foot every other day between postpartum 14th- 20th days. Measures included personal information form and Postpartum Sleep Quality Scale scores.

Result

The postpartum sleep quality of the women in the intervention group was increased (p=0.000) and significantly higher than the control group in the posttest (p=0.001). There was no significant difference between the pre and posttest sleep quality of the women in the control group (p=0.057). A sleep duration increased (p=0.004) in the intervention group, while there was no change in the control group.

Conclusion

Foot reflexology can be used to improve sleep quality and sleep duration of postpartum women after vaginal birth.

Key Words

Nursing, postpartum period, postpartum sleep quality, reflexology

ÖZET

Amaç

Kötü uyku kalitesi, doğum sonrası dönemin en önemli sorunlarından biridir. Refleksoloji uyku kalitesini artırabilen ve uyku problemlerini azaltabilen etkili bir hemşirelik uygulamasıdır. Bu çalışmanın amacı vajinal doğum sonrası postpartum kadınların uyku kalitesinin iyileştirilmesi için ayak refleksolojisinin etkinliğini belirlemektir.

Yöntem

Bu tek körlü ve randomize kontrollü araştırma, girişim grubu (n= 24) ve kontrol grubu (n= 30) ile Temmuz 2016 ile Mart 2017 tarihleri arasında yürütülmüştür. Girişim

grubundaki kadınlara, doğum sonu 14-20. günler arasında gün aşırı olmak üzere her ayağa 15'er dakikalık dört seans ayak refleksolojisi uygulanmıştır. Ölçüm araçları olarak kişisel bilgi formu ve Doğum Sonrası Uyku Kalitesi Ölçeği kullanılmıştır.

Bulgular

Girişim grubundaki kadınların doğum sonu uyku kalitesi, son testte kontrol grubuna göre artarak ($p=0.000$) anlamlı derecede yüksek olduğu belirlenmiştir ($p=0.001$). Kontrol grubundaki kadınların ise ön-test ve son test uyku kaliteleri arasında anlamlı bir fark saptanmamıştır ($p=0.057$). Girişim grubundaki doğum sonu kadınların uyku süreleri artarken ($p=0.004$), kontrol grubunda değişiklik olmamıştır.

Sonuç

Ayak refleksolojisi, vajinal doğum sonrası doğum yapan kadınların uyku kalitelerini ve uyku sürelerini iyileştirmek için kullanılabilir.

Anahtar Kelimeler

Hemşirelik, doğum sonu dönem, doğum sonu dönem uyku kalitesi, refleksoloji

What is known about the field

- Sleep problems are a major health issue for postpartum women.
- Compared to pregnant women or their non-postpartum peers, postpartum women experience more sleep disorders, and a reduction in total sleep time and sleep quality.
- It is necessary to obtain qualified nursing care based on evidence to increase the sleep quality of women after childbirth. Foot reflexology is a useful nursing intervention that can improve sleep quality and reduce sleep problems.

Contribution of the article to the field

- It has been proven by RCT that foot reflexology applied four times daily for 30 minutes/day is an effective method to increase sleep quality of women in early post vaginal birth.
- It was also found that for the first time, foot reflexology increased the total daily sleep duration of women in the early postnatal period.
- It may be suggested for nurses to include foot reflexology in their care practice to increase sleep quality and sleep duration during the postpartum period.

INTRODUCTION

Although the term "sleep quality" is widely used, the empirical literature specifies that it is not clearly understood. Sleep quality is called a complex phenomenon

that is difficult to objectively define and assess and, a major variable affecting the quality of life (1). Besides, USA National Sleep Foundation reported that indicators of sleep quality are sleep quantity, sleep satisfaction, sleep efficiency, and depth of sleep (2). Sleep problems such as sleep disturbance, poor sleep quality, sleeplessness, and sleep deprivation are major health issues for postpartum women. Compared to pregnant women or their non-postpartum peers, postpartum women experience more sleep disorders, a reduction in total sleep time and sleep efficiency, and a decrease in rapid eye movements (3). Studies indicate that between 50.9% and 87.5% of postpartum women suffer from sleeplessness (4, 5). A recent study from Turkey including 400 women in the early postpartum period found that 76% of these women experienced sleep disturbance (6). One study showed that women at the second week of the postpartum period have low sleep quality (7). Another study found that 28% of women in the late postpartum period (2–12 months of child's age) had poor sleep quality (8).

