Effectiveness of reflexology on labor pain: A systematic review and meta-analysis

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Abstract
Background: Reflexology is one of the nonpharmacological methods of pain management; however, its effectiveness on labor pain is not clear. Also, reflexology is a noninvasive complementary method used for pain relief during labor, but its efficacy in alleviating labor pain has not yet been confirmed clearly. This meta-analysis assessed the efficacy of this simple and noninvasive method in reducing labor pain.

Methods: A systematic search of all clinical trials studies on Cochrane, Scopus, Web of Science, Ovid, PubMed, Google Scholar, Irandoc, ScienceDirect, Magiran, Sid, and Iran Medex was done up to June 2017. The pooled mean difference with random effects model was used for meta-analyses. Heterogeneity of the studies was analyzed using the I2 calculation index. Variance between studies was analyzed using (Tau2) and STATA software.

Results: In this study, 7 relevant studies with 1142 participants were selected for meta-analysis. A significant difference was found between reflexology and pain intensity after intervention (MD= -0.54, 95% CI: -1.08 to -0.004), 6-8 cm dilation (MD = -2.29, 95% CI: -2.52 to -2.07), 8-10 cm dilation (MD= -1.03, 95% CI: -1.21 to -0.85), 1 hour after intervention (MD = -1.55, 95% CI: -2.94 to -0.16), 2 hours after intervention (MD= -2.81, 95% CI: -3.27 to -2.35), and in the second stage subgroup (MD= -2.14, 95% CI: -4.61 to 0.33).

Conclusion: This study showed reflexology is an effective method for alleviation of labor pain. Therefore, this method can be used to reduce the labor pain.

Keywords: Clinical trial, Reflexology, Labor pain

Introduction
Pain is a common and an inevitable part of the delivery process (1). This pain usually occurs when lumbosacral and the pelvic floor muscles are contracted and nerve receptors stimulated (2). Fear and anxiety increase during labor. Therefore, catecholamine is increased and causes vasoconstriction, increased muscle tone, and reduction in the strength of uterine contractions, leading to obstetrical interventions and increased demand for elective caesarean section (3). The most important factor for mothers’ desire to have cesarean section delivery is their phobia of labor pain (4). Although the World Health Organization has recommended a 15% rate for cesarean section, this rate is

↑What is “already known” in this topic:
Reflexology is an effective method for some conditions such as diabetes, premenstrual syndrome, cancer, multiple sclerosis, symptomatic idiopathic detrusor overactivity, and dementia. However, there was no consensus about the effect of reflexology on labor pain.

—What this article adds:
This study found that reflexology is an effective method for reducing the labor pain and can be used before using pharmacological methods for pain management.
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56% in Iran (5).

There methods to reduce labor pain and stress are divided into 2 general categories: nonpharmacological and pharmacological (6). Pharmacological methods have adverse side effects and their application is not often easy and suitable; however, in nonpharmacological methods, the patient herself makes the decisions, and this makes her feel more strong and in control, which is effective in labor progress (7).

The nonpharmacological method can be used as an alternative treatment or as an auxiliary treatment along with medication (8).

There are many nonpharmacological methods for relieving the labor pain such as relaxation, reflexology, massage, hypnosis, water birth, massage therapy, transcutaneous nerve stimulation, listening to music, and change in the status of mothers during childbirth (eg, walking and controlled breathing) (9).

Reflexology is an easy, safe, noninvasive, and inexpensive complementary method (10).

Experts reflexologists believe that foot can be divided into a large number of reflex points that are associated with all parts of the body and that pressing reflex points may cause different responses of body organs and systems and may have positive effects on the person's health (11).

