Journal of Midwifery & Reproductive Health

JMRH.mums.ac.ir

The Effect of Foot Reflexology on Lactation and Breast Milk Volume in Postpartum Women: A Systematic Review and Meta-analysis

Zahra Abbaspoor (PhD)[1], Zaynab Mohaghegh (PhD)[2], Shahla Faal Siahkal (PhD)[3], Fatemeh Yousefi (MSc)[4,5*], Maryam Zahedian (MSc)[6]

[1] Associate Professor, Reproductive Health Promotion Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[2] PhD of Midwifery, Health Deputy, Department of Family Health, Tehran University of Medical Sciences, Tehran, Iran
[3] PhD of Midwifery, Department of Midwifery, Islamic Azad University, Marand Branch, Marand, Iran
[4] PhD Student of Midwifery, Department of Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[5] Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[6] MSc, Librarian of Nursing and Midwifery School, Ahvaz Jundishapur University of Medical Science, Ahvaz, Iran

ARTICLE INFO

Article type:
Review article

Article History:
Received: 17-Jul-2023
Accepted: 30-Jan-2024

Key words:
Reflexology
Lactation
Postpartum
Meta-analysis

ABSTRACT

Background & aim: Research on foot reflexology (FR) for lactation and its impact on increasing breast milk volume is scarce. This study aimed to evaluate the effect of FR on lactation and breast milk volume in postpartum women.

Methods: This systematic review was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). 2023. The search strategy was directed to databases of PubMed, Embase, Cochrane Library, Scopus, and Web of Science as well as the search engine of Google Scholar from inception to February 30, 2023. The quality of the included trials evaluated by the Cochrane Risk of Bias tool. The main results were analyzed by RevMan 5.1.

Results: Out of 525 initially searched studies, six studies involving 364 women were included in the final analysis. Findings indicated that the use of FR significantly improved LATCH (Latch, Audible swallowing, Type of nipple, Comfort and Hold) scores (MD = 0.98; 95% CI: 0.57 – 1.38, P < 0.001). However, no significant differences were observed between groups regarding breast milk volume (MD: 2.52; 95% CI: 0.04-5.01; P = 0.05) or lactation onset symptoms (breast tension, heat, and pain) in the first day post-intervention. But, two groups were significantly different in terms of symptoms of the onset of lactation on the second day after intervention.

Conclusion: This study showed that FR significantly increase the LATCH score and symptoms of onset of lactation on the second day after intervention and did not display any significant increase in volume of breast milk.

▶ *Please cite this paper as*:
Abbaspoor Z, Mohaghegh Z, Faal Siahkal Sh, Yousefi F, Zahedian M. The Effect of Foot Reflexology on Lactation and Breast Milk Volume in Postpartum Women: A Systematic Review and Meta-analysis. Journal of Midwifery and Reproductive Health. 2025; 13(1): 4510-4522. DOI: 10.22038/JMRH.2024.73794.2154

Introduction

Breastfeeding is one of the most effective ways to ensure a child health and survival (1). Breast milk is considered the best source of nutrition for the baby's growth and development (2). Breastfeeding has short-term benefits such as reducing the prevalence of neonatal infections, proper infant weight gain, appropriate mother-baby bonding, and long-term advantages such as reducing the prevalence of allergies, obesity, endocrine disorders e.g., diabetes and cardiovascular disease, and psychological problems in the later stages of life (2-4). It also has maternal benefits such as reducing the incidence of breast cancer and diabetes (5). The reported rate of exclusive breastfeeding in the first six months of life by WHO is about 44% (6).

* *Corresponding author*: Fatemeh Yousefi, 5 Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Tel: 00989125178487; Email: fatiyousefi@yahoo.com

According to a meta-analysis (2016), the overall prevalence of exclusive breastfeeding in Iran is reported to be 49.1% (7).

Several factors can affect exclusive breastfeeding. Background factors, factors related to pregnancy and childbirth, factors related to child health, cognitive and behavioral factors, social support, and the mother's perceived attitude as well as maternal education could influence exclusive breastfeeding (8-9).The results of a qualitative study in Iran showed that health providers have an important role in meeting the appraisal support needs of breastfeeding mothers (10).

Many interventions have been designed and implemented to increase the breastfeeding rate, some of which have been successful based on systematic reviews including peer counseling, telephone support, massage, financial incentives, prenatal education, and combined interventions (11-12). Another intervention in this field is foot reflexology (FR) which is one of the sub-branches of complementary medicine. The mechanism of reflexology is based on the idea that all areas of the body are mapped on the areas of the feet and hands (13). However, the mechanism of FR is not well described. FR can help reduce inflammation, pain, and muscle tension, and increase lymphatic flow around the body and more relaxation (13-16). Some clinical trials assessed the effect of FR on breast milk volume and lactation (15-17). In some studies, FR has been able to increase the volume of breast milk or lactation in the postpartum period (17-18), while some could not show this effect (19).

Considering the safety of reflexology as a complementary method in increasing breastfeeding, in case of its efficacy, it can be suggested to health care workers. Also, based on the researchers' knowledge, no review study has been conducted to investigate the effect of reflexology on breastfeeding so far. This study was conducted to investigate the effect of FR on lactation and breast milk volume in postpartum women.

Materials and Methods

Search strategy and data sources

The current study was performed based on the preferred reporting items for systematic reviews (PRISMA 2020 checklist)(20). We searched published scientific articles using the relevant electronic databases including PubMed, Embase, Cochrane Library, Scopus, Web of Science, and search engine of Google Scholar from inception to February 30, 2023, without any language restriction. Keywords that were searched included; “Postpartum Period”, “Musculoskeletal Manipulations”, “Foot Reflexology”, “Milk Human”, “Breastfeeding” ,"Breast milk volume" and “Lactation”. An example of PubMed search strategy is given below.