Recently studies showed that postpartum sleep problems cause various problems, including maternal fatigue, anxiety, depression, reduction in quality of life, and impairment in mother-baby attachment and baby care (9, 10). For these reasons, many women require quality care to help with their postpartum sleep problems (11).

BACKGROUND

Many postpartum women experiencing sleep problems have turned to complementary therapies (CT) due to the shortcomings of modern medical approaches and concerns about possible harm to the mother and the baby caused by unwanted drug side effects (12). The World Health Organization (WHO) describes CT as integrative therapy that are used together with modern medicine (13). Reflexology as an easy and non-invasive therapy is an application of CT in which nurses can be directly involved, and is widely used mainly in China, Denmark, England, and particularly, in the United States (14). Recently systematic reviews and meta-analyze has shown that foot reflexology is a useful intervention that can improve sleep quality and reduce sleep problems (15).

The philosophy behind of reflexology related to the Chinese theory of meridians. Reflexology involves applying direct topical pressure to specific points on the feet or hands. These points are believed to correspond to somatic organs. With reflexology, it is possible to find out which areas of body are out balance and healing can be given to rebalance body by stimulating its own mechanism (16). The impact of reflexology on postpartum sleep quality can be explained by zone / reflex, haemodynamic, nerve impulse and stress theories. Reflex points on the feet, which are connected with

internal organs, are structured by meridians. In the postpartum period, the blockage of the energy channel which causes imbalances in the return of the body to the pre-pregnancy period can be solved by reflexology. Correction of the energy imbalances can provide improving women's health after childbirth (14, 17). Reflexology stimulates the nervous system, increases dopamine secretion and accelerates the transfer of sensory stimuli to the brain. This can help women in the postpartum period to relax and improve sleep quality. Stress restricts the flow of oxygen to the organs, reducing their function and therefore causing poor sleep quality. Reflexology reduces stress with deep relaxation and helps the body to regenerate with therapeutic touch applied by hands (18).

A literature review revealed that only one randomized controlled trial (RCT) investigated the effects of foot reflexology on postpartum sleep quality following vaginal birth. In this study conducted with 65 postpartum Taiwanese women, it was found that women's sleep quality improved significantly by foot reflexology 30 minutes daily for 5 days (19). In addition, two studies from India reported that women who underwent foot reflexology following caesarian birth experienced reduced pain and sleep quality (20, 21). It was seen that the effect of foot reflexology on postpartum sleep duration was not examined in these studies. To our knowledge, there has been no experimental study from Turkey related to the improvement of sleep quality and the sleep duration of postpartum women. The aim of this study was determined the effects of foot reflexology versus routine care on the sleep quality and sleep duration of postpartum women with vaginal birth. This study has two hypotheses:(1) Women in the intervention group who receive foot reflexology will have improved sleep quality during the postpartum period compared to the women in the control group. (2) Women in the intervention group who receive foot reflexology will have increased daily sleep duration during the postpartum period compared to the women in the control group.

METHODS

Study Design

The design of this study was a single-blinded, randomized controlled trial. This study was carried out at the homes of women who had vaginal birth in Erdemli State Hospital, Gynecology and Obstetrics Clinic between July 2016 and March 2017. This RCT was recorded in ClinicalTrials.gov with NCT03882086 registry number.