Reflexology is a holistic practice that uses pressure on reflexology points on the feet and sometimes on the palms, which are associated to any part of the body such as muscles, nerves, glands, and bones; and applying pressure on these points eliminates inflation or congestion and helps to calm nerves and consequent nerve relaxation reduces vasoconstriction; this improves blood and nerve flow and returns balance throughout the body and promotes relaxation (12). Several studies have been done on the effect of reflexology on pain relief. Due to global policy to decrease cesarean rate, it is necessary to find effective and safe nonpharmacological methods for pain relief. The results of clinical trials conducted on the effect of reflexology on labor pain are controversial. Hence, this systematic review study aimed to evaluate the effect of reflexology on labor pain.

Methods

Search strategy

A web search was done using the following keywords in Persian and English: ((("massage"[MeSH Terms] OR "massage"[All Fields] OR "reflexology"[All Fields]) OR (("foot"[MeSH Terms] OR "foot"[All Fields]) AND ("massage"[MeSH Terms] OR "massage"[All Fields]))) AND ((("labor"[All Fields] OR "labor"[All Fields]) AND ("labor, obstetric"[MeSH Terms] OR ("labor"[All Fields] AND "obstetric"[All Fields])) OR "obstetric labor"[All Fields])) OR ("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "childbirth"[All Fields]) OR ("delivery, obstetric"[MeSH Terms] OR ("delivery"[All Fields] AND "obstetric"[All Fields]) OR "obstetric delivery"[All Fields] OR "delivery"[All Fields])) AND ("clinical trial"[Publication Type] OR "clinical trials as topic"[MeSH Terms] OR "clinical trial"[All Fields]).

In this systematic review, international databases (eg, Cochrane, Web of Knowledge, PubMed, Embase, Science direct, Scopus, Ovid, and Google scholar) and national databases (eg, Iranmedex, Scientific Information Database (SID) and Magiran) were searched for published articles in English and Persian language from 1990 up to June 2018. Moreover, the reference list of included studies were reviewed to find relevant articles. The review was conducted based on the PRISMA guidelines.

Inclusion and exclusion criteria

All available randomized controlled clinical trials in English and Persian language which evaluated the effect of reflexology on labor pain were included. Also, all clinical trials whose participants were nulliparous women aged 18-35 years with gestational age of 37-41 weeks, singleton pregnancy, cephalic presentation, and women at the beginning of labor active phase (dilation 3-4 cm) were included. Visual scale analog was used as the pain measurement scale. If a full-text article was not available, the information was extracted from its abstract, and if the article did not provide enough information, it was excluded.

Articles selection and data extraction:

First, 2 colleagues evaluated the titles of the articles and the duplicates were excluded. Then, the remaining titles and abstracts of the articles were studied carefully. Next, those articles that did not meet the inclusion criteria were excluded. Finally, the full-texts of all relevant articles were evaluated. To avoid selection bias, 2 independent researchers evaluated the quality of the selected studies.

For article evaluation, the Jadad score for quality assessment of clinical trials was used. Studies were scored based on some important methodological considerations such as accountability of all patients (eg, withdrawals, randomization, and masking) (13). Articles with a score of 3 or more entered this study.

Therefore, at first, 707 studies were collected. Then, after reviewing the titles and abstracts, 429 articles were excluded due to irrelevancy or repetitiveness.

To evaluate the treatment efficacy of continuous data, mean difference was used and to assess the heterogeneity, $\tau^2$, $I^2$, and $\chi^2$ were used. $I^2$ index of 0%-30% showed low heterogeneity, 30%-50% average heterogeneity, and over 70% high heterogeneity (14). Meta-analysis was performed using random effect model using stata 11 software. P value less than 0.05 was considered statistically significant.

Results

Description of the studies

A total of 545 publications on the effect of reflexology on labor pain were found after searching in electronic databases. Finally, after screening retrieved studies based on inclusion and exclusion criteria and removing the duplicated records, 7 clinical trials were included in the meta-analysis (Fig. 1). The summary of risk of bias is presented in Figure 2. Characteristics of the studies included in the systematic review and meta-analysis and Jadad scores are shown in Table 1.

