The Effects of Aromatherapy on Postpartum Women: A Systematic Review

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ABSTRACT
Background: The postpartum period is the most crucial but also the most fragile stage of most pregnancies. The health benefits of aromatherapy have recently become more widely accepted among medical experts. Although a number of studies have examined these health benefits, no systematic reviews have been conducted to assess the effects of aromatherapy on the psycho-physiological health of postpartum women.

Purpose: This systematic review was conducted to evaluate the effectiveness of aromatherapy interventions on the psycho-physiological health of postpartum women, to determine the methods that were used to measure intervention effectiveness, and to identify the types of interventions that were used.

Methods: We searched for studies that evaluated the effects of aromatherapy on postpartum women published in the Chinese or English languages before March 2018. We used online databases such as the Taiwan Journal Index, Centre for European Policy Studies, Cumulative Index for Nursing and Allied Health Literature, Cochrane Library, PubMed, and Social Sciences Citation Index. The search keywords used were “women,” AND “postpartum,” OR “postnatal” AND “aromatherapy,” OR “aroma,” OR “essential oils.” Only randomized controlled trials including humans as study participants were included. The methodological quality of the trials was assessed using the modified Jadad scale. The quality of the full-text studies was assessed by three reviewers.

Results: The 15 studies that were included in this systematic review were performed in Iran, England, and the United States and included 2,131 participants in total. The numbers of participants in each study ranged between 35 and 635. The review found that the effective duration of aromatherapy varied according to the essential oils that were selected. The visual analog scale was the most frequently used measure of postpartum pain. Most of the studies found that the aromatherapy intervention improved postpartum physiological and psychological health, with positive effects shown on anxiety, depression, distress, fatigue, mood, nipple fissure pain, physical pain, post-caesarean-delivery pain, post-caesarean-delivery nausea, postepisiotomy pain, postepisiotomy recovery, sleep quality, and stress. Most of the studies reported no serious intervention-related side effects.

Conclusions: This systematic review may serve as a reference for healthcare workers in caring for postpartum women. Aromatherapy may be applied as a noninvasive complementary intervention to promote physio-psychological comfort in postpartum women.

Key Words: aromatherapy, essential oils, postnatal, postpartum, systematic review.

Introduction
The postpartum or postnatal period is regarded as the fourth trimester of pregnancy and is defined as the time between giving birth and the recovery of a woman’s reproductive organs to their prepregnancy state (Romano, Cacciatoro, Giordano, & La Rosa, 2010; Sun, 2016). This is the most crucial but also the most fragile stage of pregnancy (World Health Organization, 2014). Women experience various changes in their physiological and psychological state during the postpartum period and find it difficult to adapt to these changes, which may affect their role as mothers as well as their health-related quality of life. Therefore, postpartum women require timely assistance to adapt to postpartum life (Sun, 2016).

Aromatherapy, a complementary therapy frequently categorized under phytotherapy or botanical medicine, involves using essential oils (EOs) as therapeutic agents (Dunning, 2013; Gnatta, Kurebayashi, Turrini, & Silva, 2016). The use of EOs for mental, physical, and spiritual purposes traces back thousands of years to ancient Eastern and Western civilizations, including the Chinese, Egyptians, Greeks, Indians, and Romans, among others (Buckle, 2011; Chang, 2014). Aromatherapy is a compound noun that was reportedly first used by René Maurice Gattefossé in 1937 (as cited in Chang, 2014; Gattefossé, 1993). The experiments of Gattefossé confirmed the scientific argument that, because of their excellent permeability, EOs can enter the body via pathways such as inhalation (through the olfactory system) and absorption (through the surface of the skin; Buckle, 2011; Chang, 2014). EOs were applied to treat burns, wounds, gangrenosum, and other trauma
Injuries during World War I and World War II as well as to treat mental disorders in postwar society (Buckle, 2011; Chang, 2014). Aromatherapy is defined as the science and art of therapies that are applied intrinsically using smells and practical EOs (Lis-Balchin, 1999; Robins, 1999). EOs, known as volatile oils, are extracted from the stems, leaves, flowers, and fruits of certain plants and may be produced using distillation, enfleurage, chemical solvents, resin tapping, carbon dioxide (CO2), and cold pressing (Ali et al., 2015; Buckle, 2011). The dozens of popular EOs in current use include rosemary, tea tree, cinnamon, bergamot, sage, ylang-ylang, chamomile, geranium, jasmine, lavender, lemon, and peppermint (Ali et al., 2015; Chang, 2014). Most EOs should not be applied to the skin undiluted (Dunning, 2013) and are therefore commonly administered through baths, local application, and inhalation to prevent or treat diseases, improve immune function, and protect human health (Ali et al., 2015; Buckle, 2011). The health benefits of aromatherapy are becoming more widely accepted among medical experts, and a number of studies have been conducted to evaluate these benefits (Ali et al., 2015). Gnatta et al. (2016) suggested that aromatherapy is practiced as a nursing intervention because it addresses psycho-physiological health and has been historically and widely practiced by nurses and that it is worth discussing aromatherapy within the context of nursing theory. However, no published articles have yet investigated the effects of aromatherapy on postpartum health. In addition, no clinical guidelines are currently available for the application of aromatherapy on postpartum women. Using an alternative, noninvasive therapeutic approach such as aromatherapy to address psychosomatic discomfort during the postpartum period may highlight the independence of nursing care while increasing comfort and relaxation and beneficial treatment outcomes among postpartum women. The objectives of this article are to (a) review the evidence from clinical trials that have assessed the benefits and safety of aromatherapy on the psycho-physiological health of postpartum women, (b) determine the methods used to measure the effectiveness of aromatherapy, and (c) identify the intervention approaches that were used. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) were used during the review process to ensure a high level of quality and transparency in data selection and reporting.

