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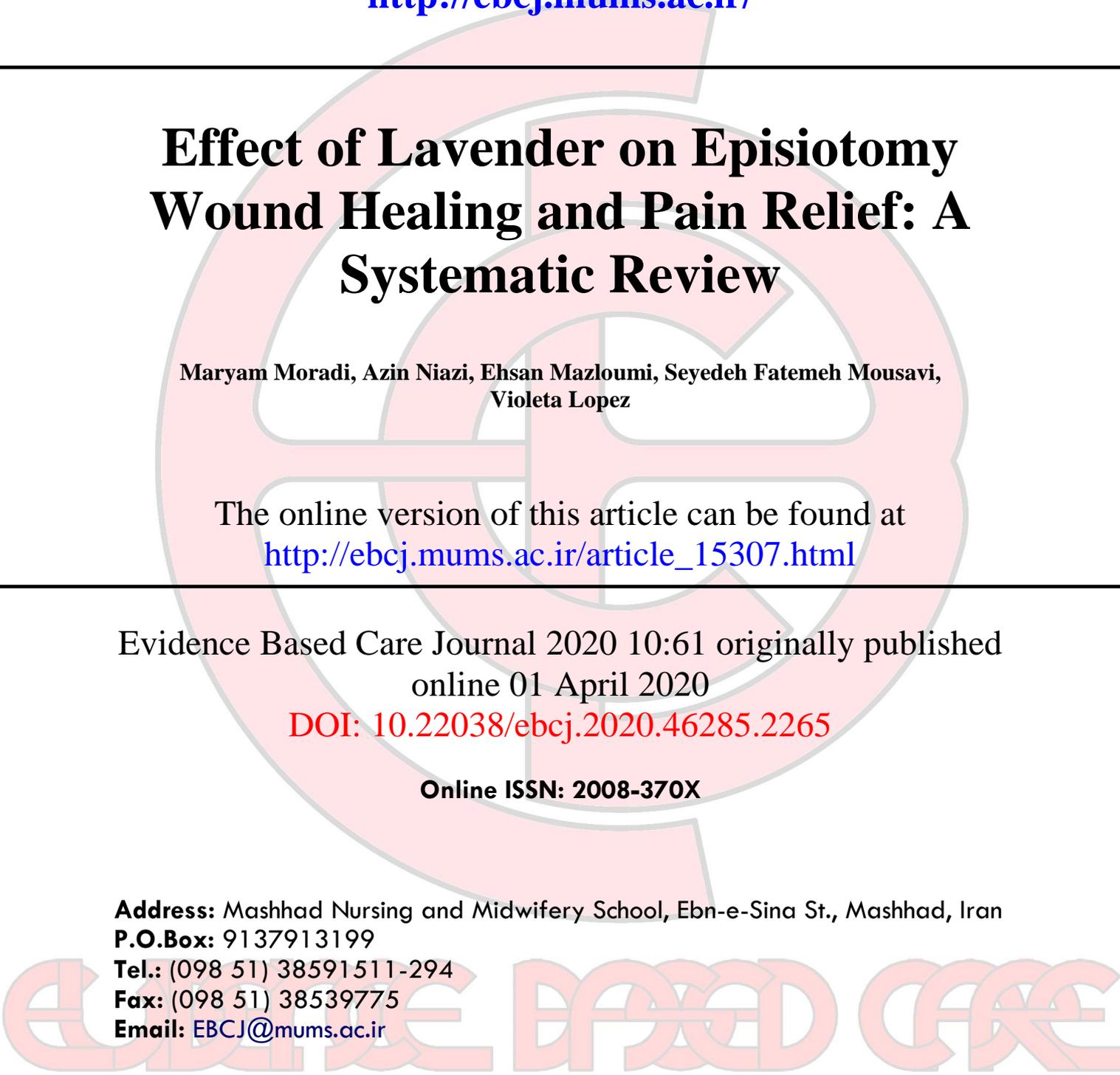
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Effect of Lavender on Episiotomy Wound Healing and Pain Relief: A Systematic Review

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Abstract

Background: Perineal pain is the most common post-episiotomy complication, and delay in episiotomy wound healing can lead to infection. Linalool and linalyl acetate are the most effective compounds of lavender. The present systematic review was performed on the effect of lavender on episiotomy wound healing and pain relief.