Participants

The inclusion criteria of the study were as follows: (a) having a sleep problem, (b) being literate, (c) being able to communicate in Turkish, (d) 18-45 years old, (e) being in the early postpartum period (2-6 weeks), (f) having delivered a single fetus with birth weight

between 2500 and 4000 grams in the vertex presentation, and (g) having exclusive breastfeeding. The study exclusion criteria were as follows: (a) having postpartum complications such as acute infections and fevers, myocardial infarction history, irregular blood pressure, epilepsy, diabetes, osteoporosis, deep vein thrombosis, malignant melanoma, eclampsia and/or preeclampsia (b) diabetic foot, (c) open wound, varicose veins, edema or fungal infection on the foot, (d) have a psychiatric diagnosis such as postpartum depression, psychosis, (e) being treated for insomnia, and (f) alcohol intake.

Sample size calculation

G Power package software was used to estimate the sample size. In the original study of foot reflexology (19), sleep quality scores revealed that the mean and standard deviation (SD) for intervention and control groups were 3.97 (SD 1.26) and 6.24 (SD 1.68), respectively. Given a difference in sleep quality score of 2.27 between intervention and control groups, and a 95% confidence interval, 80% power, it was calculated that 30 participants would be needed in each group (30 control, 30 intervention). The study was completed with 54 women due to some of the women dropping-out of the study, with 24 women in the intervention group and 30 women in the control group.

The effect size was calculated at the end of the study as 0.97 from the analyses based on PSQS posttest scores in the control and intervention groups. Taking this large effect size into account, the post-hoc power value was calculated to be 0.916 with a t test using G Power package software. Based on this value, the actual power of the study was 91%.

Randomization and blinding

The simple randomization method was used in this study. Eligible women were randomized into intervention (foot reflexology) and control groups with 1:1 allocation ratio using a computer-generated sequence. The allocation sequence was prepared by a researcher not involved in the recruitment, data collection and analysis.

Women were enrolled for the study during the first researcher's visit to the obstetrics clinic of Erdemli State Hospital between 8 am and 8 pm, at which time they were informed about the purpose of the study. Women who agreed to participate in the study were visited on the 14th day of postpartum. At home visits, women who have a sleep problem were allocated to intervention or control groups with the sealed envelope method. Thus, participants were single-blinded to treatment allocation. The CONSORT scheme of this study is presented in Figure 1.

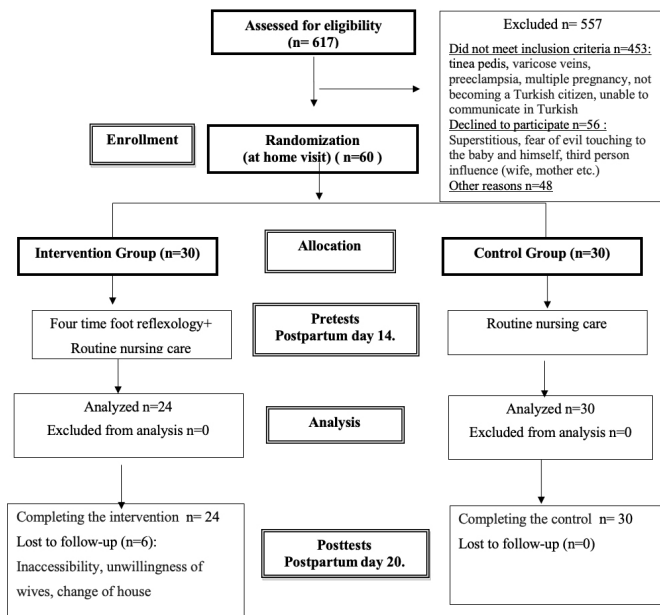


Figure 1. Consort scheme of the study

Intervention procedure

It was found that previous study conducted to improve sleep quality after vaginal birth, foot reflexology was performed in the early postpartum period between postpartum days 9 through 13 (19). Also considering the follow-up frequency of the National Post-natal Care Management Guide (22), the researchers decided to implement the foot reflexology between postpartum 14th- 20th days. A pilot study was conducted in June 2016 with five primiparous women in the postpartum period who had delivered a single baby via the vaginal birth and volunteered to participate in this study. In the pilot study, four reflexology sessions were applied. These sessions were held every other day, in the afternoons, between 14th-20th days postpartum. As a result of the pilot study, it was understood that there was no need to change the study procedure. Data from the pilot study were not used in the RCT.