Methods

Eligibility Criteria

Aromatherapy studies meeting the following criteria were included in this systematic review: (a) described the intervention, its implementation, and the aromatherapy medium (menthol, peppermint, lavender, orange peel, and Citrus aurantium); (b) examined physiological and psychological health of postpartum participants; that is, physiological health factors included nipple fissures, postepisiotomy perineal discomfort, postepisiotomy pain, postepisiotomy recovery, physical pain, fatigue, post-cesarean-section (CS) delivery pain, post-CS-delivery nausea, and sleep quality, and psychological health factors included mood, anxiety, stress, depression, and distress; (c) were designed as randomized controlled trials (RCTs); (d) reported results in a full article that was published in either Chinese or English; and (e) used humans as study participants. Studies that used combined therapies, case reports, case series, descriptive studies, letters to editors, or reviews were excluded. The target populations were all postpartum women, and the studies were all conducted for a period of 8 weeks or less.

Information Sources

We searched online databases for Chinese- and English-language studies evaluating the effects of aromatherapy on postpartum women that were published before March 2018. The online databases that were used included the Taiwan Journal Index (Index to Taiwan Periodical Literature System, \( n = 35 \)), Chinese Electronic Periodicals Service \( (n = 37) \), Cumulative Index for Nursing and Allied Health Literature \( (n = 25) \), Cochrane Library \( (n = 156) \), PubMed \( (n = 395) \), and Social Sciences Citation Index \( (n = 45) \). The search keywords that were used included “women,” “pain,” “postpartum,” OR “pain,” AND “aromatherapy,” OR “aroma,” OR “essential oils.” As noted, only RCTs that examined humans as study participants were included in this review. In addition, the literature was carefully searched for references and citations to articles included in this study to avoid repetition and to include as many relevant original studies as possible.

Study Selection

Titles and structured summaries were reviewed independently by three researchers to identify potentially relevant articles. Next, the full texts of these articles were reviewed to confirm that the eligibility criteria were met and to extract the requisite information, which included study characteristics (author, year, country, design, participants, and risk of bias), intervention characteristics (type of aromatherapy, aromatherapy dose, treatment frequency, administration method, duration per session, total number of sessions, and total duration of intervention), and main outcomes. Data extraction was performed by three independent researchers, and any differences in opinion were resolved through mutual discussion and agreement.

Data Items

The modified Jadad scale is frequently used to assess the quality of trial reports that are candidates for inclusion in systematic reviews. This scale has an interrater reliability of .9, indicating that it is a useful tool (Oremus et al., 2001). The methodological quality of the included trials was assessed using the modified Jadad scale (Oremus et al., 2001). It is highly reliable and easily used. Thus, it is feasible to appraise the quality of the original studies (Dimitriou, Mavridou, Manatakai, & Damigos, 2017; Oremus et al., 2001). The quality of the trials was analyzed using an
eight-item scale (randomization, blinding, withdrawals and dropouts, inclusion and exclusion criteria, adverse effects, and statistical analysis), and “high” quality was determined by a score of equal to or greater than 4 (Table 1). All of the items were assessed by three researchers, and concurrence among all three was achieved through discussion.

Risk of Bias
The validity of the eligible RCTs was ascertained by evaluating the frequency and duration of the aromatherapy interventions, determining the methods that were used to measure intervention effectiveness, and identifying the intervention approaches that were used. Three researchers provided validity ratings independently, and the rating scores given by each matched completely.

Results
Study Selection
The initial search strategy identified 693 potentially relevant articles. After removing duplicates, 557 studies remained.