The total sample size in 7 clinical trials that reported the
The effect of reflexology on labor pain was 1142 (575 control groups and 567 case groups). Based on the Jadad criteria, all included articles had generally acceptable quality.

All clinical trials had parallel designs. A study conducted in Saudi Arabia was excluded due to the use of such criteria as change in facial expressions and vital signs;
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Table 1. The characteristic of studies were included in the systematic review and meta-analysis

<table>
<thead>
<tr>
<th>Author name</th>
<th>Publication date</th>
<th>Study Method</th>
<th>Sample Size</th>
<th>Methodology</th>
<th>Findings</th>
<th>Impacts</th>
<th>Jaded score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dohati /2010(17)</td>
<td>Three-group</td>
<td>120 term women</td>
<td>40</td>
<td>reflexology group/40 participants were in reflexology group/40 participants were in routine care group/40 were in support. Pain intensity was analyzed by VAS scale immediately after intervention and in dilution of 6-8 cm and dilation of 8-10 cm</td>
<td>In the reflexology group pain intensity showed a significant difference in all three stages of dilation. (P&lt;0.001)</td>
<td>Maternal, fetal and neonatal complications were not observed.</td>
<td>3</td>
</tr>
<tr>
<td>Moghimi 2012(28)</td>
<td>two-group</td>
<td>80 women admitted to Alborz and Bahonar hospitals in Karaj</td>
<td>40</td>
<td>Reflexology and control group there were 40 participants. Pain intensity was assessed immediately after the intervention by VASA.</td>
<td>Pain intensity immediately after intervention showed significant difference in the control groups (P&lt;0.001)</td>
<td>Not mentioned</td>
<td>5</td>
</tr>
<tr>
<td>Jenabi /2011 (29)</td>
<td>Two-group</td>
<td>70 primiparous women who visited the Social Security Hospital in Hamedan</td>
<td>35</td>
<td>There were 35 participant in the two intervention and control group and pain intensity was assessed immediately after the intervention by VAS pain scale</td>
<td>Pain intensity immediately after intervention was less than the control group (P=0.001)</td>
<td>Not mentioned</td>
<td>5</td>
</tr>
<tr>
<td>Haj Ghasemi ali /2015 (30)</td>
<td>Three-group</td>
<td>92 nulliparous women who referred to Shahid Akbarabadi hospital</td>
<td>28</td>
<td>28 participant in acupressure group, 34 in the control group and 30 in reflexology group and pain intensity assessed immediately after intervention and in 6-8 cm dilation of cervix by VASA.</td>
<td>Pain intensity immediately after intervention was less than the control group (P=0.006) and in 6-8 cm dilation (P=0.004) in the reflexology group was less than control group</td>
<td>In the Reflexology group Pain intensity immediately after intervention showed significant difference (P&lt;0.001)</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>mirzaee /2009 (31)</td>
<td>Two-group</td>
<td>70 women referred to Azfalipour hospital in Kerman</td>
<td>39</td>
<td>39 primipara were in intervention group and 31 were in control group. pain intensity immediately after intervention was assessed by VAS pain scale</td>
<td>Pain intensity immediately after intervention was less than the control group (P&lt;0.001)</td>
<td>Not mentioned</td>
<td>4</td>
</tr>
<tr>
<td>Hanan Abdol Fattaf 2015 (19)</td>
<td>Two-group Semi experimental</td>
<td>120 people visited Ein al-shams hospital in Egypt</td>
<td>60</td>
<td>60 primiparous women were in Reflexology group, 60 were in the control group and pain intensity immediately after intervention and in 6-8 cm and 8-10 cm dilation and second stage was assessed.</td>
<td>Pain intensity of reflexology in all stages of labor was less than control group.</td>
<td>Maternal and, fetal complications were not found</td>
<td>3</td>
</tr>
<tr>
<td>Valiani 2010 (21)</td>
<td>Two-group</td>
<td>88 primiparous women visited Asghari and shahid beheshti hospitals in Isfahan</td>
<td>44</td>
<td>In each group 44 primiparous women were assessed. Pain intensity immediately after intervention and in 3-5 am, 6-8 cm and 8-10 cm dilation and second stage pain intensity was assessed.</td>
<td>Pain intensity of reflexology in all stages of labor was less than control group (P&lt;0.001).</td>
<td>Maternal and, fetal complications were not found</td>
<td>3</td>
</tr>
</tbody>
</table>

