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An Update on the Effect of Massage and Inhalation Aromatherapy with Lavender on Labor Pain Relief: A Systematic Review and Meta-analysis

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ABSTRACT

Aims Labor is a painful process. Managing and controlling labor pain is an essential aspect of midwifery services and is the main goal of childbirth care. One of the methods used in traditional medicine to relieve labor pain is aromatherapy. This systematic review and meta-analysis study was an update conducted with the aim of critically evaluating and summarizing all available evidence obtained from randomized clinical trials on the effect of aromatherapy with lavender on labor pain relief.

Information and Methods In this systematic review, searching a number of foreign databases, including MEDLINE/PubMed, Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), and Scopus, from the start date of these databases to December 2017 was independently conducted by two researchers, using symbols, i.e. Lavender* OR Lavandula* OR silexan AND labor OR labour OR birth OR childbirth. Comprehensive Meta-analysis (CMA) software version 2 was used for statistical analysis.

Findings Based on the search strategy, 244 primary studies were found. Finally, 5 studies including 541 participants were examined in this systematic review. Three studies were subjected to meta-analysis. In general, the quality of clinical trials was moderate and combinatory. Aromatherapy with lavender reduced labor pain in the active phase. The mean difference of labor pain in the aromatherapy groups with lavender and control groups was 1.05 (0.552-1.548; p=0.000036).

Conclusion Using aromatherapy with lavender among pregnant women reduces the labor pain. The availability of information obtained from this study can be useful for gynecologists, midwives, and nurses working in labor and delivery units.

Keywords Aromatherapy; Lavender; Labor; Pain Management

CITATION LINKS

[1] The relationship between personality ... [2] Effects of electro-acupuncture ... [3] Therapeutic group ... [4] Patient-choice vaginal ... [5] The global numbers ... [6] Caesarean section ... [7] Ambivalence towards ... [8] Williams ...[9] Maternal and infant outcome after ... [10] Complications of cesarean ... [11] Maternal complications ... [12] Effects of postoperative ... [13] Bladder Injury during ... [14] General anesthesia for ... [15] The impact of cesarean ... [16] Anxiety sensitivity ... [17] Pain management for women ... [18] Aromatherapy for ... [19] Reviewing the effect of ... [20] Effect of birth ball ... [21] The effect of chewing ... [22] The effect of the ... [23] Meta-analysis of the ... [24] Aromatherapy: does it ... [25] Aromatherapy for ... [26] Effectiveness of therapeutic ... [27] A prospective randomized ... [28] Some patients experience ... [29] The effect of aromatherapy ... [30] Lavender aromatherapy ... [31] Healing advantages of ... [32] Examination of the effectiveness of peppermint ... [33] The effect of aromatherapy ... [34] Comparison of the Efficacy ... [35] The uses of aromatherapy ... [36] Complementary ... [37] The use of aromatherapy in intrapartum midwifery practice an observational ... [38] Massage andaromatherapy ... [39] Effect of aromatherapy ... [40] Complementary and alternative ... [41] Medical plants utilized in ... [42] The effect of lavender ... [43] The comparison between the effects of aromatherapy with lavender and reathing techniques on the reduction of ... [44] The effectof lavender aromatherapy ... [45] Cochrane Handbook for Systematic ... [46] Emodin-6-O-β-D--glucoside inhibits ... [47] Effect of massage Aromatherapy ... [48] The effect of Lavender ... [49] The effect of lavender essence ... [50] The psychophysiological effects ... [51] Influence of peppermint oil on absorptive and secretory processes in rat ... [52] Inhaled linalool-induced sedation in ... [53] Linalool modifies the nicotinic receptor–ion channel kinetics at the mouse ... [54] A practical approach to labor ...

Introduction

From the very beginning of human creation, people have constantly been experiencing pain and have always sought ways to control and reduce it. Among various pains, labor pain is recognized as an inevitable aspect of childbirth and is considered as one of the most severe pains. Unlike other pains, this pain is not a sign of tissue damage and continues steadily and continuously and eventually leads to a sweet and an enjoyable incident known as birth[1].

Severe pain during labor can lead to emotional distress and fatigue in a mother or abnormal uterine muscle function during delivery, which may cause an increase in therapeutic interventions and childbirth complications[2]. Additionally, fear of natural vaginal delivery is known as one of the reasons for the increase in the cesarean section prevalence rate[3, 4].