(((Postpartum[Title/Abstract] OR "Postpartum Period"[Title/Abstract] OR "Postpartum Women"[Title/Abstract] OR Puerperium[Title/Abstract] OR Mother[Title/Abstract] OR Mothers[Title/Abstract] OR Women[Title/Abstract] OR females[Title/Abstract]) OR (Postpartum OR "Postpartum Period" OR "Postpartum Women" OR Puerperium OR Mother OR Mothers OR Women OR females[MeSH Terms])) AND ((Reflexology[Title/Abstract] OR "Musculoskeletal Manipulations"[Title/Abstract] OR "Manipulation Therapy"[Title/Abstract] OR "Manipulative Therapies"[Title/Abstract] OR Bodywork[Title/Abstract] OR Rolfing[Title/Abstract] OR "Craniosacral Massage"[Title/Abstract] OR "Manual Therapies"[Title/Abstract] OR "Manual Therapy"[Title/Abstract] OR "Foot Reflexology",[Title/Abstract] OR "Zone Therapy",[Title/Abstract] OR "Clinical Foot Reflexology"[Title/Abstract] OR "Clinical Foot Reflexology",[Title/Abstract] Massage) OR (Reflexology OR "Musculoskeletal Manipulations" OR "Manipulation Therapy" OR "Manipulative Therapies" OR Bodywork OR Rolfing OR "Craniosacral Massage" OR "Manual Therapies" OR "Manual Therapy" OR "Foot Reflexology", OR "Zone Therapy", OR "Clinical Foot Reflexology", OR Massage [MeSH Terms]))) AND (("Breast milk volume"[Title/Abstract] OR "milk volume"[Title/Abstract] OR "Milk, Human"[Title/Abstract] OR "Human Milk"[Title/Abstract] OR Lactation[Title/Abstract] OR "Milk Secretion"[Title/Abstract] OR "Milk Secretions"[Title/Abstract] OR "Prolonged Lactations"[Title/Abstract] OR "Prolonged Lactation"[Title/Abstract]) OR ("Breast milk volume" OR "milk volume" OR "Milk, Human" OR "Human Milk" OR Lactation OR "Milk Secretion" OR "Milk Secretions" OR "Prolonged Lactations" OR "Prolonged Lactation"[MeSH Terms])).

Inclusion and exclusion criteria

We included the following studies: published randomized controlled trials with full-text and without language restriction. Studies published as thesis, conference abstract, commentary, review and letter to the editor were excluded from this review. Our inclusion and exclusion criterions were selected according the PICO that was described as below:

Participants (P)

Participants in reviewed studies were primigravid and multigravid women who had a vaginal childbirth, or undergoing cesarean section and had an infant with a gestational age ≥ 28 weeks, Lack of injury, wound, or tumor on the feet for reflexology, being in 24 hours after childbirth, absence of lactation three hours before measuring, and lack of a history of back massage and FR were other inclusion criteria. Reluctance to continue the research at any time during the study, having a recent stressful experience (in the past 6 months) such as death and divorce, illness or hospitalization, or the need to take medications affecting breast milk such as antibiotics, anticonvulsants, and antipsychotics were of exclusion criteria for women in reviewed studies.

Intervention (I)

We included studies which FR was used during the postpartum period compared with a placebo or control group with no intervention.

Comparison group (C)

Studies that had a control group in the form of routine nursing care or general massage of foot were included in the systematic review. Studies that did not have a control group were not included.

Outcome measures (O)

The primary outcomes included LATCH (Latch, Audible swallowing, Type of nipple, Comfort and Hold) score in the first and second days, and the volume of breast milk after the intervention. LATCH is an abbreviation of five letters, each representing an aspect of breastfeeding. The "L" stands for latching, the "A" stands for audible swallowing, the "T" stands for the mother's nipple type, the "C" stands for the mother's comfort level, and the "H" stands for the amount of assistance that the mother needs to keep her baby on her breast. (21).

The secondary outcome was initial signs of lactation including breast-tension, increase in breast-heat, and breast-pain.

Study selection

Following the initial search, two reviewers (FY and SHF) independently screened the titles and abstracts of searched studies. Full-text screening, data extraction, and quality assessment were done by two mentioned authors using Covidence software. If there was any disagreement, it was resolved by discussion or with help from the third author (ZM).

Data extraction

We designed the data extraction form recommended by the Pregnancy and Childbirth Cochrane Group (22). Two authors (FY and SHF), independently, extracted data on study details including author, country, age of participants, number of participants, the kind of intervention in both the intervention and control groups, main outcomes, and findings. Data was entered into Review Manager Software (RevMan 5.1). It is worth mentioning that because the mean and standard deviation of the changes in breast milk volume among the control group after intervention were zero in a study (23), therefore the mean difference was not estimable, additional information, that being the volume of milk after intervention, which was obtained from a theses, was extracted via accessing the actual thesis itself.

Risk of bias

Risk of bias for each study assessed independently by two reviewers (FY and SHF) using seven criteria that recommended by Cochrane for quality assessment of randomized controlled trials. These criteria were covered: random sequence generation (selection bias), allocation concealment (selection bias), blinding of the participants and the personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective reporting (reporting bias) and other risk of bias. If there was any disagreement, it was resolved by discussion.

Data analysis

For continuous data including LATCH score on the 1st and 2nd day, the volume of breast milk

after intervention, and the Visual Analogue Scale (VAS) as a sign of the onset of lactation, we used the mean difference (MD), and confidence intervals (CIs). Forest plots were used to demonstrate effect size and CI. Heterogeneity between the included studies was assessed by I^2. By default, we used fixed effects for all pooled studies. According to the primary heterogeneity results, if $I^2 > 50$ %, the random effect model was used. All data were analyzed using Review Manager (RevMan 5.1) statistical software provided by the Cochrane group. For random-effects and fixed-effect the significance level was set at 0.05.