Aim: Systematic review of clinical trials to determine the effect of lavender on episiotomy wound healing and pain relief

Method: In the present study, the research question was determined based on PICO, and search process to screen the related articles was conducted on electronic databases of SID, Iran Medex, Pubmed, EMBASE, Scopus, Science Direct, and Google Scholar using English keywords and Persian equivalents of Episiotomy, healing, Pain, Lavender, and Complementary Medicine from inception until March 2020. Inclusion criteria entailed randomized human clinical trials published in Persian and English on the effect of lavender on episiotomy wound healing and pain relief with a Jadad score of ≥ 3 . Irrelevant, duplicate, descriptive, or qualitative studies were excluded. Cochrane risk-of-bias tool was used for the quality assessment of included articles.

Results: Out of 143 articles found in the primary search, five clinical trials were systematically reviewed. All five studies examined the effect of lavender essential oil on episiotomy pain relief, while the effect of lavender essential oil on episiotomy wound healing was measured only in three studies.

Implications for Practice: Lavender essential oil (sitz bath twice daily) can be suggested as the treatment of choice in episiotomy wound healing and pain relief. Further studies are suggested to obtain stronger scientific evidence on the effective dose, complications, and the feasibility of meta-analysis.

Keywords: Episiotomy, Healing, Lavender, Pain, Review

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Introduction

Episiotomy is a surgical incision of the perineum (1) performed at the time of delivery to increase the diameter of the soft tissue pelvic outlet (2). Episiotomy will facilitate and expedite delivery and prevent perineal injury (1, 4) if performed correctly and at appropriate times, such as dystocia, breech delivery, fetal macrosomia, prolonged second-stage labor, obstetric anal sphincter injury, and rapid delivery (3). The prevalence of episiotomy varies across countries (5) with 60% reported in Jordan (6) and 85% in Australia (7). The prevalence of episiotomy in Iran was reported to be 97.3% in 2009 in Tehran (8) and 41.5% in 2016 in Shahroud exceeding the world standard (9). Perineal pain is the most common complication of episiotomy (10) which is experienced by approximately 30% of women within the first two weeks and 7% of women up to 3 months after delivery (11). The perineal pain can decrease maternal quality of life and change mother's attitude towards her infant (12, 13). Delay in wound healing can lead to poor anatomical outcomes, increase the risk of infection, and ultimately lead to dangerous complications and even death (14). In addition, post-episiotomy scars and pain interfere with breastfeeding position and effective lactation, thereby causing a delay in the initiation of lactation (15). Pain relief and wound healing can be achieved in various ways, including cryotherapy (3), electrical stimulation, acupuncture (16), laser therapy (1), pelvic floor muscle training exercises, epidural analgesia, as well as taking medications, such as acetaminophen, mefenamic acid, and diclofenac sodium suppositories (17). Nonetheless, many medicines used for this purpose, especially narcotics and nonsteroidal anti-inflammatory drugs (NSAIDs), have such side effects as nausea, itching, and gastrointestinal bleeding (18). Herbal preparations are among the earliest methods adopted in episiotomy wound healing and pain relief (19) which have a significant advantage over chemical medicines due to their higher acceptability and lower side effects (20). Lavender, *Lavandula angustifolia*, is an herbaceous plant belonging to the mint family, Lamiaceae. Linalool and linalyl acetate are among the effective compounds of this plant with positive and significant effects on the gastrointestinal and central nervous systems. Moreover, their analgesic, anti-inflammatory, and sedative effects have been proven in various studies (21, 22). In the same vein, Jahdi et al. (2009) pointed to the significant effect of lavender essential oil on episiotomy pain relief (23). Nevertheless, Vakilian et al. (2008) assessed the effect of lavender on postpartum episiotomy wound healing and pain intensity and reported that edema increased significantly in the group using lavender essential oil sitz bath. In addition, they revealed that pain intensity, infection, and dehiscence were not significantly different between the two groups (24). In the same direction, in a study carried out by Ebrahimi Houshyar et al. (2015), transcutaneous electrical nerve stimulation (TENS) was found to be more effective in pain relief after cesarean section, in comparison to aromatherapy with lavender essential oil (25). Hosseini Abroush et al. (2015) in a review article entitled "pain control with lavender essential oil" indicated that the antinociceptive effects of lavender on controlling acute and chronic pain considerably varied among different studies due to the nature of pain and method of drug administration (e.g., open-heart surgery, biopsy, or hemodialysis); therefore, further studies with more robust methodologies are needed to prove these effects (26). It is widely accepted that maternal health and support after delivery is of great importance; however, episiotomy as a highly prevalent procedure during childbirth carries a high risk of complications (27, 28). On the other hand, since national policies aim to promote vaginal delivery and reduce cesarean delivery rates, they should highlight the use of lavender as a medicinal plant which is effective in natural delivery wound healing and pain relief. Nonetheless, there is a paucity of clinical information and evidence on the effect of this plant on wound healing and pain relief. Therefore, this systematic review aimed to evaluate and summarize the results of clinical trials evaluating the effect of lavender on episiotomy wound healing and pain relief.