Another study done in Oman used ordinal measure scale for pain, which was also excluded (15). Most participants were housewives, 59 (98%) and 53 (97%) of them held a diploma or passed some high school courses. In one study, none of the databases provided the full-texts and contacting the author was not successful either (16); in 2 studies, verbal and nonverbal pain criteria were used instead of visual analogue scale; therefore, they were not entered the meta-analysis (11, 15) Finally, 7 papers were entered into the meta-analysis. In 3 studies (17-19), maternal, fetal, and neonatal complications were reviewed, including mother’s vital signs, first and fifth minute Apgar, bleeding for pain, which was also excluded (15). Most participants were housewives, 59 (98%) and 53 (97%) of them held a diploma or passed some high school courses. In one study, none of the databases provided the full-texts and contacting the author was not successful either (16); in 2 studies, verbal and nonverbal pain criteria were used instead of visual analogue scale; therefore, they were not entered the meta-analysis (11, 15) Finally, 7 papers were entered into the meta-analysis. In 3 studies (17-19), maternal, fetal, and neonatal complications were reviewed, including mother’s vital signs, first and fifth minute Apgar, bleeding lengthy active phase, and fetal distress. They indicated no significant difference between the control group and reflexology. Severity of pain was evaluated at different times.

Publication bias, Pooled mean difference, and sub-group analysis

According to the results of Egger’s test (p=0.651) and Begg’s test (p=0.882), there was no considerable amount of publication bias (Fig. 3). However, there was a substantial heterogeneity among the studies that reported the ef-
The effect of reflexology on labor pain, based on chi-square test and I² statistics (Q = 283.48, p<0.001, and I²=98.9%). Due to high heterogeneity, a random effect model was used for analysis in this study. Considering the high heterogeneity observed, the subgroup analysis was conducted based on pain intensity time intervals (eg, after intervention, in 6-8 cm dilation, in 8-10 cm dilation, 1 hour after intervention, 2 hours after intervention, and in second stage) which resulted in lower amount of I² index that showed homogeneity of the results in every subgroups. When the data of all clinical trials were pooled in the meta-analysis, a significant difference was found between the mean difference (MD) of pain intensity after intervention (MD = -0.54, 95% CI: -1.08 to -0.004, I²=0.54%), 6-8 cm dilation (MD= -2.29, 95% CI: -2.52 to -2.07, I²= 0.0%), 8-10 cm dilation (MD= -1.03, 95% CI: -1.21 to -0.85, I²= 0.0%), 1 hour after intervention (MD = -1.55, 95% CI: -2.94 to -0.16, I²= 0.98%), 2 hours after intervention (MD= -2.81, 95% CI: -3.27 to -2.35, I² = 0.66%), and in second stage subgroup (MD= -2.14, 95% CI: -4.61 to 0.33, I²= 0.99%) (Fig. 4).

Discussion

Pain is an inevitable part of childbirth process which can bring special physiologic changes to both the mother and the fetus that can disrupt the delivery process (20). In many cases, these changes require medical intervention. Doctors believe that the methods used to reduce labor pain should be effective and should not disturb delivery process, consciousness, and mothers’ physiological activities such as placental uterine blood flow, increased respiratory effort, and increased muscle tone and activity due to uterine contraction (21). Therefore, it is recommended that nonpharmacological methods such as reflexology be used to relieve labor pain.