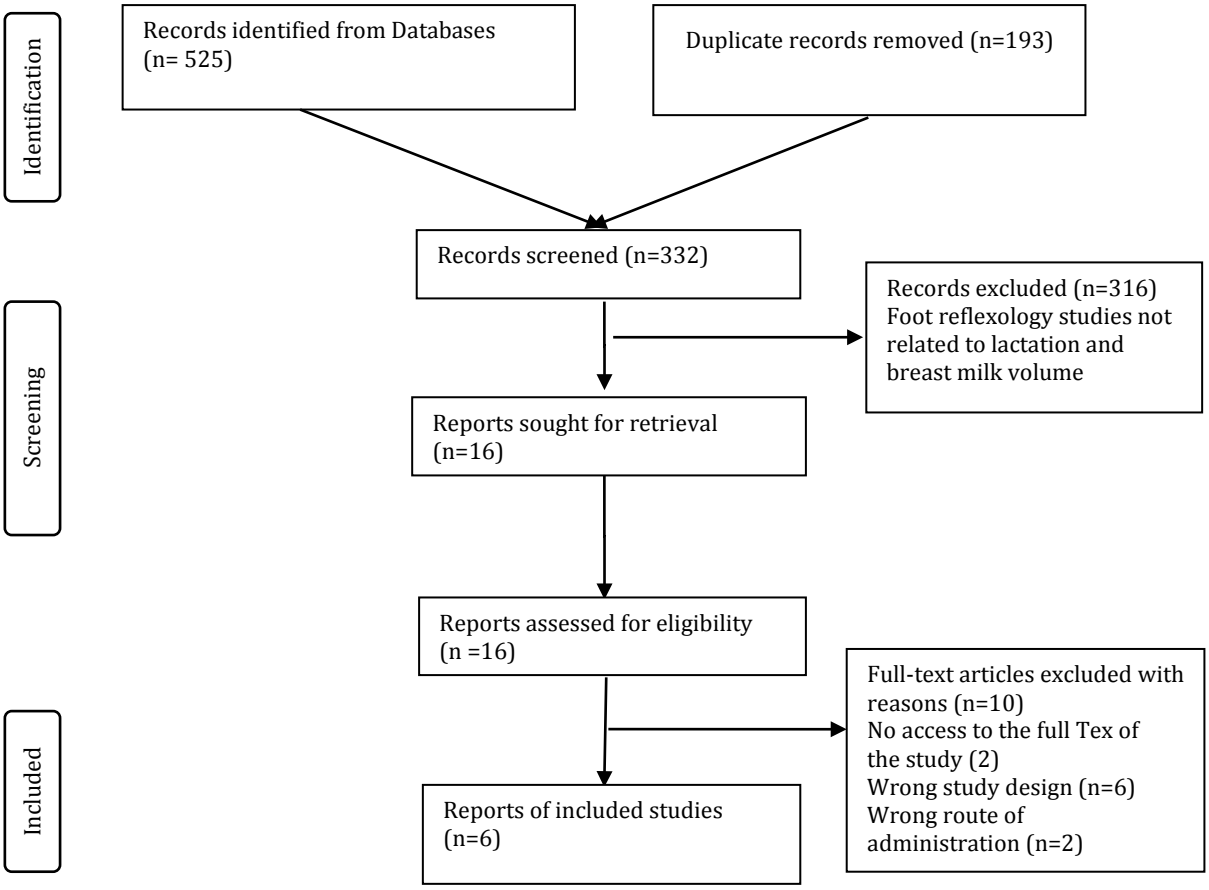

Figure 1. Study selection steps based on the PRISMA 2020 flow diagram

Results

Study selection process

The primary search detected 525 studies in total. After removing duplicates (n=193) using Covidence, 332 papers were screened. After screening the titles and abstracts 316 records that not related to the topic were excluded, and 16 eligible articles were selected for full-text screening. Through a full-text review, we removed 10 records for unqualified types of study design, therefore, six articles were finally pooled in the meta-analysis. A flow diagram of the process of study selection is shown in Figure 1.

Characteristics of included studies

In this review of six studies, two examined the effect of FR on breastfeeding and four studied the impact of FR on breast milk volume in breastfeeding mothers. We examined the outcomes of these two groups separately. In terms of geographical distribution, three studies were from Iran (15, 17, 20), two were from Turkey (18, 24), and one was from Thailand (25). Four were written in English, one in Persian (17) and one in Thai language (25) they were all randomized control trials. In the study by Mirzaie et al., both the control and intervention groups initially received a general foot massage. Following that, the intervention group had specific lactation points targeted during their massage (15), and the remaining had control groups receiving routine care. All studies included examined the impact of FR in breastfeed mothers after C-section; but three of the studies also included breastfeed mothers after vaginal delivery (17, 19, 25). The age range of the breastfeed mothers was between the ages of 18 and 35. The characteristics of the reviewed studies are presented in Table 1.

Risk of bias assessment in included studies

Two reviewers (SHF, FY) assessed the quality of studies using the Cochrane Risk of Bias tool. The lowest level of bias was associated with selection bias, reporting bias, and attrition bias, respectively. However, the majority of studies had unclear risk of detection bias and allocation concealment (19, 23-25). Only one study was rated as having high risk of selection bias and detection bias (19). Figures 2 and 3 show the risk of bias summary of selected studies (16–22).