Methods

In the present study, the research question was determined based on PICO, and the search process to screen the related articles was conducted on electronic databases of SID, Iran Medex, Pubmed, EMBASE, Scopus, Science Direct, and Google Scholar using English keywords and Persian equivalents of Episiotomy, healing, Pain, Lavender, Complementary Medicine and all possible combinations with Boolean operators of OR/AND with no time restriction from inception until March 2020.

The inclusion criteria entailed randomized human clinical trials published in Persian and English

which assessed the effect of lavender on episiotomy wound healing and pain relief using appropriate data collection tools. The study population included women who had a vaginal delivery with episiotomy. On the other hand, the exclusion criteria included irrelevant, duplicate, descriptive, as well as qualitative studies, and failure to meet the purpose of the study. Jones (2011) in a review study entitled "the efficacy of lavender oil on perineal trauma" did not reach a definitive conclusion regarding the effect of lavender on perineal wound healing (27), although the mentioned study reviewed only two articles on the effect of lavender on episiotomy wound healing. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) was performed to present findings ranging from statement of problem, analysis, interpretation, and data collection (29). In order to select the articles and extract the data, all articles with titles or abstracts containing the main keywords were initially included in the search process. The quality assessment and selection process were carried out independently by two reviewers (the first and second authors of the article), and any disagreement was judged by an independent third party. The primary review of the article was performed on the abstract of the articles; therefore, irrelevant and duplicate cases, as well as descriptive or qualitative studies, were excluded from the review. The full text of the articles was then reviewed. The searched articles were evaluated using the Jadad scale which assesses articles based on clinical trial design, randomization, blinding, and how to conduct and follow up patients with a minimum score of 1 and a maximum score of 5 (30). The articles with a Jadad score of $3 \geq$ were included in the study. One study was excluded due to the unavailability of full-text (31), one study owing to non-English and non-Persian language (32), and three studies due to a Jadad score of <3 (33-35). The quality of the included articles was reviewed for the selection bias (random sequence generation and allocation concealment), performance bias (blinding of participants and personnel), detection bias (blinding statistical analyzer), attrition bias (exclusion after randomization), and reporting bias (selective outcome reporting). Cochrane risk-of-bias tool was applied for the quality assessment of the included articles (36). The selection process of articles and the reasons for their exclusion are displayed as a Flowchart in Figure 1.

