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Review Article

The effectiveness and safety of complementary health approaches to managing postpartum pain: A systematic review and meta-analysis

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Abstract

Background: Women experience pain from a number of causes during the postpartum period. Although pharmacological pain relief has shown to be effective, the efficacy of non-pharmacological methods of pain relief will be of interest to breastfeeding women. The aim of this systematic review was to examine the efficacy and safety of complementary approaches to manage postpartum pain.

Methods: A search of English language databases from their inception to 2020 was undertaken for randomised controlled trials and included primiparous and multiparous women who experienced postpartum pain up to two weeks post birth. The primary outcome was pain. The risk of bias was assessed using the Cochrane risk of bias tool.

Results: Thirty trials were included in the review, 25 trials (2,413 women) were included in the meta-analysis. Two trials of massage found a reduction in pain following caesarean birth within the first 24 hours post birth (MD -2.64, 95% -2.82 to -2.46, 184 women, I^2 0%), and at seven days postpartum (MD -1.91, 95%CI -2.42 to -1.40, 2 trials, 120 women I^2 37%). Two trials conducted with women receiving an episiotomy found reduction in perineal pain from herbal ointments within 24 hours (MD -1.33, 95% CI -0.96 to -0.70, 221 women) and at 14 days postpartum (MD -0.74, 95% CI -1.02 to -0.47, 4 trials). Few trials reported on safety, few trials were at an overall low risk of bias, and overall the quality of evidence was very low.

Conclusion: Further high quality trials are needed to determine the safety and effectiveness of herbal ointment and massage during the early postpartum period.

Key words:

complementary therapies, postpartum pain, systematic review

1. Introduction

Pain relating to pregnancy and childbirth can have a significant impact on women during the postpartum period. Women may experience perineal pain, breast pain, low back pain, pain from uterine involution and incisional pain post caesarean section ¹. Experience of postpartum pain varies depending upon individual circumstance, mode of birth, previous conditions, level of psychosocial support and available options for pain management. Postpartum pain can be significant with potential detrimental impacts on maternal movement, mobility, sleep and mental health which may interrupt a woman's transition to motherhood ².

Much of the research on complementary health approaches for childbearing women has focused to date on labour pain and techniques to reduce pain and minimise the need for pharmacological options. The 'working with pain' model ³ has been the dominant theory when it comes to labour and birth but there is less focus on pain following the birth. The postpartum period is a time when the woman's body is recovering from birth physically and adapting physiologically to a non-pregnant state. This is happening at the same time that the woman is caring for a newborn baby, experiencing interruptions to sleep, changes in hormones and learning how to establish breastfeeding. As a result, there are physiological and psychosocial changes impacting on how pain may be perceived and responded to. Pain associated with the birth, such as perineal trauma, back pain and breast pain tend to be most intense in the first couple of weeks unless there is some unresolved pathology underlying the ongoing pain ⁴.

Whilst pharmacological pain relief may be effective, consideration needs to be given to use in women who may be breastfeeding ⁵. It is therefore essential that effective and safe pain

management options and alternatives to mainstream medical treatments are available to women during the postpartum period.

Complementary health approaches are practised to maintain health and wellbeing and are used with conventional medicine ⁶. They include a wide range of practices including biological based therapies, traditional herbal medicines, and non-biologically-based therapies. These practices are regularly used by women during pregnancy, and in Australia, data indicate these modalities are widely used to manage pain in labour ⁷. Evidence of effectiveness from these therapies during labour show a small benefit from acupuncture and acupressure ⁸, relaxation, yoga and music ⁹, and massage, warm packs and thermal massage ¹⁰. The aim of this systematic review is to examine the effectiveness and safety of complementary health approaches to manage perineal pain, low back pain and postoperative caesarean pain.