Afterward, 540 studies were excluded because of their use of combined therapies, being a review article, not using EOs in the intervention, not including postpartum participants, and not including human participants. After screening the titles and abstracts of the remaining articles, 17 remained for full-text screening. Three studies were excluded in this stage because of being either a pilot study (2) or a qualitative study (1). In addition, one study was subsequently obtained from a reference. Thus, 15 RCTs were included in this review. A detailed flowchart for the study selection process is presented in Figure 1. The included studies were conducted in Iran, England, and the United States, with 2,131 participants and the number of participants per study ranging from 35 to 635. The participants in these studies were all postpartum women. Two of the included studies evaluated the effectiveness of aromatherapy in alleviating nipple fissure pain, five evaluated the alleviation of discomfort and pain and the effect on episiotomy recovery outcomes, three evaluated the alleviation of pain and nausea after CS, two evaluated improvements in sleep quality, and five evaluated the effect on psychological health.

Trial Quality
Information on the participants, design, intervention, follow-up, main outcome, and modified Jadad scale scores for the studies are presented in Table 2, and the main results of each study are compared numerically. All 15 of the RCTs met stringent standards for quality. The method of randomization was appropriate in eight of the studies (Study nos. 1, 7–9, and 11–14), seven studies used no blinding (Study nos. 1, 5–7, and 11–13), single blinding was used in four studies (Study nos. 3, 4, 14, and 15), and double blinding (Study nos. 2 and 9) and triple blinding (Study nos. 8 and 10) were used in two studies each. An appropriate blinding procedure was used in five studies (Study nos. 2, 3, 10, 14, and 15). There were descriptions of withdrawals and dropouts in eight studies (Study nos. 1–3, 5, 6, 12, 13, and 15). All of the studies presented clear descriptions of inclusion and exclusion criteria and applied appropriate statistical analysis. Six articles described adverse effects of the intervention (Study nos. 3, 4, 8, 9, 13, and 14). All of the studies received scores between 4 and 6.5, indicating high quality.

Effects of Aromatherapy on Physiological Health

Effect of aromatherapy on nipple fissures
Many lactating mothers experienced varying degrees of nipple trauma and that most followed poor breastfeeding-related practices (Ahmed, Mohamed, & Abu-Talib, 2015). Two Iranian studies evaluated improvements in nipple fissures in breastfeeding women, with one using an aromatherapy intervention on 110 primiparous lactating women. This intervention applied four drops of menthol essence on the nipple and areola after each feeding for 2 weeks. The visual analog

### Table 1.

**Modified Jadad Scale**

| Eight Items of the Modified Jadad Scale | Score |
|----------------------------------------|-------|
| 1. Was the study described as randomized? | +1    |
| Yes                                    |       |
| No                                     | 0     |
| 2. Was the method of randomization appropriate? | +1 |
| Yes                                    |       |
| No                                     | −1    |
| Not described                          | 0     |
| 3. Was the study described as blinded? | +1    |
| Yes                                    |       |
| No                                     | 0     |
| 4. Was the method of blinding appropriate? | +1 |
| Yes                                    |       |
| No                                     | −1    |
| Not described                          | 0     |
| 5. Was there a description of withdrawals and dropouts? | +1 |
| Yes                                    |       |
| No                                     | 0     |
| 6. Was there a clear description of the inclusion and exclusion criteria? | +1 |
| Yes                                    |       |
| No                                     | 0     |
| 7. Was the method used to assess adverse effects described? | +1 |
| Yes                                    |       |
| No                                     | 0     |
| 8. Was the method of statistical analysis described? | +1 |
| Yes                                    |       |
| No                                     | 0     |
scale (VAS; 0–10 cm) and Amir Scale (1–10 mm) were used to measure intensity of pain and severity of damage, respectively. In addition, the presence of nipple discharge was observed (Study no. 1). Other studies were conducted to assess the effects of peppermint water in alleviating nipple cracks. Peppermint water was produced by introducing peppermint EO gradually into 1 liter of distilled water. After every feeding from Day 1 to Day 14, the nipples were washed with water and then the nipple and areola were covered with peppermint-water-saturated cotton. The nipple and areola were washed again before the next feeding (Study no. 12).

The results of these studies were consistent in their findings that menthol essence and peppermint water were respectively effective in preventing and alleviating nipple pain, fissures, and damage in primiparous breastfeeding women when the aromatherapy intervention was conducted after each feeding for 2 weeks postpartum. These studies indicate that menthol and peppermint aromatherapy may be used in nursing practice to alleviate nipple fissures in breastfeeding mothers.