According to the World Health Organization (WHO) report presented in 2010, the mean prevalence rate of cesarean section in Iran was about 42% of all childbirths[5] and it was determined that more than 60% of Iranian women choose a cesarean section to escape from the pain of natural vaginal delivery[6, 7]. However, a cesarean section is a major operation accompanied by more complications, such as maternal death[8], hemorrhage[9], infection[9], a need for blood transfusions[10], dense internal adhesions[11], thromboembolism[8], urinary retention[12], bladder damage[13], and anesthesia complications[14], compared to a natural vaginal delivery. Furthermore, a reduction in fertility was also reported as complications of cesarean sections[15].

In addition, an increase in the prevalence rate of cesarean section in a country may impose many costs on its health system. According to the World Health Organization, in 2008, 373,372 non-essential cesarean sections were performed in Iran (6% of total cesarean sections) and the estimated cost of the total cesarean sections in Iran was $ 108,495,217[5].

Managing and controlling labor pain is an essential part of midwifery services and is the main goal of childbirth care. Many pharmaceutical and non-pharmaceutical methods are used for this purpose[8, 16]. Although there is high-quality evidence for the effectiveness of some medications in reducing labor pain, a comprehensive review study conducted on Cochran's systematic reviews demonstrated that some pharmaceutical methods used for reducing labor pain were associated with creating a number of side effects for the mother and fetus[17]. On the contrary, although non-pharmacological methods used for reducing labor pain are non-invasive, affordable, and inexpensive and they seem safe for the mother and fetus, their effectiveness remains ambiguous due to lack of high-quality evidence and documentation[17, 18]. These methods include educational programs, massage, reflexology, relaxation, heat and cold therapy, the use of a labor ball, injection of distilled water into the interior or subcutaneous tissue, water therapy, chewing sugar-free gum, acupressure, aromatherapy, and music therapy[19-23].

One of the non-pharmacological methods for relieving labor pain is aromatherapy. Aromatherapy refers to an application of essential oils to create a balance in the body and promote health[24]. These oils are aromatic and volatile organic compounds that are extracted by the process of distillation from the root, flower, leaves, skin, and seeds of various plants[25].

Different studies have indicated the effect of aromatherapy on reducing pain and anxiety among hospitalized patients[26], improving nausea and vomiting after a surgery[27], balancing hemodynamic indices in patients with the acute coronary syndrome[28], and promoting levels of quality of life among women with breast cancer[29]. Moreover, in the field of women's health, aromatherapy has been used to reduce labor pain[30], heal episiotomy wounds[31], treat nausea after a cesarean section[32], treat primary dysmenorrhea[33], and improve depression among postmenopausal women[34].

In 2010, a study carried out by Tillett and Ames, it was figured out that applying essential oils in aromatherapy did not have any complications and had a high acceptance rate among women[35]. In general, various essences of oils are used in an aromatherapy during labor, some of which include lavender, eucalyptus, chamomile, common sage, jasmine, and rose[36, 37]. These essential oils are used in a variety of ways such as topically applied to the skin, inhalation, or by using baths and compresses[38].

Lavender (*Lavandula angustifolia*), which belongs to the green peppermint family, is one of the most aromatic herbs used in aromatherapy[39]. This plant consists of linalool, alcohol, ketones, esters, and aldehydes. Ketone available in lavender effectively helps reduce pain and inflammation. Esters prevent muscle spasms and reduce tension and depression[40]. Findings of a study conducted by Jaradat showed that lavender is a common medicinal herb that has traditionally been applied to treat a cough, eczema, rheumatism, and migraine, and has been used as a diuretic, anti-flatulence, antispasmodic, and sedative herb[41].

Although some studies have suggested conducting aromatherapy with lavender for reducing labor pain and anxiety[42-44], the effectiveness of non-pharmaceutical therapies, such as aromatherapy with lavender, on labor outcomes is

not fully specified and there is still no consensus on the use of aromatherapy with lavender to relieve labor pain in hospital settings. In fact, a lack of systematic review carried out to investigate the effects of aromatherapy with lavender on reducing labor pain is one of the most important issues preventing the routine use of this method of pain control in clinical settings.