Before the intervention, the first researcher received a course organized by the Association of Health and Natural Therapies and took an ITEC (International Therapy Examination Council) certificate in reflexology. The second researcher, as a certified nurse reflexologist advised on the preparation and implementation of the program.

In the intervention group, four reflexology sessions were applied for 15 minutes, in the afternoons, every other day between postpartum 14th-20th day. Procedure of foot reflexology sessions was created according to the expert opinion of a reflexologist and studies in the literature (19-21). The women rested in a comfortable position, usually lying on their back, during the preparation phase of about 8 minutes. The researcher

washed her hands with warm water and moderate amount of baby oil was applied to her hands. General reflexology was started by massaging all reflex points in the plantar with the thumb and forefinger. Then at the performing stage for nearly seven minutes, specialized reflexology was done through the pressure point of the foot reflex. The seven reflexology areas were used for stimulation: solar plexus, brain, adrenal, excretory organs, genital organs, spine and lower abdomen. The researcher used the following reflexology techniques: hook & backup, rotating, stroking, walking techniques, shaking feet, pivot-on-a-point and pressing acupoints. Thirty women who had sleep problems in the early postpartum period, who were in the control group of the study, received only routine postpartum care, and foot reflexology was not applied. The pretest data of these women were evaluated on the 14th postpartum day, and the posttest data were evaluated on the 20th day during the home visits.

Data collection tools

Personal Information Form. After reviewing the relevant literature, a personal information form was composed by the researchers. This form was comprised of 11 items related to sociodemographic, obstetric, and sleep properties. Sleep properties such as the presence of sleep problems, daily sleep time, frequency and duration of daytime nap, and nighttime sleep were obtained based on the estimated expressions of women.

Postpartum Sleep Quality Scale. The Postpartum Sleep Quality Scale (PSQS) was developed by Yang, Yu, & Chen, (2013) (23). It consists of 14 items that are used to measure the postpartum sleep quality based on the women's perceptions in the last two weeks. The items of the scale assess duration of falling asleep, actual sleep time per night, difficulty falling asleep, waking up at midnight, waking up early in the morning, the effect of baby care and maternal physical state on sleep, feeling energetic throughout the day and satisfaction with sleep quality in the postpartum period. The validation and reliability study for the Turkish version of the scale was conducted by Boz and Selvi (2018) (24). According to factor analysis results, the Turkish version of the scale has a three-factor structure as "Infant Night Care Related Daytime Dysfunction" (items 4, 5, 7, 8, 11, 12), "Physical Symptoms Related Sleep Inefficiency" (items 3, 6, 9, 10, 13) and "Satisfaction with the Sleep Quality" (items 1, 2, 14). The total Cronbach alpha coefficient of the scale is 0.88. The items of the PSQS are scored between 0 and 4 on a 5-point Likert scale (0 never, 4 always). The minimum score of the PSQS is 0, and the maximum available score is 56. There is no cut-off score for the scale. Higher PSQS scores indicate worse sleep quality (24). The total Cronbach alpha coefficient of the PSQS was .72 in the current study.

Data analysis

The SPSS-24 software (Statistical Package for Social Sciences) was used for data analysis. Kurtosis and skewness were used for normal distribution. Kurtosis values in the control and intervention groups ranged between $-.51$ and $.89$, and skewness values ranged between $-.32$ and $.70$. For normally distributed data, skewness values between ± 1.00 and kurtosis values between ± 2.00 are sufficient. Therefore, the data obtained in the present study are normally distributed. The Student's t-test was used to determine the significance of the differences between pretest and posttest sleep duration and quality. Values of $p < .05$ were considered significant. An Intention to Treat (ITT) analysis was performed because of the dropouts. Mean substitution was used for missing data (25).