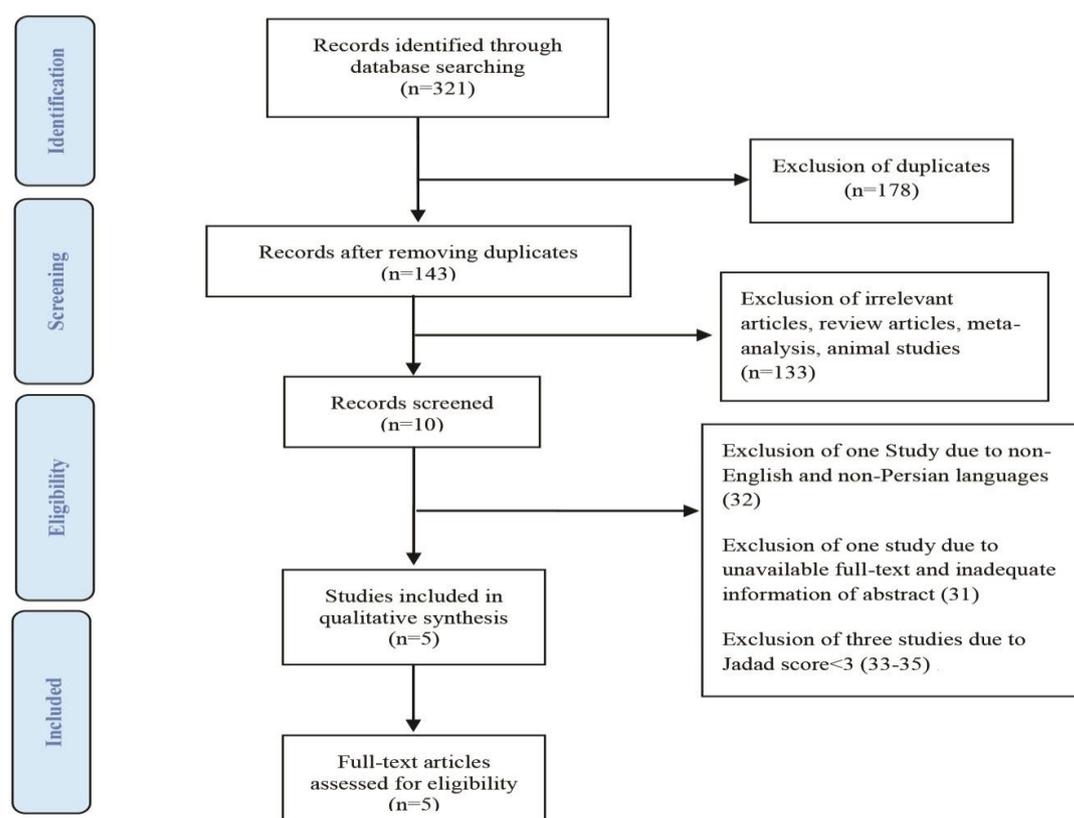


Figure 1. Study selection procedure (PRISMA flowchart)

Results

Out of the total 143 articles found in the primary search, five clinical trials (with a sample size of 635) were systematically reviewed. All five studies had investigated the effect of lavender essential oil on post-episiotomy pain relief (23, 24, 37-39), while the effect of lavender essential oil on episiotomy wound healing had been assessed only in three studies (24, 37 and 38). The results confirmed that the use of lavender essential oil 2% via sitz bath twice a day was effective in episiotomy wound healing and pain relief. A summary of the reviewed studies is displayed in Table 1.

Table 1. Characteristics of the studies included in the systematic review

Authors/year/ Reference number	Place of study	objectives	Research units	Intervention group	Control group	Complications	Results	Tools	Jadad scale scores
Behmaneshet al.,2011(37)	Iran	Determining the effect of lavender on episiotomy wound healing and pain relief	N=89, nulliparous woman with second- degree perineal laceration or mediolateral episiotomy	Group 1 (n=30): lavender essential oil 2% based olive oil sitz bath (10 drops per 5 liters) Group 2 (n=30): olive oil sitz bath (10 drops per 5 liters)	Placebo (distilled water), n=29	Not mentioned	Lavender essential oil 2% (sitz bath twice daily) is effective in episiotomy wound healing and pain relief (p=0.000).	REEDA ¹ scale VAS ² score	3
Jahdi et al.,2009(23)	Iran	Determining the effect of lavender on episiotomy pain relief	N= 60, nulliparous woman with laceration- free episiotomy	lavender essential oil sitz bath (twice daily for 20 minutes by 5 days, 6 drops of essential oil per 5 liters of lukewarm water), n= 30	Betadine sitz bath, n=30	Not mentioned	Lavender sitz bath twice daily reduces episiotomy pain intensity (P<0.001).	VAS score	4
Vakilian et al.,2008(24)	Iran	Determining the effect of lavender on episiotomy wound healing and pain relief	N= 120, woman with laceration- free mediolateral episiotomy	lavender essential oil 1.5% based olive oil sitz bath (5-10 drops per 5 liters of water) twice daily for 5 days (n=60)	Betadine sitz bath, n=60	Not mentioned	The mean redness on the fifth day was lower in the lavender group than in the betadine group (P<0.001). There was no significant difference in pain intensity between the two groups (P> 0.05).	VAS score REEDA scale	4
Marzouket al.,2015(38)	Egypt	Determining the effect of lavender on episiotomy wound healing and pain relief	N= 69, nulliparous woman with laceration- free mediolateral episiotomy	7 drops of 1.47% thymol- lavender essential oil sitz bath in 4 liters of water twice daily for 7 days (n=30)	10 ml of saline (0.9%) in 4 liters of water twice daily for 7 days (n=30)	Not mentioned	Lavender sitz bath twice daily was effective in episiotomy wound healing and pain relief (P=0.011).	REEDA scale VAS score	4
Vaziri et al.,2017(39)	Iran	Determining the effect of lavender on episiotomy pain relief	N= 56, the woman with episiotomy	Inhalation of 1% lavender essential oil (cotton impregnated with essential oil at a distance of 10 cm for 10- 15 minutes) 3 doses in 24 hours (n=29)	Placebo, n=27	Not mentioned	Lavender was effective in episiotomy pain relief (P<0.001).	VAS score	3