2. Methods

2.1. Study selection and eligibility

We included primiparous and multiparous women who experienced perineal pain, low back pain and postoperative caesarean pain. Breast pain, nipple pain and chronic back pain were excluded as there is extensive literature available on breast/nipple pain and treatments and chronic back pain may have other causes than pregnancy hormones and the birth process. Studies were eligible if women had given birth by normal vaginal birth, instrumental birth or caesarean section and were breast or formula feeding. The care setting was unrestricted.

We included parallel randomised, cross over or quasi randomised controlled trials. Non randomised studies were excluded. Due to limited resources, studies not published in English were also excluded.

2.2. *Types of interventions*

The interventions evaluated in this review included non-pharmacological approaches used alone or as an adjunct to conventional treatment. Complementary health approaches included the following categories; mind and body interventions, natural product-based therapies, manipulative and body-based practices, energy therapies and alternative medical systems¹¹. Operational definitions were inclusive, utilising the Weiland et al, 2011 definitions for complementary and alternative therapies¹¹. Cryotherapy for perineal pain was excluded as it was considered a recommended routine intervention¹². Cognitive psychological interventions were excluded from the review. Interventions were included that commenced during labour or prior to the onset where the aim was to reduce pain postnatally.

2.3. *Outcomes*

The primary outcome was a reduction in self-reported post-partum pain. Secondary maternal outcomes included: maternal satisfaction, change in wound appearance, maternal quality of life, adverse events for the mother, use of pharmacological pain relief and duration of use, and full or partial breastfeeding.

Secondary outcomes were focussed on the infant and included: adverse effects (lethargy, reduced feeding, jaundice), delayed maternal/infant bonding, and maternal infant hospital admission.

2.4. Database search

AD and EH searched the following databases, CINAHL, Pubmed, Nursing & Allied Health, Johanna Briggs Institute, Embase, Cochrane Library and Ovid Medline from the inception of the databases to 27 July 2020. The grey literature was searched including conference proceedings, Google Scholar and reference lists of primary and reviewed articles. Each database search was performed utilising the terms postpartum, post-partum, postnatal, post-natal and pain and 'yoga' OR 'hypnosis' OR 'hypnotherapy' OR 'meditation' OR 'aromatherapy' OR 'tai chi' OR 'rescue remedy' OR 'hydrotherapy' OR 'nutrition therapy' OR 'diet therapies' OR 'alexander technique' OR 'chiropractic' OR 'osteopathic manipulation' OR 'massage' OR 'reflexology' OR 'healing touch' OR 'movement therapies' OR 'herbs' OR 'probiotics' OR 'vitamins' OR 'minerals' OR 'acupuncture' OR 'acupressure' OR 'breathing exercises' OR 'moxibustion' OR 'qi gong' OR 'magnetic therapy' OR 'therapeutic touch' OR 'reiki therapy' OR "ultrasonic therapy" OR 'ayurvedic medicine' OR 'Chinese/Japanese/Tibetan traditional medicine' OR 'homeopathy' OR 'naturopathy'.

Retrieved articles were reviewed for further sources. No date restrictions were applied. Three authors retrieved the studies and assessed the study eligibility (EH, AD, CS). Data was extracted and assessed by two review authors (EH, AD). The following characteristics were retrieved for each study; country, setting, study design, inclusion criteria, description of the intervention and control groups, and outcomes.

Quality assessment was assessed independently by two authors (CS, AD) using the Cochrane risk of bias tool¹³. Any disagreements were resolved by a third author (HD). The quality of the evidence was assessed using the Grade of Recommendation, Assessment, Development and Evaluation (GRADE) criteria¹⁴. GRADE was applied to outcomes in the meta-analysis that included more than one included trial, and the evidence downgraded following an assessment of study limitations.