Thus, this systematic review and meta-analysis study was conducted with the aim of critically evaluating and summarizing all available qualitative and quantitative evidence obtained from randomized clinical trials on the effects of aromatherapy with lavender on labor pain relief.

Information and Methods

Data sources and search strategy: In this systematic review, searching a number of foreign databases, including MEDLINE/PubMed, Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), and Scopus, from the start date of these databases to December 2017 was independently conducted by two researchers, using symbols, i.e. Lavender* OR Lavandula* OR silexan AND labor OR labour OR birth OR childbirth. Considering Persian-language databases, including Magiran, SID, and IranMedex, a comprehensive search was performed until December 21, 2017, using the following keywords: aromatherapy, lavender, Lavandula, Lavendel, lavender angustifolia, Lavender officinalis, labor pain, labor, and delivery. The resource list for articles was reviewed for further documentation. When it seemed necessary, corresponding authors of the articles were contacted and asked for additional data.

Inclusion criteria: All studies, whose methodologies were randomized clinical trials and in which any form of aromatherapy with lavender was used during various stages of delivery and labor to relieve labor pain, were included in the study.

Examined outcomes: The outcome examined in the study included labor pain, which was evaluated, using a 10cm visual analogue scale.

Risk of bias (quality) assessment of the articles: Two authors independently reviewed the quality of each study, using the quality criteria presented in the Cochrane Handbook for Systematic Reviews of Interventions. The Cochrane collaboration's tool for assessing the risk of bias includes 7 domains that are random sequence generation, random allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other potential bias[45]. The risk of bias for each domain can be reported in the following way: low risk (-), unspecified risk (?), or high risk (+). Any disagreement was resolved by having a discussion and considering the consensus.

Selection of studies: Two authors independently reviewed the output of the searches. In this regard, initially, according to titles and abstracts of the articles, irrelevant cases were eliminated. Then, full texts of the rest of articles, which seemed relevant, were examined and evaluated to investigate if they had the inclusion criteria for this study. Based on the search strategy, 244 primary studies were found. After reviewing their titles and abstracts, 236 unrelated articles were deleted. Full texts of the remaining 8 articles were precisely evaluated. Finally, 5 articles, which had the inclusion criteria for quality assessment and data extraction, were ultimately examined[30, 46-49]. At the end, 2 articles were eliminated due to the use of a combined intervention and inadequate information, and the meta-analysis was performed on the remaining 3 articles[46, 48, 49]. Any disagreement was resolved by having a discussion and considering the consensus.

Data extraction: First, a data extraction form was designed. Afterwards, the information provided in the articles was independently extracted by two authors and recorded in the designed form. The data included the author's name, year of publication, country, participants, intervention, and outcomes. Any disagreement was resolved by having a discussion and considering the consensus of opinion.

Statistical analysis: Data analysis was performed, using Comprehensive Meta-analysis (CMA) software version 2. Standard mean differences of labor pain between the experimental and control groups were used as the effect size. To combine the findings in the studies, the Random Effects Model was used and the findings were presented in the form of a forest plot. The homogeneity of the studies was evaluated by a Cochran's Q test. To show the homogeneity, an I^2 index was applied.

Findings

Characteristics of these articles are presented (Table 1). A PRISMA flow diagram related to the searched studies was mentioned (Figure 1).

Participants and research environment: In the final studies reviewed in this systematic review, 541 participants were studied. Two studies included nulliparous women[46, 49], two studies involved multiparous women[47, 48], and one study included nulliparous and multiparous women[30]. All studies were carried out in Iran from 2007 to 2012.

Types of experimental and control groups: In the studies conducted by Abbaspoor and Mohammadkhani Shahri[30] and Mohammadkhani Shahri *et al.*[47], an aromatherapy massage was used and in the other 3 studies[46, 48, 49], inhalation aromatherapies with lavender were applied (Table 1).