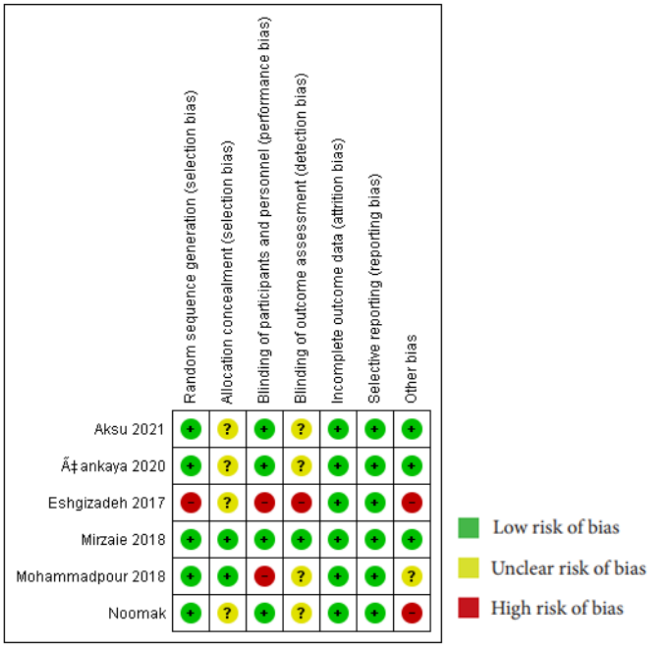

Figure. 2. Risk of bias for each included studied based on the Cochran risk of bias tool

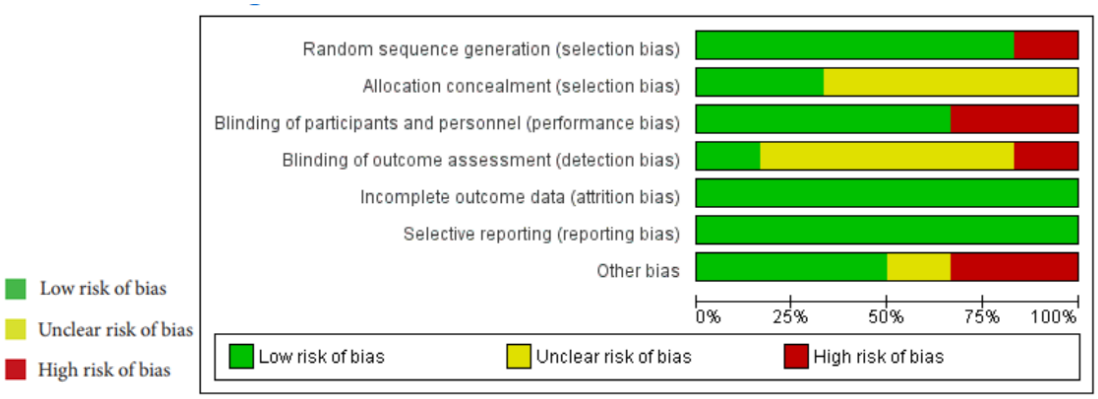

Figure 3. Risk of bias across all included studies based on the Cochran risk of bias tool

Effectiveness of interventions

Primary outcomes

LATCH score on the first and second days after intervention

The use of FR for increasing LATCH score on the first and second days was evaluated in two studies involving 167 participants (18, 24).The results showed that FR could significantly increase the LATCH score (MD = 0.98; 95% CI: 0.57, 1.38, I^2= 0%; P < 0.00001) in 1st day and 2nd days following intervention (MD: 1.70, CI 95% (0.94, 2.46); I^2= 0%; P<0.0001). Figure 3 shows the forest plot of FR effect on the LATCH score on the first and second days after the intervention.

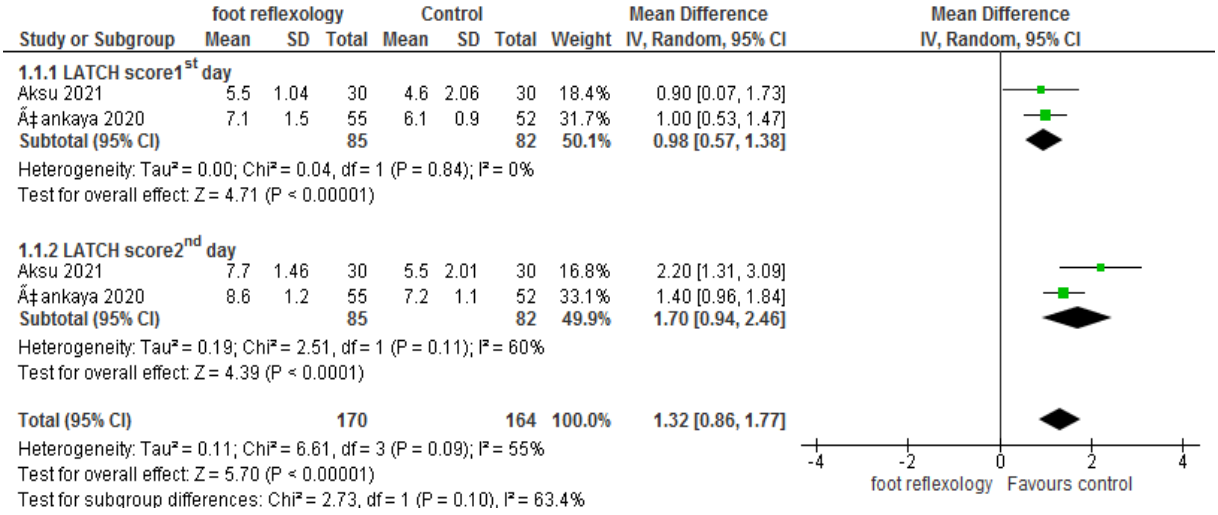

Figure 4. Forest plot showing foot reflexology effect on LATCH score 1st and 2nd days after the intervention