Ethical issues

This study was approved by the Mersin University Ethical Committee of Clinical Research (approval number: 2016/50, date: 23.02.2016) and by the Ethical Committee of Educational Unit of Mersin Public Hospitals Administration. During the research, "Helsinki Declaration Principles" were complied with in terms of protecting the medical and personal data of individuals. All the participants provided written informed voluntary consent.

RESULTS

Sample Characteristics

This study was conducted with 54 postpartum women to determine the effects of foot reflexology versus routine care on sleep quality and sleep duration. The mean ages of the women in the control and intervention groups were 28.6 (SD = 5.89) and 26.73 (SD = 5.36) years, respectively ($t = -1.282$, $p = .205$). Regarding education levels, 53.3% of women in the control group were primary school graduates, and 60% of women in the intervention group were high school graduates. When the income status of women was examined, 76.7% of the women in the control group and 53.3% in the intervention group stated that their income was lower than their expenses. The majority of the women in both the groups were living in a nuclear family (control group=86.7% and intervention group= 93.3%). The time spent by women every day on housework was similar in the groups (control group M= 3.20, SD = 1.39 and intervention group M= 3.40, SD = 2.29 hours) ($t = .407$, $p = .685$). Thirty percent of women in the control group and 40% of women in the intervention group had a helper at home who provided support with caring for the baby. Regarding the obstetric properties of the participants, it was found that the majority of the women in both groups have an intended pregnancy (control group=86.7% and intervention group=80%) and multiparous (control group=76.7% and intervention group=66.3%). It was found that 60% of the women in

the control group and 43.3% of the women in the intervention group had a baby girl at last birth. As a result of the analysis of descriptive data, there were no significant differences between the control group and intervention group in terms of sociodemographic and obstetric characteristics; thus, the homogeneity of the subjects was established (Table 1).

Table 1. Demographic and obstetric characteristics of control and intervention groups

Variable	Control group (n:30) n (%)	Intervention group (n:30) n (%)	Statistic and p
Average Age and Standard Deviation	28.6±5.89	26.73±5.36	$t = -1.282$, $p = 0.205$
Education status			$\chi^2 = 3.396$, $p = 0.183$
Primary school	16 (53.3)	9 (30)	
High school	12 (40)	18 (60)	
University	2 (6.7)	3 (10)	
Income			$\chi^2 = 3.642$, $p = 0.056$
Expenditure more than income	23 (76.7)	16 (53.3)	
Income equal expenditure	7 (23.3)	14 (46.7)	
Family structure			$\chi^2 = 0.741$, $p = 0.335$
Nuclear family	26 (86.7)	28 (93.3)	
Extended family	4 (13.3)	2 (6.7)	
Relative support for baby care			$\chi^2 = 0.659$, $p = 0.294$
Yes	9 (30)	12 (40)	
No	21 (70)	18 (60)	
Baby's gender			$\chi^2 = 1.676$, $p = 0.151$
Girl	18 (60)	13 (43.3)	
Boy	12 (40)	17 (56.7)	
Pregnancy intendedness			$\chi^2 = 0.585$, $p = 0.746$
Intended pregnancy	26 (86.7)	24 (80)	
Mistimed pregnancy	4 (13.3)	6 (20)	
Parity			$\chi^2 = 0.742$, $p = 0.284$
Primiparous	7 (23.3)	10 (33.7)	
Multiparous	23 (76.7)	20 (66.3)	

Participant Attrition

We required 60 postpartum women for this study, but, only 54 yielded data for analysis. The total ratio of dropouts from the sample was 10% (6/60). Twenty-four women were included in the analysis as the intervention group, and the dropout ratio in this group (6/30) was 20%. No dropouts occurred in the control group. A maximum of 20% dropout is recommended in order not to impair the randomization (25). Therefore, the ratios of dropouts in this study were within allowable limits.