Table 1) The characteristics of the studies examined in this systematic review

Corresponding author, year, place of sampling	Participants	Intervention	Outcome (labor pain)
Abbaspoor and Mohammadkhani Shahri, 2013, Iran-Tehran[30]	60 nulliparous and multiparous women Inclusion criteria: Singleton fetus, gestational age>36 weeks, vertex presentation, cervical dilatation≥ 4cm, and the existence of 3 uterine contractions in 10 minutes Exclusion criteria: Vaginal hemorrhage, delayed intrauterine growth, multiple pregnancies, being an athlete, addiction, use of analgesics 3 hours before or during the intervention, use of tranquilizers, having a history of infertility, and sensitivity to lavender	Group 1 (30 people): aromatherapy massage of the back with 2 drops of lavender oil dissolved in 50cc of almond oil at cervical dilatations of 3-4, 5-7, and 8-10cm, each time for 20 minutes Group 2 (30 people): Back message	Dilatation of 4-5cm (mean): Group 1: before 4.56, after 3.20, p=0.0001 Group 2: before 4.60, after 4.20, p=0.01 Dilatation of 5-7 cm (mean): Group 1: before 4.83, after 5, p=0.0001 Group 2: before 7.2, after 6.7, p=0.0001 Dilatation of 8-10cm (mean): Group 1: before 8.16, after 6.16, p=0.0001 Group 2: before 7.76, after 7.53, p=0.05
Kaviani *et al.*, 2014, Iran-Shiraz[46]	160 nulliparous women Inclusion criteria: Singleton fetus, gestational age≥36 weeks, cervical dilatation of 3-4cm Exclusion criteria: Medical and obstetric problems, asthma, sensitivity, cold, elective cesarean section, use of tranquilizers, and being unwilling to continue the study	Group 1 (80 people): Inhalation aromatherapy with a napkin soaked in 0.1ml of lavender oil mixed with 1ml of distilled water attached to the collar Group 2 (80 people): A napkin soaked in 2ml of distilled water attached to the collar	30 minutes after the intervention (mean±standard deviation): Group 1: 2.2±6.6 Group 2: 1.9±7.8, p<0.1, 0.001 60 minutes after the intervention (mean±standard deviation): Group 1: 2.3±6.9 Group 2: 1.6±8.5 p<0.001
Mohamadkhani Shahri *et al.*, 2013, Iran-Tehran[47]	90 multiparous women Inclusion criteria: Iranian race, aged 18-35, singleton fetus, gestational age 36-42 weeks, cervical dilatation 4cm, the existence of 3 30-second uterine contractions in 10 minutes, low-risk pregnancy, BMI of 19.8-26.4 Exclusion criteria: being an athlete, addiction, use of analgesics 3 hours before or during the intervention, use of oxytocin, use of tranquilizers, having a history of infertility, and sensitivity to essences	Group 1 (30 people): aromatherapy massage of the back with lavender oil at cervical dilatations of 4-5, 6-7, and 8-10 cm, each time for 20 minutes Group 2 (30 people): Back massage with almond oil Group 3 (30 people): Back massage alone	The total mean of labor pain in 3 times measured in cervical dilatations of 4-5, 6-7, and 8-10cm (mean±standard deviation): Group 1: before 1.63±6.65, after 1.50±6.08 p =0.1, 0.0001 Group 2: before 1.85±6.52, after 1.65±6.08 p =0.1, 0.001 Group 3: before 1.65±6.52, after 2.52±6.14 p=0.1
Vakilian *et al.*, 2012, Iran-Shahroud[48]	120 multiparous women Inclusion criteria: Singleton fetus, absence of acute or chronic illness in the mother, no history of acute or chronic pain in the mother, no history of mother's sensitivity Exclusion criteria: Systolic blood pressure <95 mmHg, sensitivity to lavender or inability to tolerate it, vaginal hemorrhage	Group 1 (60 people): Cold-water immersion of lavender oil Group 2 (51 people): Cold water immersion	The total mean of labor pain in 3 times measured in cervical dilatations of 4-6, 6-7, and 8-10cm (mean±standard deviation): Group 1: 1.73±6.8, Group 2: 27.26±7.11 p =0.1 Cervical dilatations of 4-6 cm (mean±standard deviation): Group 1: 2.20±6.47, Group 2: 9.30±7.06 p=0.1 Cervical dilatations of 6-8 cm (mean±standard deviation): Group 1: 2.02±6.74, Group 2: 1.48±7.19 p =0.18 Cervical dilatations of 8-10 cm (mean±standard deviation): Group 1: 2.01±7.19, Group 2: 75.80±7.07 p =0.1 Mean pain difference before and after the intervention (mean±standard deviation): Group 1: 2.48±0.81, Group 2: 3.90±0.90, p=0.1
Pirak *et al.*, 2015, Iran-Iranshahr[49]	120 primiparous women Inclusion criteria: Singleton pregnancy, gestational age greater than 37 weeks, dilatation of 4 cm, being able to read and write, cephalic presentation, and not receiving any kinds of analgesia during labor Exclusion criteria: cephalopelvic disproportion, patient's unwillingness to continue taking part in the study, a history of sensitivity to herbs, any cause that leads to an emergency cesarean section, any underlying illness in the mother	Group 1 (60 people): Inhalation aromatherapy with 2 drops of lavender essence Group 2 (60 people): No interventions	Cervical dilatations of 4-5 cm (mean±standard deviation): Group 1: before 2.4±6.6, after 1.50±5.5, p=0.2, 0.001 Group 2: before 2.5±6.9, after 99.60±6.9, p=0.2 Cervical dilatations of 6-7 cm (mean±standard deviation): Group 1: before 2.7±7.7, after 2.1±6.7, p=0.009 Group 2: before 2.1±7.8, after 1.70±8.2, p=0.15 Cervical dilatations of 8-9 cm (mean±standard deviation) Group 1: before 0.8±9.7, after 1.5±9.1, p=0.006 Group 2: before 1.3±9.4, after 1.1±9.6, p=0.06