2.5. *Data synthesis*

Data was presented as risk ratios (RR) or a mean difference (MD) with 95% confidence intervals (CI) for the primary and secondary outcomes. We used the standardised mean difference (SMD) if outcomes were the same but used different methods. Data were pooled using Review Manager version 5.4, and effect sizes with a 95% confidence interval were reported. Statistical heterogeneity was assessed for each meta-analysis using the I^2 and Chi square statistics. Heterogeneity was rated at substantial if the I^2 statistic was greater than 30%. Where substantial heterogeneity was assessed a random effects model was applied. If we could not pool data a narrative reporting of the results was undertaken. For cross over trials we planned to analyse data from the first phase only before groups crossed into the second phase of the study.

3. Results

A total of 236 studies were identified through database searching (Figure 1). A further nine studies were identified through other sources such as the reference review on retrieved studies. After duplicates were removed, a total of 128 studies underwent an abstract and title screen, which resulted in 80 articles being excluded due to failure to meet established inclusion criteria, and a further 20 studies were excluded following a full article assessment

for eligibility. Of these, eighteen studies were excluded, this included ten studies that were not RCTs^{12 15-23}, seven studies examined interventions outside the scope of the review²⁴⁻³⁰, no outcomes were reported in the two week postpartum period in one study³¹.

3.1. Study number and design

Thirty studies were included, and the characteristics are shown in Table 1. Seventeen studies were from Iran³²⁻⁴⁸, and two each from Brazil^{49 50}, England^{51 52}, India^{53 54}, and one each from Turkey⁵⁵, Croatia⁵⁶, Hong Kong⁵⁷, Taiwan⁵⁸, Denmark⁵⁹, Egypt⁶⁰, and the United States⁶¹.

3.2. Description of interventions

There were four studies using massage^{32 45 53 58}, seven trials evaluating aromatherapy^{37 43 46-48 52 60}, six trials that applied a topical application of a herbal ointment^{35 36 39-42}, and acupuncture and acupressure^{33 34 56 57 59 61}, two studies each of music^{44 55}, and laser therapy^{49 50}, and one trial each respectively of electro-magnetic therapy⁵¹, reflexology⁵⁴, and a nutritional supplement³⁸.

The intervention was administered during labour in one study⁵⁵, and one trial applied music during caesarean section⁴⁴, with five interventions administered post caesarean section^{32 43 45 53 54}. A further 23 trials were administered post vaginal birth^{33-42 46-52 55-58 60 61}.

3.3. Outcomes

Pain was assessed in all studies; the majority using a Visual Analogue Scale (VAS).

Women's views' of pain relief or satisfaction with pain relief was assessed in six studies^{32 43 49 55 57 59}. Wound healing was assessed in 11 trials^{37-42 46 47 51 52 59 60} and most frequently used the redness, oedema, ecchymosis, discharge (REEDA) scale⁶². Use of medication was assessed in 14 trials^{32 33 35 36 41 46 49 51 52 56 57 59-61}, and side effects assessed in two trials^{36 52}.

Outcomes were assessed within 24 hours post birth or application of the intervention in seven studies^{32-34 43 45 48 53}. An additional six trials collected outcomes up to and including day seven postpartum^{46 50 55-57 60} and 16 trials assessed pain up to two weeks postpartum^{35-42 47 49 51 52 54 58 59 61}. It is worth noting that all studies predominantly focused on effectiveness of pharmacological pain relief with little focus on safety during breastfeeding.

3.4. *Participant parity and mode of birth*

Twenty-six studies reported details of the women's previous pregnancy and childbirth. Fourteen studies recruited primiparous women only^{35 37 38 40 42 45-50 55 59 60}, and five studies recruited multiparous and primiparous women^{51 52 56-58}. Three studies recruited multiparous women only^{32 33 42}. No details were reported in six trials^{34 43 44 53 54 61}. The intervention was performed on women following a caesarean section in six trials^{32 43-45 53 54}, post vaginal birth in seven trials^{33 51 52 55 58 59 61}, and specifically post episiotomy in 16 trials^{35-42 46-50 56 57 60}.