Postpartum Sleep Quality

At the beginning of the study, all participants stated that they have a sleep problem and daytime naps after childbirth at the postpartum period. A comparison of pretest and posttest PSQS scores of sleep durations of intervention and control group women according to ITT Analysis is presented in Table 3. The mean PSQS scores of women in the intervention group were 44.73 (SD = 6.89) for pretest and 35.34 (SD = 5.48) for posttest; this decrease indicated an improvement in the sleep quality of these women ($t = 7.635$, $p = .000$). In addition, there was a significant difference between the intervention and control groups regarding mean posttest total PSQS scores, with women in the intervention group having higher sleep quality compared to those in the control group ($t = -3.608$, $p = .001$) (Table 2). Based on these results, the hypothesis stating that "H1:

Women in the intervention group who receive foot reflexology will have improved sleep quality in the postpartum period compared to women in the control group" was accepted.

Table 2. Comparison of pre-test and post-test postpartum sleep quality of intervention and control group women according to ITT Analysis

Groups	Intervention group (n:30)		Control group (n:30)		Pretest**		Posttest**	
	Scale		Scale					
	Pretest	Posttest	Pretest	Posttest	t	p	t	p
	X ± SD	X ± SD	X ± SD	X ± SD				
PSQS	44.73±6.89	35.34±5.48	42.40±3.9	40.1±4.69	-3.613	0.110	-3.608	0.001*
	t: 7.635 p: 0.000*		t: 2.064, p: 0.057					

*p<0.05, **Comparison of intervention and control groups' PSQS scores

Table 3. Comparison of sleep durations of intervention and control group women according to ITT Analysis

Groups	Intervention group (n:30)		Control group (n:30)		Pretest**		Posttest**	
	Sleep Durations		Sleep Durations					
	Pretest	Posttest	Pretest	Posttest	t	p	t	p
	X ± SD	X ± SD	X ± SD	X ± SD				
Daily sleep durations	5.06±1.46	5.84±1.02	5.20±1.34	5.23±1.35	-0.367	1.95	0.715	0.04*
	t= -0.40, p=0.001*		t= -1.00, p=0.326					
Nighttime Sleep Durations	4.50±1.40	4.92±0.96	4.66±1.51	4.65±1.40	-0.441	0.66	0.881	0.38

*p<0.05, **Comparison of intervention and control groups' sleep durations

Postpartum Daily Sleep Duration

The participants' sleep durations were calculated based on their own statements. A comparison of daily sleep durations of women in the intervention and control groups is presented in Table 3. The mean daily sleep duration of women in the intervention group was 5.06±1.46 hours in the pretest and 5.84 (SD = 1.02) hours in the posttest, with a significant average increase of 0.78 hours (47 minutes) at the end of the experiment (t=-.40, p=.001). There was no difference between the pretest sleep durations (t=-.367, p=1.95) of the intervention and control groups. However, the posttest mean daily sleep duration was 5.84 (SD = 1.02) hours in the intervention group and 5.23 (SD = 1.35) hours in the control group. At the end of the experiment, women in the intervention group had an average 0.42 hours (37 minutes) more of daily sleep duration than the control group (t=.715, p=.04) (Table 3). Based on these results, the hypothesis stating that "H2: Women in the intervention group who receive foot reflexology will have increased daily sleep duration in the postpartum period compared to women in the control group" was accepted.