**Effect of aromatherapy after episiotomy**

Episiotomies are performed to expand the diameter of the outlet pelvis during normal spontaneous delivery (Masoumi, Keramat, & Hajiaghaee, 2011). Five of the included articles examined the effectiveness of aromatherapy in alleviating discomfort and pain and in facilitating recovery after episiotomy. One study that was conducted in England used lavender oil aromatherapy. Subjects in this study took a daily, half-hour bath into which six drops of lavender oil had been added. After each bath, they completed a VAS to measure degree of discomfort experienced. Moreover, the condition of the perineum was assessed as part of the midwife’s normal daily examination of the subjects. There was some consistency in the results between the third and fifth days, with a reduction in mean discomfort scores. However, aromatherapy did not reduce perineum daily discomfort (Study no. 3). In Iran, four studies were conducted to assess the effectiveness of aromatherapy in reducing discomfort and pain and in facilitating recovery after episiotomy. Three of these

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**Figure 1.** Flowchart for study selection. CINAHL = Cumulative Index to Nursing and Allied Health Literature; CEPS = Chinese Electronic Periodicals Service; SSCI = Social Sciences Citation Index.
| Study | Participant | Design | Intervention | Follow-Up | Main Outcome | Score |
|-------|-------------|--------|--------------|-----------|--------------|-------|
| 1. Akbari, Alamolhoda, Baghban, & Mirabi (2014) Iran | 110 primiparous lactating women IG = 55, CG = 55 | RCT | Four drops of menthol essence on the nipple and areola after each feeding CG = four drops of their own milk | 3, 10, and 14 days | Nipple fissure pain VAS \((p < .001)\), nipple fissure damage Amir Scale \((p < .001)\), and nipple fissure discharge Amir Scale \((p < .001)\) | 5 |
| 2. Behmanesh et al. (2011) Iran | 89 episiotomy in primiparous women, aged 17–34 years IG = 30, G2 = 30, G3 = 29 | RCT/double blind | Ten drops of 2% lavender-EO-based olive oil added to 5 L of bathwater, twice a day G2 = olive oil, G3 = distilled water | 2 hours, 5 and 10 days | 1. Postepisiotomy pain VAS \((p = .030)\) 2. Perineum REEDA score \((p = .001)\) | 6 |
| 3. Dale & Cornwell (1994) England | 635 episiotomy in women IG = 217, G2 = 213, G3 = 205 | RCT/single blind | Six drops of pure lavender oil added to bathwater for 30 minutes daily G2 = synthetic EO G3 = inert substance | 10 days | 1. Daily discomfort VAS: no significance 2. Daily mood VAS: no significance | 6.5 |
| 4. Hadi & Hanid (2011) Iran | 200 women who underwent CS IG = 100, PG = 100 | RCT/single blind | • Two drops of 2% lavender essence through oxygen mask for 3 minutes • Placebo was a similar, clinically neutral aromatic material | Half, 8 and 16 hours | Post-CS-delivery pain VAS \((p < .001)\) | 4.5 |
| 5. Keshavarz Afshar et al. (2015) Iran | 158 primiparous women who received vaginal delivery, aged 18–35 years IG = 79, PG = 79 | RCT | • A cotton ball containing four drops of 10% lavender EO and sesame carrier oil placed inside a cylindrical container. They inhaled 10 deep breaths from a distance of 20 cm, four times a week. • Placebo was sesame carrier oil. | 4 and 8 weeks | PSQI (1) 4 weeks: no significance (2) 8 weeks \((p < .05)\) | 4 |
| 6. Kianpour, Mansouri, Mehrabi, & Asghari (2016) Iran | 140 postpartum women IG = 70, SG = 70 | RCT | Three drops of lavender EO on their palms, rubbed them together. They inhaled it, three times a day for 4 weeks | 2 weeks, 1 and 3 months | DASS-21 and the Edinburgh Stress, Anxiety, and Depression Scale for stress, anxiety, and depression: 2 weeks \((p = .012, p = .001\), and \(p = .003\), respectively), 1 M \((p = .001)\), 3 M \((p = .001)\) | 4 |
| 7. Lane et al. (2012) United States | 35 women who deliver by CS IG = 22, PG = 8, SG = 5 | RCT | • A cotton ball containing spirits of peppermint placed inside a minutes small ziploc bag. They inhaled three deep breaths. • Placebo was sterile water with green food coloring. | 2 and 5 and 3 months | Post-CS-delivery nausea, an ordinal nausea scale: 2 minutes \((p < .001)\), 5 minutes \((p = .005)\) | 4 |
| 8. Mirghafourvand, Charandabi, Hakimi, Khodaie, & Galeshi (2016) Iran | 96 postpartum women IG = 48, PG = 48 | RCT/triple blind | • Ten drops of orange peel EO added to a glass of water. They drank it after meals, three times a day. • Placebo was water, propylene glycol, and 1–2 drops of orange edible EO. | 8 weeks | PSQI \((p < .05)\) | 6 |