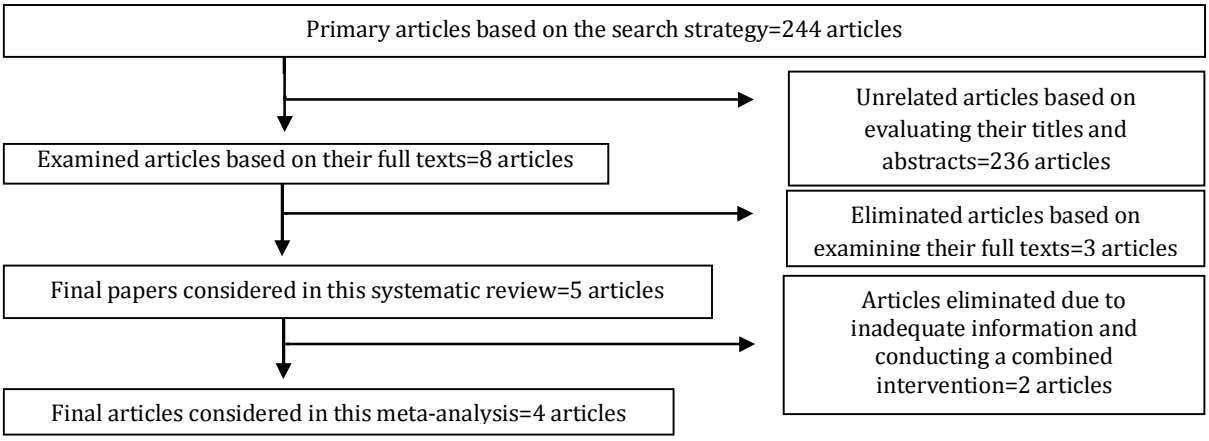

Figure 1) The PRISMA flow diagram related to the studies examined in this systematic and meta-analysis study

In the studies related to aromatherapy massage, the compared groups included massage alone and massage with almond oil. In the inhalation aromatherapy studies, the compared groups included cold-water immersion, a napkin soaked in distilled water, and no-intervention.

Description of the quality of the studies: Risks of bias in the studies reviewed in this systematic review were presented (Figure 2).

A summary of the risk of bias for each of the evaluated studies was presented, too (Table 2). A random sequence generation was done in 4 studies with a low risk of bias[30, 47-49]. A random allocation concealment was carried out in the studies conducted by Abbaspoor and Mohammadkhani Shahri[30] and Vakilian *et al*.[48] by applying closed similar envelopes; however, in the other 3 studies, it was unknown[46, 47, 49]. Blinding of participants and personnel was not implemented during the evaluation of the results of studies conducted by Abbaspoor and Mohammadkhani Shahri[30] and Kaviani *et al*.[46] and it was unspecified in most of the other studies. In two studies, there was no sample loss[30, 47]. In a study carried out by Vakilian *et al.*, 9 subjects placed in the control group were eliminated from the study due to having cesarean sections; however, all the subjects placed in the experimental group stayed in the study[48]. Since the sample size was relatively high, an imbalance between the two groups was evident. According to the Cochrane collaboration's tool for assessing the risk of bias, this study was considered inadequate in terms of the risk of incomplete outcome data and it should be considered in the group of studies with a high risk of bias[45].