DISCUSSION

The present study was conducted with the aim of determining the impact of foot reflexology on sleep quality levels and sleep duration of postpartum women. All participants stated that they had sleep problems at the beginning of the study. The reduction in the duration

and quality of sleep in postpartum women is not surprising due to various reasons including postpartum physiological processes, physical symptoms (e.g., perineal pain), neonatal care, the continuation of breastfeeding at night, and irregular infant sleep patterns (5). Also, sleep problems during the postpartum period are also an important problem for Turkish women. In a timely study with 400 Turkish women in the early postpartum period, 76% of women experienced sleep disturbances (6). In another study, it was determined that sleeplessness was the most common problem (79.5%) during the postpartum period (26). Similarly, one study indicates that mothers experience significantly poor sleep quality during the postpartum period. In 87.5% of Taiwanese healthy postpartum women' reported poor sleep quality (27). It was also reported that postpartum mothers' sleep problems were 50.9% in Malaysians and 77.8% in Japanese (28).

Postpartum sleep quality is an important indicator of a woman's physical and mental health. At the beginning of the study, women had mean total PSQS scores ranging between 42.40 (SD = 3.9) and 44.73 (SD = 6.89). The possible scores that can be obtained from the scale range between 0 and 56, with higher scores indicating lower sleep quality. Therefore, it can be said that the sleep quality of the women in the present study was quite low at the beginning of the study. It is understood from the literature, that only two studies used the PSQS to assess the postpartum sleep quality. In these studies, the mean total score of PSQS was found to be 30.2 (SD = 6.90) (min = 18, max = 47) and 33.57 (SD = 11.26) (min = 11, max = 57) respectively in Turkish postpartum women (7, 24). On the other hand, two studies from Taiwan reported moderate levels of sleep quality in postpartum women with PSQS scores between 21.71 and 22.82 (11, 29).

The results of the current study indicate that foot reflexology has significant effects on the sleep quality of postpartum women, as the intervention group had improved sleep quality compared to the control group. This is consistent with the findings of a study on postpartum sleep quality, which reported that foot reflexology improved sleep quality on the postpartum period. Li et al. (2011) reported that foot reflexology for five days from ninth to 13 days in 30-minute sessions significantly increased sleep quality after vaginal birth (p<.001). In addition to the study by Li et al., two studies examined the effects of foot reflexology on sleep in postpartum women after caesarian birth (19). The first study included 60 Indian women following caesarian birth, and foot reflexology was applied to 30 women for five days in 15-minute sessions. Results of this study revealed that the women receiving foot reflexology had reduced postoperative pain and significantly improved sleep quality compared to the control group (21). The effects of foot reflexology, back massage, and routine

nursing care on sleep quality were examined in a RCT with 120 women after a cesarean birth. Results indicated that foot reflexology applied for three days in 15-minute sessions was more effective in improving sleep quality compared to back massage and routine care (20). In a systematic review and meta-analysis, Lee, Han, Chung, Kim, & Choi, (2011) documented that foot reflexology was a beneficial intervention for improving sleep quality and reducing fatigue (30). Another systematic review of RCTs documented that reflexology was more effective for sleeplessness than routine postpartum care (31). Also, the large effect size (0.97) in this study suggests that foot reflexology is effective on postpartum sleep quality. No data has been reached on the effect size in previous studies (19-21).

A systematic review and meta-analysis study found that non-pharmacological interventions to improve sleep quality had a moderately positive short-term effect. However, more research is needed on the effects of these interventions (15). In this RCT, the fields of solar plexus, brain, adrenal, excretory organs, genital organs, spine and lower abdomen areas, which believed to help regulate sleep and influence hormonal gland secretions and the reproductive system, were used in foot reflexology. The question to be answered here is how reflexology effects postpartum sleep quality. There are some theories on the mechanism of potential action of reflexology (18). The first mechanism is explained by zone/reflex theory. This theory states that reflex points on the feet, which are structured by energy channels and/or meridians, are linked to internal organs. Reflexology can resolve energy channel blockages that cause imbalances in the body (17). Reflexology corrects postpartum women' energy imbalances and improves bodily health