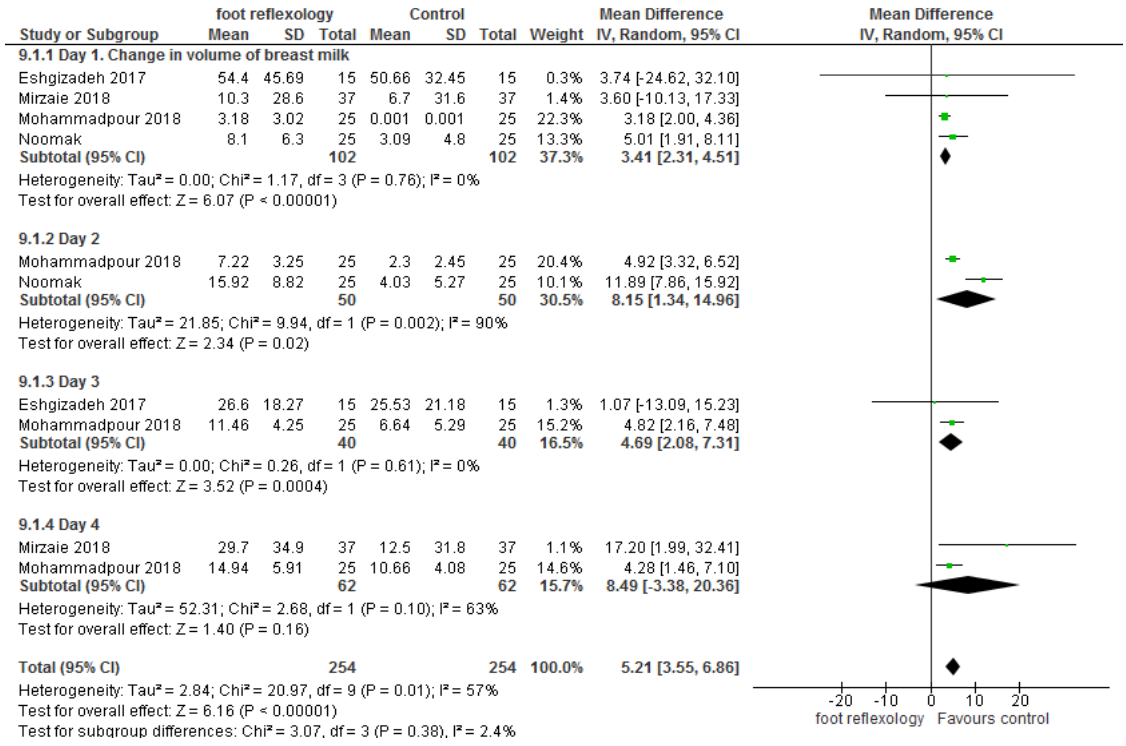

Figure 5. Forest plot showing foot reflexology effect on change in volume of breast milk first, second, third, and fourth days after the intervention (mL)

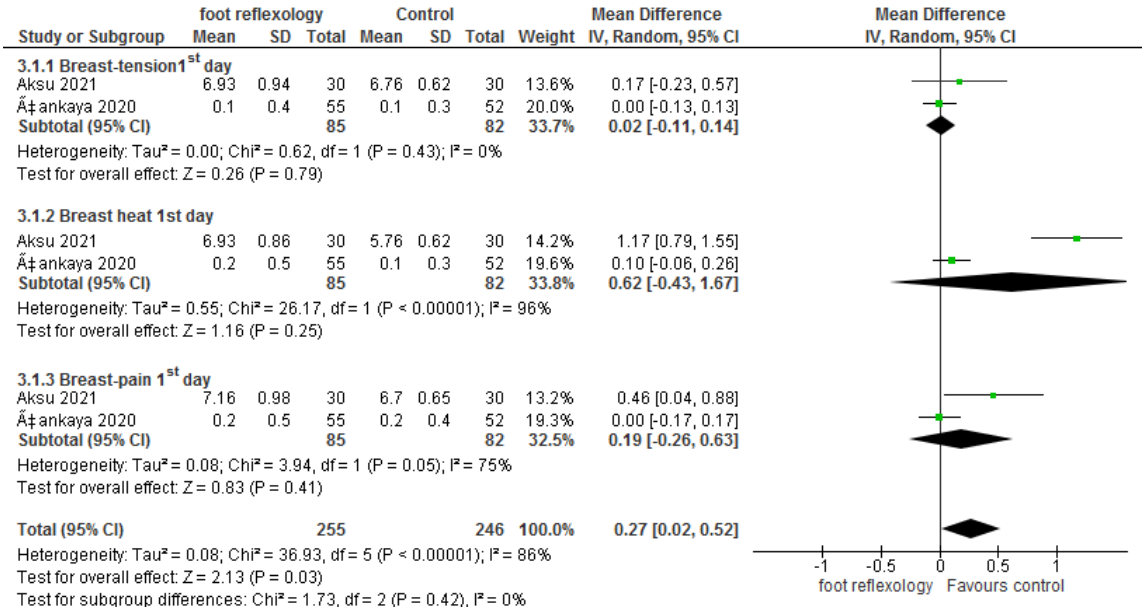

Figure 6. Forest plot showing foot reflexology effect on breast tension, breast heat, and breast pain 1st day after the intervention (mL)