(continues)
| Study | Participant | Design | Intervention | Follow-Up | Main Outcome | Score |
|-------|-------------|--------|--------------|-----------|--------------|-------|
| 9.    | Mirghafourvand, Mohammad Alizadeh Charandabi, Hakimi, Khodaie, & Galeshi (2017) Iran | 96 postpartum women <br> IG = 48, PG = 48 | RCT/double blind | Ten drops of orange peel EO added to a glass of water. They drank it after meals, three times a day. <br> Placebo was water, propylene glycol, and 1–2 drops of orange edible EO. | 8 weeks | Edinburgh Postnatal Depression Questionnaire: no significance <br> STAI: no significance | 6 |
| 10.   | Olapour et al. (2013) Iran | 60 women who deliver by CS <br> IG = 30, PG = 30 | RCT/triple blind | Three drops of 10% lavender oil essence were poured on cotton in cast containers. They inhaled it for 5 minutes from a distance of 10 cm. <br> Placebo was a base of aromatherapy blend without lavender essence. | 4, 8, and 12 hours | Post-CS-delivery pain VAS: 4 hours ($p = .008$), 8 hours ($p = .024$), 12 hours ($p = .011$) | 5 |
| 11.   | Sheikhan et al. (2012) Iran | 60 episiotomy in primiparous women <br> IG = 30, SG = 30 | RCT | Sitz baths (0.25 ml of lavender oil essence per 5 L of water) for 30 minutes, twice a day | 4 and 12 hours, 5 days | Postepisiotomy pain VAS: 4 hours ($p = .001$), 12 hours: no significance, 5 days ($p < .001$) <br> Perineum REEDA score: 5 days ($p = .000$) | 4 |
| 12.   | Sayyah Melli et al. (2007) Iran | 196 lactating primiparous women <br> IG = 98, CG = 98 | RCT | Peppermint water was poured on cotton. They put it on their nipple and areola after the nipple was washed with water after every feeding. | 14 days | 1. Nipple and areola cracks Amir Scale ($p < .01$) <br> 2. Cracked nipple (relative risk = 3.6, 95% CI [2.9, 4.3]) <br> 3. Nipple pain rating scales (odds ratio = 5.6, 95% CI [2.2, 14.6]; $p < .005$) | 5 |
| 13.   | Sharifipour, Bakhteh, & Mirmohammad (2015) Iran | 80 women who deliver by CS, aged 18-35 years <br> IG = 40, PG = 40 | RCT | Three drops of *Citrus aurantium* essence were poured on cotton. They inhaled it for 5 minutes from a distance of 10 cm. <br> Placebo was normal saline. | 12 hours | STAI ($p < .001$) | 6 |
| 14.   | Vakilian, Atarha, Bekhradi, & Chaman (2011) Iran | 120 episiotomy in primiparous women <br> IG = 60, SG = 60 | RCT/single blind | Sitz baths (five to seven drops of 1.5% lavender EO per 4 L of water), twice a day | 10 days | 1. Postepisiotomy pain VAS: no significance <br> 2. Perineum edema: no significance <br> 3. Perineum leaved suture: no significance <br> 4. Perineum redness ($p = .001$) <br> 5. Perineum dehiscence: no significance | 6.5 |

(continues)
TABLE 2. Summary of the 15 RCTs Evaluating Aromatherapy Effects on Postpartum Women, Continued

| Study | Participant | Design | Intervention | Follow-Up | Main Outcome | Score |
|-------|-------------|--------|--------------|-----------|--------------|-------|
| 15. Vaziri et al. (2017) Iran | 56 episiotomy in primiparous women, aged 18–35 years | RCT/single blind | ▪ Five drops of 1% lavender oil essence were poured on cotton. They inhaled it for 10–15 minutes from a distance of 20 cm. ▪ Placebo was sesame oil. | 1 hour and tomorrow morning | 1. Perineal pain VAS (p = .004, p < .001) 2. Physical pain VAS (p < .001) 3. Fatigue VAS (p = .02, p < .001) 4. Distress VAS (p < .001) 5. PANAS: positive moods (p < .001), negative moods (p = .007, p < .001) | 5.5 |

Note. RCTs = randomized controlled trials; IG = intervention group; CG = comparison group; PG = placebo group; SG = standard therapy group; CS = cesarean section; EO = essential oil; PSQI = Pittsburgh Sleep Quality Index; STAI = State-Trait Anxiety Inventory; VAS = visual analog scale; REEDA = Redness, Edema, Ecchymosis, Discharge, and Approximation; DASS-21 = 21-item Depression, Anxiety, and Stress Scale; CI = confidence interval; PANAS = Positive and Negative Affect Schedule.

studies asked the subjects to bathe in lavender oil twice a day to reduce pain, dehiscence, the number of sutures, infection, and Redness, Edema, Ecchymosis, Discharge, and Approximation (REEDA) score (Study nos. 2, 11, and 14). Lavender oil baths reduced redness (Study no. 14) and pain and REEDA scores (Study nos. 2 and 11). Furthermore, the effectiveness of lavender oil inhalation on perineal pain, physical pain, and fatigue was assessed in one of the included studies. The intervention with lavender oil was repeated 6 hours after the first intervention and at bedtime in three doses during the first 24 hours after delivery. Lavender oil inhalation was found to be effective in reducing pain and fatigue (Study no. 15). Two of five studies did not find significant side effects (Study nos. 3 and 14), with cases finding minor irritation (Study no. 14) and the others reporting no side effects at all (Study nos. 2, 11, and 15).