Second mechanism of reflexology is stimulating the nervous system and the transfer of sensory stimuli to the brain which can increase the secretion of dopamine. This can help women in the postpartum period to relax and improve sleep quality (18). The hemodynamic theory emphasizes that reflexology increases blood flow and can restore a healthy balance in the body (14). In this study, the blood flow and tissue perfusion of the brain, adrenal, emptying organs, genital organs, spine, and the lower abdomen of postpartum women in intervention groups were increased. The postpartum period is a challenging and sensitive time during which important anatomical, physiological and social changes occur. In this period, women experience a transition to motherhood, their social relations are rearranged (32). This transition and adaptation process is known to cause stress in women. It has been determined that lack of support (33), baby crying, sleep disorders, and inadequate partner support cause stress in postpartum women (34, 35). As a result, it is known that stress experienced in the postpartum period causes sleep problems, restricting the supply of oxygen to particular

organs and reducing organ functions (36). Moreover, low postpartum sleep quality also causes stress and creates a vicious circle (19, 23). Reflexology has certainly been shown to have positive psychological effects (18). A commonly held belief, and suggested by Tiran (2010), states that reflexology can create a deep sense of relaxation by increasing the release of endorphins (37). In the last mechanism, reflexology functions through therapeutic touch applied by hands. A systematic review and meta-analysis have showed that the therapeutic touch is importance to healing and well-being (38).

The mean daily sleep durations of postpartum women at the beginning of the study were between 5.06 and 5.20 hours. In previous studies from Turkey, the mean daily sleep durations of women in the early postpartum period were higher than this study (6.6 - 6.9 hours, respectively) (24, 30). Beside, one longitudinal study from Norway including 1.480 healthy women in the early postpartum period reported a higher daily sleep duration (6 hours 31 minutes) (5). Researchers thought that this difference in sleep duration is related to the socio-demographic data in the study groups. The researchers also emphasized that women receiving foot reflexology had a significant increase of 47 minutes in their daily sleep durations compared to controls and concluded that foot reflexology resulted in a significant increase in daily sleep duration.

Limitations of the study

There are several limitations of this study. One limitation of the study is that it was single-centered. The study was conducted this way in order to assure sample homogeneity. Therefore, results of this study should be confirmed with larger multi-centered studies. Another limitation was that the sample was predominantly comprised of postpartum women with moderate educational levels and low-moderate incomes. Other limitation of this study was the small sample size due to dropouts. The use of women' self-reported sleep durations and perceived sleep quality was a last significant limitation of this study.

Implications for Nursing Practice

This research has major implications for nursing educating and practice. We recommend that nurses who are responsible for postpartum care make use of foot reflexology. Also, nurses should receive continuing education related to the evaluation and improve of postpartum sleep quality and could acquire the skills to improve sleep quality effectively through reflexology. Beside, there is no standardization of reflexology in nursing undergraduate education. Nurses interested in reflexology should be encouraged to obtain training and courses to apply it. Foot reflexology requires expertise. It is especially important to develop hand skills as it is a manipulative and body-based therapies.

CONCLUSION

This RCT was conducted with the aim of improving the sleep quality of women in the early postpartum period following vaginal birth. This study indicated that foot reflexology is an effective intervention for improving the sleep quality of postpartum women. We realize there is a need for future RCTs investigating the effects of foot reflexology on sleep quality in the initial late postpartum periods. Comparative trials should be conducted in order to standardize the application days as well as the frequency and duration of foot reflexology with the aim of improving and/or maintaining sleep quality in the postpartum period.

Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Disclosure

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Author Contributions

Concept: N.S., İ.B; Design: N.S., İ.B; Supervision: N.S., İ.B; Data Collection and/or Processing: N.S., İ.B; Analysis and/ or Interpretation: N.S., İ.B; Literature Search: N.S., İ.B; Writing Manuscript: N.S., İ.B; Critical Review: N.S., İ.B; Resources: N.S., İ.B; Materials - N.S., İ.B

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