Table 1. Characteristics of included studies

Author/ Year	Country	Age (y) Mean ±SD	No. of participants		Intervention	Control	Main measurement outcome		Test P-Value	Main findings
			RF	C			Intervention	Control		
Aksu et al., 2020	Turkey	28.86 ± 5.64	30	30	Reflexology was applied 20 min (10 min for the right foot, 10 min for the left foot) twice a day with 8-h intervals on the second day after CS	Routine care	LATCH 1st day Score 5.50±1.04 LATCH 2nd day Score 7.70±1.46 Signs of onset of lactation Breast Tension1st day 6.93±0.94 Breast Heat 1st day 6.93±0.86 Breast Pain 1st day 7.16±0.98	4.60±2.06 5.50±2.01 6.76±0.62 5.76±0.62 6.70±0.65	0.005 <0.001 0.170 0.122 0.009	The LATCH score of the mothers in the experimental group on both days were meaningfully higher compared to control group. On the first day after CS, apart from breast pain, there was no significant difference between the two groups in terms of breast heat and breast tension. On the 2nd following CS, apart from breast tension, there was no significant difference between the groups in terms of breast heat and breast pain. Mothers in the experimental group were found to have higher scores in terms of all three symptoms compared to the control group.
cankaya et al.,2020	Turkey	24.33± 4.13	50	50	Three times per day at every eight hours for 30 min for 3 days.	Routine care	LATCH 1st day Score 7.1 ±1.5 LATCH 2 nd day Score 8.6±1.2 Signs of onset of lactation Breast Tension1st day 0.1 ± 0.4 Breast Heat1st day 0.2 ±0.5 Breast Pain1st day 0.2± 0.5	6.1 ±0.9 7.2 ±1.1 0.1 ± 0.3 0.1 ±0.3 0.2± 0.4	<0.001 <0.001 0.553 0.456 0.936	The LATCH scores of the mothers in the treatment group were found to be significantly higher in days 1 and 2 in the intervention group compared to the control group. The difference between both groups was significant, and a significant increase was present on day 2 compared to day 1. No significant differences were detected between the mean of breast-tension, breast-heat, and breast-pain of mothers in both groups on postpartum day 1 after CS. On day 2, the mean of breast-tension, breast-heat, and breast-

Author/ Year	Country	Age (y) Mean ±SD	No. of participants		Intervention	Control	Main measurement outcome		Test P-Value	Main findings
			RF	C			Intervention	Control		
										pain of the mothers in the intervention group were observed to be significantly higher than the controls The results showed that the mean increase in milk volume 1day after the intervention, relative to before
Mohammadpour et al,2018	Iran		25	25	Reflexology for each foot separately lasted 20 min for a total of 40 min (including 15 min of general reflex and 5 min of special reflex) – one session a day for 6 days	Regular breastfeeding training	Change in volume of breast milk 1 day after intervention (mL) 3.18 ±3.02 Change in volume of breast milk 3 days after intervention (mL) 11.46 ± 4.25	0 (0) 6.64 ±5.29	<0.001 0.001	The intervention, was significantly higher in the reflexology group compared to the control group.
Mirzaie et al,2018	Iran	EG: 28.1± 5.2 CG: 28.4 ± 5.2	37	37	In both groups, foot massage was performed for seven days; once a day (about one and half hour after the previous milk expression) for 10 min per each foot (total 20 min). In both groups, the first 5 min of every 10 min massage was general massage for soles of the feet. The next 5 min in reflexology group		Change in volume of breast milk 1 day after intervention (mL) 10.3± 28.6	6.7±31.6	0.213	Mean breast milk volume expressed following massage (about two hours after the previous expression) was significantly greater in the intervention group when compared with that of the control group.

Author/ Year	Country	Age (y) Mean ±SD	No. of participants		Intervention	Control	Main measurement outcome		Test P-Value	Main findings
			RF	C			Intervention	Control		
					was for massage and pressing breast related points					
Eshghizadeh et al,2017	Iran	EG: 27.3±6.04 CG: 24.6± 6.33	15	15	20 min for 3 days	Routine care	Change in volume of breast milk 1 days after intervention (mL) 54.4±45.69	50.66±32.45	0.79	There was no significant difference in the mean volume of milk on the first day after massage between the intervention group and the control group, but on the third day, there was a significant difference in the mean volume of milk after reflex massage between the intervention group and the control group.
							Change in volume of breast milk 3 days after intervention (mL) 69,46± 39.99	42.00±22.70	0.187	
Noumak et al, 2021	Thailand	EG: 29.48± 6.33 CG: 30.60±5.82	25	25	Received knowledge of foot reflexology for 10 minutes and foot reflexology for 2 sessions: the first time 4-8 hours after birth and the second time 20-28 hours after birth. It takes 30 minutes	Normal care	Change in volume of breast milk Day 1 (first 24 hours after birth) 8.10± 6.30	3.09±4.80	0.003	The experimental group had milk volume in day 1 (24 hours postpartum) significantly more than the control group and the experimental group had milk volume in day 2 (24-48 hours postpartum) significantly more than the control group.
							Change in volume of breast milk Day 2 (24-48 hours postpartum) 8.82±15.92	5.27±4.03	<0.001	

Volume of breast milk after intervention

According to the meta-analysis, four studies were conducted to examine the effectiveness of using FR to increase breast milk volume. These studies involved a total of 204 participants (17, 19, 23, 25). The results showed that the mean difference between the two groups was 3. 41 (MD: 3.41, CI 95% (2.31, 4.51); I^2= 0%) on the first day 5.87 (MD: 8.15, CI 95% (1.34, 14.96); I^2= 90%) on the second day, 4.69 (MD: 4.69, CI 95% (2.08, 7.31); I^2= 0%) on the third day and 4.71(MD: 8.49, CI 95% (-3.38, 20.36); I^2= 63%) on the fourth day after intervention. Totally, there were statistically significant differences between the two groups except for the fourth day regarding the volume of breast milk. On the other hand, the volume of milk was higher in the FR group in comparison with the control group (MD: 5.21, CI 95% (3.55, 6.86); I^2= 57%). Figure 4. Forest plot showing FR effect on change in volume of breast milk first, second, third, and fourth days after the intervention.

Secondary outcomes

Breast heat, pain, and tension on the first day after intervention

Two studies including 167 participants reported these outcomes (18, 24). The pooled analysis by using the random effects model results suggested that there were no differences between the intervention and control groups in breast heat (MD: 0.62, CI 95% (-0.43, 1.67); I^2=96%), breast pain (MD: 0.19, CI 95% (-0.26, 0.63); I^2=75%), and breast tension (MD: 0.02, CI 95% (-0.11, 0.14); I^2=0%) 1st day after intervention. Figure 5 shows the forest plot of FR effect on breast tension, breast heat, and breast pain 1st day after the intervention.