¹ Redness, Oedema, Ecchymosis, Discharge, Approximation (REEDA) scale

² Visual analogue Scale (VAS) score

Behmanesh et al. (2011) conducted a study on the efficacy of lavender essential oil and olive oil in postpartum mother's perineal healing. The subjects were randomly assigned to three groups of lavender essential oil 2% based olive oil sitz bath, olive oil sitz bath, and placebo (distilled water) twice daily for 10 days. The assessment was performed 2 h, as well as 5 and 10 days after the intervention. As illustrated by the results, Redness, Edema, Ecchymosis, Discharge, Approximation (REEDA) score was statistically significant 2 h, 5 and 10 days after the intervention ($P=0.000$). Moreover, the REEDA score was significantly different between the lavender and placebo groups ($P=0.002$), as well as the olive oil and placebo groups ($P=0.000$). Nevertheless, the olive oil and lavender groups were not significantly different. Moreover, the three groups were statistically different in terms of pain score ($P=0.000$) (37). Jahdi et al. (2009) carried out a study on the effect of lavender essential oil on perineal pain intensity after episiotomy. In the mentioned study, the subjects were randomly assigned to the case group receiving lavender essential oil sitz bath twice daily for 5 days and the control group receiving the routine care of hospitals. The two groups were evaluated for perineal pain intensity 4 h, 12 h, and 5 days after episiotomy. The mean pain scores were obtained at 2.7 ± 1.7 and 4.23 ± 1.59 in the lavender essential oil group and control group, respectively, 4 h after the episiotomy. These scores were calculated at 2.43 ± 1.94 and 4.60 ± 1.79 in the lavender essential oil group and the control group, respectively, 5 days postpartum indicating a statistically significant difference between the two groups ($P<0.001$). However, the pain score at 12 h post-episiotomy demonstrated no significant difference ($P=0.066$) (23).

Vakilian et al. (2008) evaluated the effectiveness of lavender in episiotomy pain and wound healing of postpartum women. In this clinical trial, the subjects were randomly assigned to two groups: episiotomy wound washing with lavender (sitz bath twice daily) and episiotomy wound washing with iodine solution. The two groups were evaluated for wound healing 5 days after giving birth. The results indicated that the mean redness on the fifth day was lower in the lavender group (0.2 ± 1.88), as compared to the betadine group (3 ± 3.12) ($P<0.05$); nonetheless, edema was significantly higher ($P<0.01$) (24).

Marzouk et al. (2015) investigated the effect of topical aromatherapy with lavender-thymol on episiotomy pain relief and wound healing. The intervention group received 1.47% thymol- lavender essential oil sitz bath twice daily for 7 days, while the control group received 0.9% saline sitz bath. As evidenced by the obtained results, the episiotomy site in women in the intervention group showed less redness ($P=0.032$), edema ($p=0.027$), and discharge ($P=0.016$), as compared to the control group. Furthermore, the intervention and control groups were significantly different in terms of the mean pain intensity after 7 days ($P=0.011$) (38).