Reflexology after intervention could only decrease the pain intensity to 0.54. Although there was a statistically significant difference between the 2 groups, it was not

<table>
<thead>
<tr>
<th>Study ID</th>
<th>N</th>
<th>Treatment N</th>
<th>I²</th>
<th>p</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain intensity after intervention</td>
<td>35</td>
<td>35</td>
<td>62.2</td>
<td>0.112</td>
<td>19.7</td>
</tr>
<tr>
<td>Pain intensity in 6-8 cm</td>
<td>40</td>
<td>40</td>
<td>6.73</td>
<td>0.062</td>
<td>19.1</td>
</tr>
<tr>
<td>Pain intensity in 8-10</td>
<td>50</td>
<td>50</td>
<td>6.85</td>
<td>0.787</td>
<td>19.3</td>
</tr>
<tr>
<td>Pain intensity 1 hr after intervention</td>
<td>40</td>
<td>40</td>
<td>6.66</td>
<td>0.000</td>
<td>19.0</td>
</tr>
<tr>
<td>Pain intensity 2 hr after intervention</td>
<td>40</td>
<td>40</td>
<td>6.49</td>
<td>0.000</td>
<td>20.3</td>
</tr>
<tr>
<td>Pain intensity on second stage</td>
<td>40</td>
<td>40</td>
<td>6.66</td>
<td>0.000</td>
<td>15.0</td>
</tr>
<tr>
<td>Overall I²= &gt; 95% (p = 0.000)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis

Fig. 3. Begg’s funnel plot for assessing the publication bias

Fig. 4. Forest plot of mean difference of pain intensity by study subgroups

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clinically significant. In a study by Haji Ghasem Ali, 80% of the participants attended childbirth preparation classes and 63%-70% did not have painful menstruation or have had a slight dysmenorrhea history, and perhaps the reason for further reduction in the patient's pain after the intervention was individual differences or participation in childbirth preparation classes (22). Labor pain is not a simple reflection of labor physiological process, but it is the result of a complex and subjective reaction of various physical, emotional, and psychological factors which impacts the individual’s interpretations of labor pain (23).

Smith et al (according to Melzak paper) has described labor as a major physiological and psychological challenge for women (24).

In 6-8 cm dilation, reflexology could reduce pain intensity to 2.29 and in 8-10 cm dilation it can reduce it to 1.03. Tiran explained that use of complementary and alternative therapies such as reflexology can produce endorphins and encephalin, improve blood and lymph flow, and increase the mother’s ability to cope with the labor pain (24, 25).

Lee reviewed 44 studies on the effect of reflexology on pain and sleep and reported that reflexology has a greater impact on sleep and fatigue and has less effect on pain, which requires more studies in this area (26). Nasirian et al found a positive effect of reflexology on pain in their review article. Albeit frequency of performing reflexology in the studies ranged from 1 to 90 sessions and duration of foot massage was 10 to 20 minutes (27).

Assessment of pain intensity was I²=98% in 1 hour, I²=65% in 2 hours after intervention, and I²=100% in the second stage of labor, showing a high heterogeneity. Han- an Abdel Fattah study showed more different results compared to other Iranian studies (19). In their study, 66% of participants in the control and reflexology groups had secondary and tertiary education, 51.7% percent of the control group and 53.3% of the intervention group were employed. Also, 63.3% of the control group and 56.7% of those in the reflexology group had accurate information about labor pain relief methods. The limitations of this study were full-text unavailability of all articles. Moreover, as some of the studies did not gain enough scores from Jadad criteria, they were not included in this study. Thus, higher quality studies should be conducted in the field of reflexology.

Conclusion

This study showed reflexology is an effective method in labor pain relief. Reflexology is a noninvasive, inexpensive, and safe method which can be used during active phase of labor.

This method should be used before using pharmacological methods of pain management.

Conflict of Interests

The authors declare that they have no competing interests.

References


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