These results suggest that aromatherapy using five to 10 drops of lavender oil added to 4–5 liters of bathwater twice a day for 5–10 days (Study nos. 2, 11, and 14) or five drops of lavender oil inhalation for 10–15 minutes (Study no. 15) may have beneficial effects on wound care (Study nos. 2, 11, 14, and 15) and physical pain and fatigue (Study no. 15) in women after perineal episiotomy.

**Effect of aromatherapy after cesarean section delivery**

CS delivery, the most widely performed surgery worldwide, is continuing to increase in prevalence (Masoumi et al., 2011). Three studies examined the effectiveness of aromatherapy in alleviating nausea (Study no. 7) and pain (Study nos. 4 and 10) after CS delivery. In Iran, two studies asked subjects to inhale lavender essence for 3 and 5 minutes, respectively, to reduce pain (Study nos. 4 and 10) after CS delivery. Lavender aromatherapy was found to be effective in reducing postcesarean-delivery pain (Study nos. 4 and 10). The results of a study conducted in the United States support the use of a spirit of peppermint (82% ethyl alcohol, peppermint oil, purified water, peppermint leaf extract) aromatherapy intervention as a useful adjunct treatment for postoperative nausea after CS delivery (Study no. 7). One of three studies did not find side effects (Study no. 4), whereas the others did not mention side effects (Study nos. 7 and 10).

On the basis of these findings, lavender (Study nos. 4 and 10) and peppermint (Study no. 7) aromatherapies may be used as an effective complementary therapy for controlling nausea (Study no. 7) and pain (Study nos. 4 and 10) after CS.

**Effect of aromatherapy on sleep**

Two studies in Iran examined the effectiveness of aromatherapy in improving sleep quality in postpartum women. In one of these studies, 158 primiparous women received a cylindrical container in which a cotton ball infused with four drops of 10% lavender EO and sesame carrier oil had been placed. These women were instructed to inhale 10 deep breaths and then to place the container beside their pillow until morning (Study no. 5). The other Iranian study asked the 96 postpartum women participants to drink one glass of water into which 10 drops of orange peel EO had been added three times a day after each meal for 8 weeks (Study no. 8). One of these two studies found side effects, including dizziness (6.3%) and increased urination (10.4%; Study no. 8), and the other did not mention side effects (Study no. 5).

These results support the positive effects of lavender (Study no. 5) and orange peel (Study no. 8) aromatherapies on the sleep quality of women at 8 weeks postpartum.

**Effect of Aromatherapy on Psychological Health**

Five studies examined the effectiveness of aromatherapy on psychological health. The effects of lavender oil bath on daily mood have been assessed in England (Study no. 3), with the results indicating that lavender oil has no effect on daily mood. However, another study (Study no. 15) reported
better mood status and distress scores in the lavender oil essence inhalation group than in the control group. A clinical trial (Study no. 13) investigated the effectiveness of *Citrus aurantium* essence in improving anxiety in 80 Iranian women. The intervention involved applying three drops of *Citrus aurantium* essence and asking the participants to inhale for 5 minutes. The results support using this intervention as an effective complementary therapy to help control anxiety. This result is in line with another study (Study no. 6) that reported significant reductions in stress, anxiety, and depression in postpartum women who had undergone an aromatherapy with lavender intervention. However, a further study (Study no. 9) reported a nonsignificant reduction in depression and anxiety levels during the postpartum period after aromatherapy with orange EO.

In summary, three of these five studies indicate that inhalation aromatherapy, either with lavender oil (Study nos. 6 and 15) or *Citrus aurantium* essence (Study no. 13), improves psychological health in postpartum women, whereas the studies that used bath (Study no. 3) and drink (Study no. 9) interventions found no significant effects.

**Summary of Aromatherapy Outcomes**

The EOs described in the included articles included pure, diluted, and mixtures of multiple EOs. The identified effects on the psycho-physiological health of the postpartum women subjects are presented in Tables 2 and 3. Lavender was the EO that had the greatest effect on psycho-physiological health (*n* = 9; Study nos. 2–6, 10, 11, 14, and 15).