3.5. Risk of bias

The overall risk of bias for the included trials was variable across trials (Figure 2). No single trial was at a low risk of bias although three trials were at a low risk of bias on six of the seven domains, but insufficient reporting resulted in an unclear risk of bias for this single domain for these three trials. Eleven trials were assessed at a low risk of bias on both randomisation domains^{33 35 36 41 42 49 50 56 57 59 60}. Most trials were not designed as a placebo controlled. Eleven trials were assessed at low risk on both blinding domains^{35 36 38 39 41 48-51 57 60}. Performance bias assessed as low risk in 13 trials^{33 35 36 38 39 41 43 48-51 57 60}. Twenty five trials had a low risk of bias for attrition with two trials assessed at high risk^{49 52}. For the majority of trials, we assessed the risk of selective reporting to be unclear due to insufficient reporting. The other sources of bias were rated at low risk in 21 trials, with one trial at high risk³⁷, and eight trials where the risk was unclear^{34 35 39 52-54 56 61}.

3.6. Effect of the interventions

Twenty-five trials and 2,413 women were included in the meta-analysis reporting on pain outcomes. For this outcome there was significant heterogeneity and a random effects model was applied, different scales were used for some interventions and the standard mean difference was calculated. Data from five trials that was not in a form to be included in the meta-analysis and is reported narratively.

3.6.1. Essential oils

3.6.1.1. Primary Outcome

Four trials^{37 43 48 52} of essential oils (lavender or a blend) reported on pain (site specific to mode of birth) within 24 hours of being applied, and found no difference between groups (MD 0.33, 95% CI -0.71 to 1.36, 423 women, I^2 83%). There was also no difference in pain between groups at 7 days (MD 0.76, 95% CI -1.9 to 3.41, 3 trials^{37 46 52} 368 women), and at 8 to 14 days (MD 0.22, 95% CI -0.22 to 0.67, 2 trials^{37 52}, 296 women, I^2 16%).

3.6.1.2. Secondary outcomes

Wound healing to the perineum assessed by the REEDA scale demonstrated no difference between groups when assessed at 24 hours post intervention. There was significant heterogeneity and a random effects model was applied (MD -0.92, 95% CI -2.52 to 0.68, 120 women, two trials^{37 46}, I^2 94%). There was no effect at 7 days (MD 0.50, 95% CI -0.15 to 1.15, one trial³⁷ 60 women), and at 8-14 days post intervention (MD -0.20, 95% CI -0.57 to 0.17, one trial³⁷ 60 women).

There were fewer women in the intervention group reporting use of pharmacological medication compared with the control (RR 0.58, 95% CI 0.45 to 0.75, 2 trials^{43 52} 322 women). One trial reported pain as the presence or absence of pain symptoms⁴⁷. There was no difference in the number of women reporting no pain at the end of the intervention (RR 0.68, 95%CI 0.41 to 1.12, 42 women).

3.6.2. *Acupressure.*

3.6.2.1. Primary outcome

Two small trials^{33 34} of acupressure found no reduction in perineal pain within 24 hours of the intervention being applied compared to the control (SMD -0.54, 95% CI -1.13 to 0.05, 135 women, I^2 0%), and no difference in pain assessed at 8 to 14 days (MD -1.20, 95% CI -3.58 to 1.19, one trial³⁴, 75 women). One trial⁶⁰ reported self-reported pain as the presence or absence of symptoms. There was no difference in the number of women reporting no pain at the end of the intervention (RR 0.95, 95% CI 0.72 to 1.24, 256 women).

3.6.3. *Acupuncture*

3.6.3.1. Primary outcome

One trial⁵⁹ reported pain as the presence or absence of symptoms. There was no difference in the number of women reporting no perineal pain at the end of the intervention (RR 1.34, 95% CI 0.97 to 1.85, 207 women).

One trial⁵⁶ did not report data that could be included in the meta-analysis, this study found that pain was significantly reduced in the acupuncture group on the third day postpartum ($P = 0.22$).