Breast heat, pain, and tension on the second day after intervention

Two studies including 167 subjects reported this outcome (18, 24). The results of the meta-analysis using the random effects model showed that there was a significant difference between the intervention and control groups in breast heat (MD: 2.43, CI 95% (1.54, 3.31); I^2= 83%; P<0/00001), breast pain (MD: 2.39, CI 95% (1.19, 3.60); I^2=90%), and breast tension (MD: 2.41, CI 95% (1.56, 3.26); I^2=82%) on the second day after the intervention.

Discussion

This systematic review was conducted to examine the effect of FR on lactation and breast milk volume in mothers who breastfeed. Results of this study indicated that FR significantly increased the LATCH score and symptoms of onset of lactation in mothers (breast heat, pain and tension) on the second day after intervention. Regarding FR and breast milk volume, the results of this study did not reveal any significant increase in breast milk volume.

Several studies have examined the effectiveness of FR on the LATCH score of mothers who are breastfeeding (18, 24, 26-28) but the number of randomized studies investigating the effects of reflexology on lactation is scarce (18, 24).

In the study by Aksu and Palas Karaca (2021), the breastfeeding scores of the mothers in the FR group were significantly higher on first, second and third days of the intervention group compared to the controls, and the mothers in the group experienced higher satisfaction with breastfeeding compared to the controls (18).

The results of this systematic review and meta-analysis are aligned with the results that have been reported previously. Machhi et al. (2019) conducted a review that evaluated the impact of FR on lactation and other obstetric factors such as labor, pain, fatigue, and sleep and found that reflexology had a positive effect on lactation (29).

In the present meta-analysis, FR as an intervention to increase breast milk volume by breastfeeding mothers was not significantly effective. Limited RCTs have reported that FR has a positive impact on breast milk volume and increases it (17, 19, 23, 25). In this regard, Mirzaei et al. (2018) argue in their study that FR to promote lactation significantly increased breast milk supply and reduced formula-fed baby intake in the reflexology group (15); however, Eshghizadeh et al.(2017) found no positive changes in breast milk volume in response to reflexology (19). The discrepancy between these studies may be due to the different intervention periods. Eshghizadeh et al. (2017) performed the FR intervention on day 4 after childbirth, while Mirzaei et al. (2018) conducted their intervention on days 7–54 after delivery. This could be the reason for the difference between the two studies, but we

assessed breast milk volume on the third day after the intervention among both groups.

In this study, there was no difference in symptoms of onset of lactation between both groups including breast tension, heat, and pain on the first day after intervention. However, the results were significant on the second day of the intervention regarding the above-mentioned symptoms. Çankaya et al. (2020) reported the breast tension, heat, and pain scores were similar in the two groups of mothers on the first day after intervention (24). However, the study by Aksu and Palas Karaca (2021) found that women in the experimental group had higher scores in terms of all three symptoms (breast tension, heat, and pain) (18).

This shows that reflexology can increase the signs of the onset of lactation in mothers who breastfeed. Reflexology is thought to support breastfeeding and improve the attachment between mothers and children by helping the mother experience increased levels of breast tension, heat, and pain after birth and start breastfeeding earlier (18).

It is important to note that the length of FR intervention, the selection of reflex zones, the devices used to assess the efficacy of reflexology on breast milk volume, and who delivered reflexology were somewhat different which could have created bias in the results.

Our study provided a comprehensive review of the effects of FR on lactation and breast milk volume in breastfeeding mothers. However, it has several limitations. There are still few RCT studies on FR to improve lactation and breast milk volume, and the quality of the included studies suggests that there is an unclear risk of bias. Future RCTs need to ensure that they are of high quality and have a large sample size to assess the effects of FR on breast milk volume. Additionally, future studies need to include a diverse sample to increase the generalization of the findings. The present systematic review should be approached with caution due to the heterogeneity among the included studies. Furthermore, it must be acknowledged that nearly all of these studies were conducted in developing countries like Iran and Turkey, which poses a challenge when attempt apply these findings universally.

Conclusion

This is the first meta-analysis of RCTs to investigate the effects of FR on lactation and breast milk volume in breastfeeding mothers. We found that FR positively affected lactation score after the intervention, but did not increase breast milk volume. Therefore, FR may offer a simple, innovative, and effective method for starting and conserving lactation in breastfeeding mothers. However, due to the limited number of included studies and their small sample size, the current evidence was inadequate to support the effectiveness of FR on lactation and breast milk volume in breastfeeding mothers. To have more rigorous evidence, further well-designed randomized controlled trials are needed.

Declarations

Acknowledgements

We express our appreciation to the librarians at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran for support in providing informational support for this study.

Conflicts of interest

Authors declared no conflicts of interest.

Ethical considerations and ethical approval

Not applicable.

Funding

This research did not take any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contribution

FY, ZM, and SHF contributed to the conception and design of the research; FY and SHF performed the quality assessment of the studies. ZM and ZA interpreted the data; SHF and FY drafted the manuscript. All authors reviewed the manuscript and agreed to be fully accountable for ensuring the integrity and accuracy of the work and approved the final manuscript.