**Summary Measures**

The primary outcome measurement was relief of pain, including nipple fissure pain, physical pain, postepisiotomy pain, and post-CS pain, measured using either the VAS or the Pain Rating Scale. Moreover, severity of nipple fissure discharge and nipple fissure damage were assessed using the Amir Scale; distress was assessed using the distress VAS; fatigue was assessed using the fatigue VAS; perineal discomfort was assessed using either the daily discomfort VAS or the daily mood VAS; mood status was assessed using the Positive and Negative Affect Schedule; depression was assessed using either the Edinburgh Postnatal Depression Questionnaire or the 21-item Depression, Anxiety, and Stress Scale (DASS-21); anxiety was assessed using the Spielberger State-Trait Anxiety Inventory, DASS-21, or the Edinburgh Stress, Anxiety, and Depression Scale; stress was assessed using either DASS-21 or the Edinburgh Stress, Anxiety, and Depression Scale; quality of sleep was assessed using the Pittsburgh Sleep Quality Index; post-CS nausea was assessed using the Ordinal Nausea Scale; and episiotomy

| TABLE 3. Outcomes of Aromatherapy |
|-----------------------------------|
| **Outcome** | **No. of Studies** | **Aromatherapy** | **No. of Effects** |
| Nipple fissures | 2 | Menthol (1) and peppermint (1) | 2 |
| 1. Pain | 4 |
| After episiotomy | 5 |
| 1. Pain | 3 |
| 2. REEDA | 3 |
| (1) Redness | 3 |
| (2) Edema | 3 |
| (3) Ecchymosis | 2 |
| (4) Discharge | 2 |
| (5) Approximation | 2 |
| 3. Leaved suture | 1 |
| 4. Dehiscence | 1 |
| 5. Daily discomfort | 1 |
| After CS delivery | 3 |
| 1. Pain | 2 | Lavender | 2 |
| 2. Nausea | 1 | Peppermint | 1 |
| Sleep | 2 | Lavender (1) and orange peel (1) | 2 |
| Physical pain | 1 | Lavender | 1 |
| Fatigue | 1 | Lavender | 1 |
| Mood | 2 | Lavender | 1 |
| Stress | 1 | Lavender | 1 |
| Depression | 2 | Lavender (1) and orange peel (1) | 1 (lavender) |
| Anxiety | 3 | Lavender (1), orange peel (1), and *Citrus aurantium* (1) | 2 (lavender and *Citrus aurantium*) |
| Distress | 1 | Lavender | 1 |

Note. CS = caesarean section; REEDA = Redness, Edema, Ecchymosis, Discharge, and Approximation.
wound was assessed using the REEDA score. TheVAS was the most frequently used measure of postpartum pain.

**Discussion**

EOs may be combined with usual care to improve health status, providing a natural and noninvasive option for care (Ali et al., 2015). Twelve of the 15 RCTs evaluated mainly reported on the effectiveness of aromatherapy in improving physiological health outcomes in postpartum women. Most of the included studies found positive effects of the interventions on physiological health in postpartum women. Aromatherapy was found to reduce nipple fissure pain, nipple fissure damage severity, nipple fissure discharge, post-CS-delivery pain, post-CS-delivery nausea, physical pain, fatigue, postepisiotomy pain, and perineum REEDA scores and to improve sleep quality. Although only five of the included studies examined the effect of aromatherapy on psychological health outcomes in the postpartum period, two of these showed nonsignificant outcomes (Dale & Cornwell, 1994; Mirghafourvand, Mohammad-Alizadeh-Charandabi, Hakimi, Khodaie, & Galeshi, 2017). Although most of the included studies indicated positive effects of interventions in terms of improving postpartum physio-psychological health, few of these studies assessed health effects such as nausea, physical pain, fatigue, stress, and distress. Therefore, additional studies evaluating the effects of aromatherapy on physiological and psychological health in postpartum women are warranted.

The most common modes of aromatherapy during the postpartum period were the addition of lavender oil to bathwater, lavender oil inhalation, and menthol oil application to the skin. However, lavender oil application caused a skin reaction. Overall, aromatherapy in these studies was administered using various methods, including baths, drinking, inhalation, and topical treatment for external use. The methods differed based on the health requirements of the postpartum women and the EO that was selected for use. Aromatherapy intervention for 30 minutes in baths relieved discomfort and pain and improved recovery after episiotomy. The effective duration of aromatherapy varied by the EO that was used.