Along similar lines, Vaziri et al. (2017) assessed the effect of aromatherapy with lavender essential oil on episiotomy pain. The intervention group received 1% lavender essential oil to inhale (cotton impregnated with essential oil at a distance of 10 cm for 10-15 min), whereas sesame oil was applied in the control group (three doses within 24 h). The evaluation was performed before and after the first intervention, as well as the next morning before discharge. The results demonstrated a statistically significant difference in the effect of lavender essential oil on pain intensity between the two groups ($P<0.001$) (39).

The Cochrane risk-of-bias tool was used for the quality assessment of the included articles. Based on the random sequence generation bias, two studies fell into the ambiguous range due to failure to explain randomization (37, 39). Three studies were considered low bias owing to the application of random sequence generation software for assigning subjects to control and intervention groups (38, 24). Concerning the allocation concealment bias, three studies were evaluated as low bias due to the use of computer software (23, 24, and 38). Two studies were in vague range owing to insufficient information to judge (37, 39). In terms of performance bias, four studies had single-blind design (23, 24, 38, and 39), and one study had double-blind design (37) all of which were assessed as low bias. Regarding detection bias, the data analysts were blind to the status of allocation to treatment or control groups in four studies (23, 24, 38, and 39); therefore, the four studies were regarded as high bias. Furthermore, concerning attrition bias, the participants in the four studies were involved in the study from randomization up to the analysis of results (23, 24, 37, and 39). In one study (38), out of 69 participants, there were 9 cases of attrition due to complications of labor; therefore, this study was evaluated as low attrition bias. In terms of reporting bias, all six published articles seemingly contained all the expected outcomes. According to the quality assessment of the studies included in

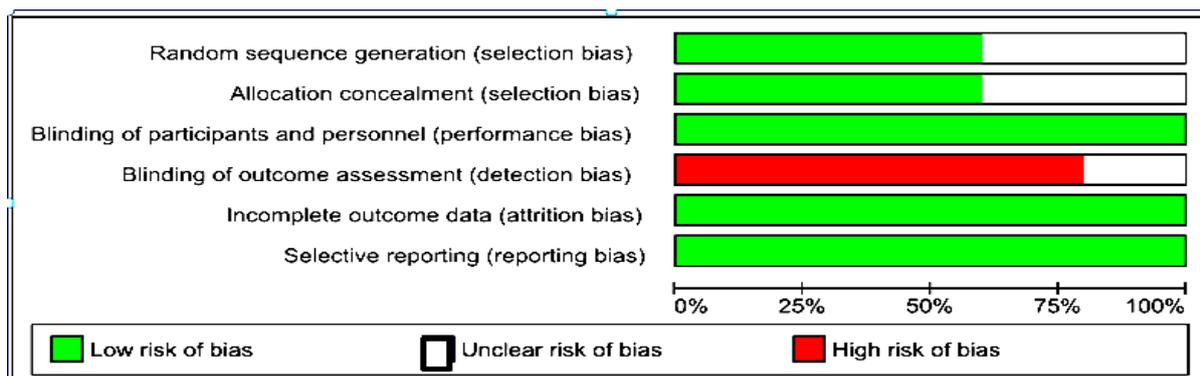


Figure 2. Risk of bias using Cochrane criteria

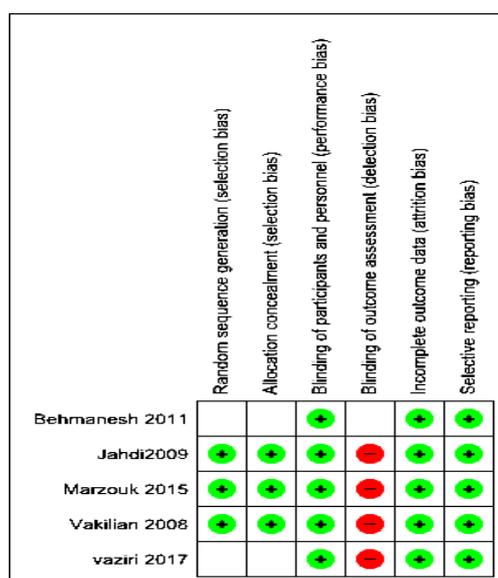


Figure 3. Summary of risk of bias profile

the current systematic review using the Cochrane risk-of-bias tool, most studies had an appropriate methodology. A summary of the risk of bias for each study is presented in figures 2 and 3.