References

1. Breastfeeding. [Internet]. World Health Organization. 2021 [cited December 29, 2021]. Available from: https://www.who.int/health-topics/breastfeeding#tab=tab_1.
2. Shi H, Yang Y, Yin X, Li J, Fang J, Wang X. Determinants of exclusive breastfeeding for the

first six months in China: a cross-sectional study. International Breastfeeding Journal. 2021; 16(1): 40.
3. CoutoG.R D, OliveiraI.J. Benefits of exclusive breastfeeding: An integrative review. Nursing Practice Today. 2020; 7(4): 245-254.
4. Binns C, Lee M, Low WY. The long-term public health benefits of breastfeeding. Asia Pacific Journal of Public Health. 2016; 28(1): 7-14.
5. Victora CG, Bahl R, Barros AJ, França GV, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. The lancet. 2016; 387(10017): 475-490.
6. Infant and young child feeding [Internet]. 2016 [cited 18th Nov 2016]. Available from: http://www.who.int/mediacentre/factsheets/fs342/en/.
7. Ranjbaran M, Nakhaei MR, Chizary M, Shamsi M. Prevalence of exclusive breastfeeding in Iran: Systematic review and meta-analysis. Epidemiology and Health System Journal. 2016; 3(3): 294-301.
8. Rafizadeh-Tafti R, Heydari Z, Karimy M, Zamani-Alavijeh F, Araban M. Factors associated with breastfeeding: A review study. Journal of Health System Research. 2020; 16(1): 69-77.
9. Cohen SS, Alexander DD, Krebs NF, Young BE, Cabana MD, Erdmann P, et al. Factors Associated with Breastfeeding Initiation and Continuation: A Meta-Analysis. The Journal of Pediatrics. 2018; 203: 190-196.
10. Saghooni NM, Kareshki H, Esmaily H, Najmabadi KM. A Qualitative Study Exploring Breastfeeding Mother's Perceptions and Experiences of Appraisal Support Needs in Iran. Journal of Midwifery & Reproductive Health. 2022; 10(2): 1.
11. Buckland C, Hector D, Kolt GS, Fahey P, Arora A. Interventions to promote exclusive breastfeeding among young mothers: a systematic review and meta-analysis. International Breastfeeding Journal. 2020; 15(1): 102.
12. Wong MS, Mou H, Chien WT. Effectiveness of educational and supportive intervention for primiparous women on breastfeeding related outcomes and breastfeeding self-efficacy: A systematic review and meta-analysis. International Journal of Nursing Studies. 2021; 117: 103874.
13. Whatley J, Perkins J, Samuel C. 'Reflexology: Exploring the mechanism of action'. Complementary Therapies in Clinical Practice. 2022; 48: 101606.
14. Sayari S, Nobahar M, Ghorbani R. Effect of foot reflexology on chest pain and anxiety in patients with acute myocardial infarction: A double blind randomized clinical trial. Complementary Therapies in Clinical Practice. 2021; 42: 101296.
15. Bakir E, Baglama SS, Gursoy S. The effects of reflexology on pain and sleep deprivation in patients with rheumatoid arthritis: a randomized controlled trial. Complementary Therapies in Clinical Practice. 2018; 31: 315-319.
16. Babazadeh R, Asadollahi F, Abdi H, Esmaily H. The Effect of foot sole reflexology on the fatigue in the first half of pregnancy: A randomized clinical trial. Journal of Midwifery & Reproductive Health. 2020; 8(2).
17. Mirzaie P, Mohammad-Alizadeh-Charandabi S, Goljarian S, Mirghafourvand M, Hoseinie MB. The effect of foot reflexology massage on breast milk volume of mothers with premature infants: A randomized controlled trial. European Journal of Integrative Medicine. 2018; 17: 72-78.
18. Aksu S, Palas Karaca P. The Effect of Reflexology on Lactation in Women Who Had Cesarean Section: A Randomized Controlled Pilot Study. Complementary Medicine Research. 2021; 28(4): 336-343.
19. Eshgizadeh M, Moshki M, Mojtabavi J, Derakhshan N. Effect of Foot Reflexology on Milk Production in Mothers with Premature Infants. QHMS. 2017; 23(4): 319-324.
20. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. [Internet]. BMJ 2021. Available from: http://www.prisma-statement.org/.
21. Griffin CM, Amorim MH, Almeida FD, Marcacine KO, Goldman RE, Coca KP. LATCH como ferramenta sistematizada para avaliação da técnica de amamentação na maternidade. Acta Paulista de Enfermagem. 2022; 35: eAPE03181.
22. Cochrane Handbook for Systematic Reviews of Interventions. 2nd Edition. [Internet]. John Wiley & Sons. 2019. Available from: www.training.cochrane.org/handbook.
23. Mohammadpour A, Valiani M, Sadeghnia A, Talakoub S. Investigating the effect of reflexology on the breast milk volume of preterm infants' mothers. Iranian Journal of Nursing and Midwifery Research. 2018; 23(5): 371.
24. Çankaya S, Ratwisch G. The effect of reflexology on lactation and postpartum comfort in caesarean-delivery primiparous mothers: A randomized controlled study. International Journal of Nursing Practice. 2020; 26(3): e12824.
25. Çankaya S, Ratwisch G. The effect of reflexology on lactation and postpartum comfort in caesarean-delivery primiparous mothers: A randomized controlled study. International Journal of Nursing Practice. 2020; 26(3): e12824.
26. Loganayagi K, Sumathi G, Nalini S. Effectiveness of reflex zone therapy among primi parae at selected hospital. Journal of Science. 2014; 4(12): 732-735.

27. Danasu R. Effectiveness of reflex zone stimulation on initiation and maintenance of lactation among lactation failure mothers at SMVMCH, Kalitheerthalkuppam, Puducherry. Asian Journal of Nursing Education and Research. 2015; 5(4): 505-512.
28. Deepthi N. Effect of reflex zone stimulation on lactation among post-caesarean mothers at Sri Ramakrishna Hospital, Coimbatore (Doctoral dissertation, College of Nursing, Sri Ramakrishna Institute of Paramedical Sciences, Coimbatore). 2014.
29. Machhi N, Tiwri A. Effect of foot reflexology on lactation-A literature review. International Journal of Advanced Research. 2019; 7(3): 962-966.