3.6.3.2. Secondary outcome

Use of pharmacological medication did not differ between groups (RR 1.23, 95% CI 0.79 to 1.93, 2 trials^{56 59}, 267 women I^2 0%). One study reported no adverse events in both groups⁵⁶.

One trial⁶¹ did not report data that could be used in the meta-analysis. This study found the mean time to a 50% reduction of pain was six days in the control group compared with 5 days in the acupuncture group ($p = 0.35$). There was also no difference in the use of pharmacological medication

3.6.4. Music

3.6.4.1. Primary outcome

Two trials^{44 55} found no reduction in pain (perineal and at site of caesarean) within the first 24 hours of administration compared to a control (MD -0.57, 95% -1.74 to 0.59, 241 women, I^2 93%).

3.6.4.2. Secondary outcomes

One trial⁵⁵ found higher maternal satisfaction with pain relief in the music group compared with the control (RR 2.91, 95% CI 2.66 to 316, 141 women).

3.6.5. Massage

3.6.5.1. Primary outcome

Two trials^{32 45} found a reduction in pain following recovery from caesarean birth within 24 hours of being administered (MD -2.64, 95% -2.82 to -2.46, 184 women, I^2 0%). A benefit

from massage with reducing pain was present at 7 days (MD -1.91, 95% CI -2.42 to -1.40, 2 trials, 120 women I^2 37%)^{53 58} (Figure 3).

3.6.5.2. Secondary outcome

There was a reduction in the amount of pharmacological pain relief used by women in the massage group (RR 0.21, 95% CI 0.10 to 0.46, one trial, 80 women)³². One trial reported on breastfeeding and found a significant increase in the frequency of breastfeeding in the massage group (data not reported)⁴⁵.

3.6.6. Herbal Ointment

3.6.6.1. Primary outcome

Two trials^{35 41} found a reduction in perineal pain within 24 hours of administration (MD -1.33, 95% CI -1.96 to -0.70, 221 women, I^2 0%), whilst no difference at 7 days MD -0.50, 95% CI -1.90 to 0.89, 4 trials^{36 40 42 60}, 334 women I^2 90%. There was evidence of a reduction in perineal pain from the different herbal ointments group at 8 to 14 days (MD -0.74, 95% CI -1.02 to -0.47, 4 trials^{35 36 40 42}, 372 women) (Figure 4).

3.6.6.2. Secondary outcome

Wound healing assessed by the REEDA scale demonstrated improved perineal healing in the intervention group at 24 hour post intervention (MD -1.40, 95% CI -1.92 to -0.88, 123 women, one trial, I^2 94%)⁴¹. There was no effect at 7 days (MD -0.67, 95% CI -1.36 to 0.02), 4 trials, 334 women^{36 40 42 60}, and at 14 days (MD -0.52, 95% CI -0.67 to -0.38, I^2 97% 3 trials, 289 women)^{36 42 60}. One trial³⁶ reported on adverse events and found no difference between groups (RR 1.4, 95% CI 0.95 to 2.09, 108 women). These events included nausea,

vomiting, diarrhoea, fever and skin reactions. One trial³⁵ found no difference in the dose of medication used (MD 0.16, 95% CI -0.03 to 0.35, 98 women). The authors of the paper reported higher satisfaction with using the chamomile cream on the day 10 although data was not reported in the paper.

One trial reported data not in a form that could be included in the meta-analysis³⁹. This study found a significant difference between groups with an improvement in perineal pain level at 7th, 10th and 14th days postpartum, and an improvement in wound healing at 7th and 10th days postpartum.

3.6.7. *Cupping*

3.6.7.1. Primary outcome

One small trial of cupping (included in the trial of acupressure) found reduced perineal pain in the first 24 hours following administration (MD -9.90, 95% CI -12.73 to -7.07, 75 women)³⁴. A reduction in pain was also found at eight to 14 days postpartum (MD -7.80, 95% CI -9.90 to -5.70, one trial, 75 women).