Although we reviewed all of the RCTs that included humans as study participants, this systematic review was affected by methodological limitations. Six electronic databases were searched, and the review was restricted to published articles only. However, it was encouraging that the RCTs were available for review and that the methodological quality of the included trials was high. Another limitation is the small number of countries in which the included studies were conducted. Most were conducted in Iran. This may be because of two reasons: (a) Aromatherapy is an accessible and convenient method for improving health in Iran (Akbari et al., 2014; Behmanesh et al., 2011; Hadi & Hanid, 2011; Keshavarz Afshar et al., 2015; Kianpour et al., 2016; Mirghafourvand, Mohammad-Alizadeh-Charandabi, Hakimi, Khodaie, & Galeshi, 2016, 2017; Olapour et al., 2013; Sayyah Melli et al., 2007; Sharifipour et al., 2015; Sheikhan et al., 2012; Vakilian et al., 2011; Vaziri et al., 2017), and (b) only RCTs that studied human participants were considered. Complementary and alternative therapy is integral to the culture of the Iranian people (Fahimi, Hrgovic, El-Safadi, & Münstedt, 2011), and aromatherapy is one of the most widely used types of complementary and alternative therapies (Lis-Balchin, 1999). Moreover, the large majority of studies that were conducted outside Iran were not RCTs. For instance, one study used a nonequivalent control group pretest–posttest design to examine the effects of EOs on labor stress, labor anxiety, and postpartum anxiety in Korea (Hur, Cheong, Yun, Lee, & Song, 2005). Another used a quasi-experimental between-groups design to investigate the effects of aromatherapy massage on psychological health in postpartum women in Japan (Imura, Misao, & Ushijima, 2006).

Because of the nature of aromatherapy intervention, it may be difficult to conduct single-, double-, and triple-blinded studies. However, eight of the included studies attempted to blind the outcome assessors to minimize potential methodological bias (Behmanesh et al., 2011; Dale & Cornwell, 1994; Hadi & Hanid, 2011; Mirghafourvand et al., 2016, 2017; Olapour et al., 2013; Vakilian et al., 2011; Vaziri et al., 2017). Moreover, because the other seven included studies were not blinded (Akbari et al., 2014; Keshavarz Afshar et al., 2015; Kianpour et al., 2016; Lane et al., 2012; Sayyah Melli et al., 2007; Sharifipour et al., 2015; Sheikhan et al., 2012), bias may have occurred and influenced the study results. To supply further evidence in support of aromatherapy as a valid therapy in postpartum women, studies with rigorous blinding procedures should be conducted. Additional systematic review studies evaluating more RCTs should be conducted to better understand the impact of aromatherapy on postpartum women.

Furthermore, three studies described the adverse effects of applying aromatherapy interventions that use lavender (Dale & Cornwell, 1994; Hadi & Hanid, 2011; Vakilian et al., 2011). An RCT involving 120 subjects evaluated postepisiotomy healing in a lavender EO treatment group and a povidone-iodine sitz bath group, which both received treatment twice a day for 10 days, and found no significant difference between the two groups in terms of pain intensity, edema, leaved suture, and dehiscence and a significant difference in terms of redness. No side effects were found with the exception of slight irritation in two of the studies (Vakilian et al., 2011). Two studies reported side effects (dizziness and increased urination) associated with applying aromatherapy using orange peel EO. A glass of water with 10 drops of orange peel EO was consumed three times a day for 8 weeks by the experimental group, with significantly lower levels of dizziness and urination reported in the control group, which received routine care (Mirghafourvand et al., 2016, 2017). One study revealed no side effects in the *Citrus aurantium* essence oil group (Sharifipour et al., 2015), whereas the other nine studies did not describe adverse effects (Akbari et al., 2014; Behmanesh et al., 2011; Keshavarz Afshar et al., 2015; Kianpour et al., 2016; Lane et al., 2012; Olapour et al., 2013; Sayyah Melli et al., 2007; Sheikhan et al., 2012; Vaziri et al., 2017). According to the findings of this systematic review regarding side effects,
lavender and *Citrus aurantium* aromatherapies are likely safe applications for postpartum women.

**Conclusions**

The number of RCTs in the literature evaluating the effects of aromatherapy on postpartum women has increased in recent years. The articles included in this systematic review addressed the effectiveness of aromatherapy on the physiological and psychological health of subjects in terms of nipple fissures, episiotomy, CS delivery, sleep, mood, stress, anxiety, distress, and depression. The methods used to measure this effectiveness included the VAS; Amir Scale; REEDA; Pittsburgh Sleep Quality Index; DASS-21; Edinburgh Stress, Anxiety, and Depression Scale; Ordinal Nausea Scale; Edinburgh Postnatal Depression Questionnaire; Pain Rating Scale; and Positive and Negative Affect Schedule. The interventions used included bathing, inhalation, drinking, and swabbing.

Aromatherapy may be considered for women during the postpartum period. Lavender was found to be the most widely applied intervention. Few of the included studies examined specific health effects with, for example, only one article examining effects on fatigue. Thus, there may be insufficient clinical evidence to support the practical application of these aromatherapies on postpartum women. Further studies using larger samples and better quality in terms of methodology and end points are necessary to build on current findings.

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Data collection: All authors

Data analysis and interpretation: All authors

Drafting of the article: SST

Critical revision of the article: SST, HHW

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