In Mohammadkhani Shahri *et al*.'s study, only a mean of labor pain was reported 3 times and it was not independently reported in each dilatation[47]. For this reason, this study should be considered in the group of studies with a high risk of bias due to the bias related to selective reporting of the results.

Considering other potential biases, all studies were classified as the unspecific risk of bias. In some of them, details related to methods of carrying out the intervention were unclear. In some others else, the time of initiating the intervention and its duration were not clearly stated. A failure to know these details means that interpreting the results is not simple and readers should consider these ambiguities while reading the results of the study.

In all these studies, means of labor pain were measured, using a 10cm visual analogue scale. In 3 of these studies, labor pain was measured at 4, 6 and, 8cm cervical dilatations[30, 47, 48]. In a study carried out by Kaviani *et al*., labor pain was measured and recorded 30 minutes and 60 minutes after the intervention[46].

In studies, in which aromatherapy was used in the form of massage, total means of labor pain at 3 times measured in different cervical dilatations and also in each dilatation were significantly lower than before the intervention in the group that underwent a massage with lavender oil. However, no comparison was made between the experimental and control groups[30, 47].

Considering inhalation aromatherapy conducted using an essential lavender oil, there were no statistically significant differences with regard to the total means of labor pain at 3 times measured in different cervical dilatations and in each dilatation between the experimental and control groups; however, a mean difference of pain before and after the intervention was observed in the experimental group ($p=0.03$) and the mean was lower in the experimental group compared to the control group[48]. In Kaviani *et al*.'s study, inhalation aromatherapy was carried out, using a napkin soaked in lavender oil attached to a collar. A mean labor pain 30 minutes and 60 minutes

after the intervention in the experimental group was lower than the control group (p<0.001)[46]. In Pirak *et al.*'s study, inhalation aromatherapy was performed with two drops of essential oil of the lavender plant dropped on the palms of the participants with a dropper. The means of the severity of labor pain in the experimental group was significant in cervical dilatations 4, 6, and 8cm[49].

A forest plot of the meta-analysis was presented (Table 3). In the active phase of labor, aromatherapy with lavender significantly reduced the labor pain in the experimental group. A mean difference of labor pain in the aromatherapy groups with lavender and control groups was 1.05 (0.552-1.548; p=0.000036). Homogeneity of the studies was confirmed with the Cochrane Q value=0.266, p=0.86, and I^2=0%.

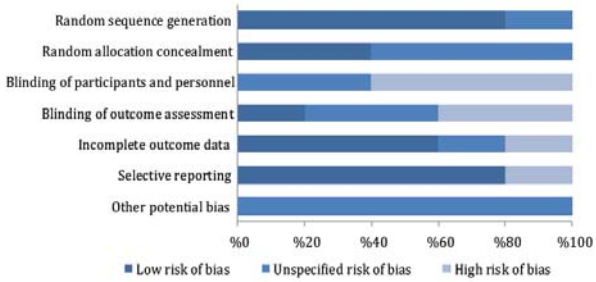

Figure 2) The risk of bias in the studies examined in this systematic review

Table 2) The forest plot of the meta-analysis

Author	Difference in means	Standard error	Lower limit	Upper limit	p value
Vakilian *et al.*	1.190	0.418	0.371	2.009	0.004387
Kaviani *et al.*	0.900	0.393	0.129	1.671	0.022177
Pirak *et al.*	1.100	0.552	0.018	2.182	0.046215
Total result	1.050	0.254	0.552	1.548	0.000036

Table 3) The summary of the risk of bias for each of the studies

Author	Random sequence generation	Random allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other potential bias
Pirak *et al.*[49]	+	?	-	?	+	+	?
Abbaspoor and Mohammadkhani Shahri[30]	+	+	-	-	+	+	?
Kaviani *et al.*[46]	?	?	-	-	?	+	?
Mohamadkhani *et al.*[47]	+	?	?	+	+	-	?
Vakilian *et al.*[48]	+	+	?	?	-	+	?