Discussion

Based on the literature review, this is the first systematic review of clinical trials which were conducted on the effect of lavender on episiotomy wound healing and pain relief. Five studies were systematically reviewed. Lavender essential oil has antibiotic, antifungal, and sedative effects and its antimicrobial properties can be effective in infection prevention and early wound healing. This essential oil accelerates the healing process by stimulating receptors located in the olfactory bulb and increasing topical blood flow at the site of injury (40, 41). The results of a study conducted by Vakilian et al. (2008) indicated that lavender and Betadine groups were not significantly different in terms of pain intensity on the 5th day; nonetheless, edema was more frequently detected in the lavender group (24). The ineffectiveness of lavender essential oil in the mentioned study may be attributed to the effects of olive oil plus lavender essential oil which was not mentioned by the researchers to control these factors in their study. Along the same lines, in a study performed by Jahdi et al. (2009), the mean pain intensity was not significantly different between the lavender essential oil and betadine groups 12 h after episiotomy. It can be argued that this ineffectiveness may be ascribed to delay in the measurement of pain intensity after essential oil consumption and loss of analgesic effect of this substance (23). In a study performed by Behmanesh et al. (2011), a significant difference was detected in the pain score obtained from Visual Analogue Scale (VAS) and wound healing based on Redness, Edema, Ecchymosis, Discharge, Approximation (REEDA) scale in three different groups ($P=0.03$). Nevertheless, no significant difference was observed between olive oil and lavender groups,

and similar effects were found in both groups in terms of wound healing and pain relief (37). Linalool and linalyl acetate as the most abundant compounds in lavender are rapidly absorbed through the skin. They are quickly detectable in plasma after topical administration and reach a maximum level approximately 19 min later (42). In the same vein, Marzouk et al. (2015) demonstrated that topical lavender is more effective for episiotomy pain relief, as compared to placebo (38). The aromatherapy activates olfactory nerve cells resulting in the stimulation of the limbic system (43). Linalool and linalyl acetate in lavender are able to stimulate the parasympathetic nervous system, linalyl acetate has a narcotic effect, and linalool acts as a sedative (44). A study carried out by Vaziri et al. (2017) showed that aromatherapy by lavender essential oil in the 24 first hours post-birth relived post-episiotomy pain (39).

According to the current systematic review, the lavender essential oil applied via sitz bath was effective in episiotomy wound healing in three studies (24, 37, 38). Moreover, it was found that lavender essential oil sitz bath in three studies (23, 37, 38) and lavender essential oil aromatherapy in one study (39) caused post-episiotomy pain relief.

One of the strengths of the present study is the quality assessment of included articles using the Jadad scale and the Cochrane risk-of-bias tool. Given the high prevalence of episiotomy and delayed healing side effects, gathering information on effective and low-risk medicinal plants is of great help to healthcare professionals. On the other hand, the current study has some limitations, including the failure to perform a meta-analysis due to scarcity of related studies, differences in the used doses of essential oil, small sample size, differences in the method of using lavender essential oil, differences in the timing of intervention to obtain definitive conclusions regarding the effect of lavender essential oil in episiotomy wound healing and pain relief. Another limitation was the inability to use full-text articles available in non-English languages.

Implications for Practice

As evidenced by the results of the majority of the reviewed studies, the lavender essential oil (via sitz bath twice a day) can be recommended as the treatment of choice in episiotomy wound healing and pain relief due to the presence of such compounds as linalool and linalyl acetate. Nonetheless, there is a paucity of studies in this field, the dose and duration of lavender use vary, and there exists methodological weakness in randomization and concealment. Therefore, further studies are suggested to obtain stronger scientific evidence on the effective dose, its possible effects, complications, and the feasibility of meta-analysis by removing the limitations and drawbacks of previous studies.

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Conflicts of Interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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