Low risk of bias Unspecified risk of bias High risk of bias

Discussion

A general look at the results of these clinical trials suggested that carrying out an aromatherapy with lavender among women during their labors could reduce labor pain. The major mechanism of aromatherapy has remained unknown. Studies which investigated psychological and physiological effects of aromatherapy with essential oils, generally, indicated that without creating any alternations in physiological parameters, like blood pressure or heart rate, aromatherapy could improve women's mental statuses including their mood and anxiety levels[50].

There was a close relationship between anxiety caused by the labor process and labor pain. Labor pain and fear of having a natural vaginal delivery lead to maternal anxiety at the delivery stages and, by stimulating the autonomic and humeral nervous system, they increase the secretion of catecholamines such as adrenaline, noradrenaline, and cortisol. One of the mechanisms of aromatherapy is that essential oils are absorbed through inhalation and can reduce cortisol secretion or increase serotonin. As findings of studies conducted by Mirzaei *et al*. and Beesley *et al*. suggested, aromatherapy with lavender among women during labor can reduce levels of labor anxiety, decrease cortisol secretion from the adrenal glands, and increase serotonin secretion from the gastrointestinal tract[42, 51].

Linalool available in lavender inhibits the release of acetylcholine and the change in ion channel efficiency at the site of the neuromuscular joint, and given that linalyl acetate has a narcotic function and linalool acts as a sedative, this justifies the traditional use of this plant as an herbal pain reliever drug. Since massaging facilitates the absorption of volatile oils from the skin, linalool and linalyl acetate can be absorbed by skin massage within 5 minutes and their plasma concentrations reach a maximum after about 20 minutes[52, 53]. In addition, the reduction in labor pain caused by aromatherapy with lavender can be attributed to the effect of this intervention in deviating the pain. Pain distraction involves entertaining women during childbirth with certain activities so that their conscious thoughts and concerns are reduced[54]. It seems that the smell of lavender or the act of massage therapy accompanied by aromatherapy massage help women distract their attention from labor pain.

During this review, the authors attempted to minimize potential bias threatening the accuracy of this study. For example, two authors independently searched the databases and extracted the data. Additionally, no time and

language limitations were considered in conducting the database searches. However, some studies may not be available in the databases. This should be taken into the consideration by readers when interpreting the results of the present study.

There are various issues at the core of the clinical trials considered in this article, indicating the need for further research and evaluations. In general, the quality of these clinical trials was moderate and combinatory. Most of the studies provided few details on the exact method of carrying out the study. In most of these clinical trials, blinding of participants and personnel was impossible; accordingly, minimizing the risk of bias in conducting the intervention and evaluating the outcomes were challenging issues. Furthermore, since a large group of participants abandoned one of the considered studies[48], this may disrupt the initial equilibrium generated by the random sequence to the experimental and control groups and may indicate the possible effect of intervening factors on the results.

In a study conducted by Abbaspour and Mohammadkhani Shahri[30], the lavender oil was used in a combination with almond oil in the experimental group and since no comparison was made between the groups and each group was compared to itself, it was impossible to accurately judge the effect of lavender on labor pain. Another potential limitation in some clinical trials is the small sample size. In case of having a small sample, as in the present study, it is better to conduct a meta-analysis on the statistical results, in addition to the systematic review, to increase the accuracy of the conclusion[20].

Although the results of examined clinical trials showed a reduction in labor pain in cases of aromatherapy massage and inhalation with lavender, the authors of the current study believed that performing more accurate randomized clinical trials with a higher quality and paying a special attention to blinding, loss of samples, and selective reporting of the results can help validate the findings of the present study on the effect of aromatherapy with lavender on the severity of labor pain. Using aromatherapy, as an intervention, is low-cost and does not require a complex training. However, in order to reach a precise conclusion, the need for carrying out more controlled randomized clinical trials is felt.

Conclusion

Using aromatherapy with lavender among pregnant women reduces the labor pain. The availability of information obtained from this study can be useful for gynecologists, midwives, and nurses working in labor and delivery units.

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Ethical permissions: None.

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