3.6.8. *Laser*

3.6.8.1. Primary outcome

One small trial of laser therapy found no difference in perineal pain between groups following administration within the first 24 hours postpartum (MD 1.10, 95% CI -0.39 to 2.59, 41 women)⁴⁹. There was no difference at eight to 14 days (MD 0.10, 95% CI -1.37 to 1.57, one trial 41 women).

One trial did not report data that could be used in the meta-analysis, there was no difference in perineal pain at the end of the intervention ⁵⁰.

3.6.8.2. Secondary outcome

Wound healing of the perineum assessed by the REEDA scale demonstrated no difference between groups when assessed at 24 hours post intervention (MD 0.33, 95% CI -0.5 to 1.16, one trial ⁴⁹, 43 women), and at 8-14 days post intervention (MD 0.47, 95% CI -0.15 to 1.09, one trial, 41 women).

3.6.9. Herbal Tablets

3.6.9.1. Primary outcome

One trial of herbal tablets(containing Bromelain) found a reduction in perineal pain from the intervention at eight to 14 days (MD -0.35, 95% CI -0.40 to -0.30, 82 women) ³⁸.

3.6.9.2. Secondary outcome

There was an improvement in perineum wound healing using the REEDA scale at 8-14 days post intervention for the intervention group (MD -0.90, 95% CI -0.97 to -0.83, one trial 82 women)³⁸. There was no difference in the use of pain relief between groups (RR 0.64, 95% CI 0.38 to 1.06), one trial, 82 women).

3.6.10. Electromagnetic therapy

3.6.10.1. Primary outcome

One trial reported pain as the presence or absence of symptoms⁵¹. There was no difference in the number of women reporting perineal pain at the end of the intervention (RR 0.70, 95% CI 0.48 to 1.01), 260 women).

3.6.10.2. Secondary outcome

There was no difference in pharmacological pain relief between the 2 groups (RR 1.26, 95% CI 0.79 to 2.01, one trial, 260 women).

3.6.11. Reflexology

There was no data on pain from one trial of reflexology that could be presented in the results, however it found a benefit from the intervention ($p(X = 4.75, X = 7.65, t = -10.627, p < .001)$)⁵⁴.

3.7. Quality of evidence

The quality of the evidence was downgraded for all outcomes that included multiple studies in the meta-analysis (Table 2). Most interventions and outcomes were rated as very low having been downgraded due to significant heterogeneity, high risk of bias on multiple domains and effect sizes with wide confidence intervals. Only one intervention (herbal ointment) assessing the outcome of pain within 14 days was assessed at moderate quality of evidence.

4. Discussion

This review aimed to examine the effectiveness and safety of complementary health approaches identified little evidence that the modalities included in the review are beneficial in reducing postpartum pain. Overall a small number of studies were found for the complementary medicines and therapies included in the review. Twenty-five trials and 2,413 women were included in this systematic review and meta-analysis. Ten complementary pain relief modalities were included in the review with studies conducted in 11 countries including high; middle and low income countries. Few trials reported on outcomes other than pain, use of pharmacological medication and wound healing. Few trials reported on adverse events and the overall safety of these therapies is uncertain One trial of acupuncture included this outcome in the study and no adverse events were reported. One trial evaluating a herbal ointment found no difference in adverse events between groups. Overall there was an absence of the inclusion of infant outcomes.

The overall risk of bias was low with only three trials where the majority of domains at a low risk of bias. The quality of evidence overall was low or very low for all modalities and the findings conflicting. The results from this review should be interpreted with caution due to the uncertainty arising from the quality of evidence due to risk of bias and the small number of study participants.

We found that massage may reduce pain in the short term and within the two-week period postpartum for women undergoing a caesarean birth. There was an associated decreased use of pharmacological pain relief and an increased reporting of breastfeeding. Trials of different herbal ointments found a reduction in perineal pain within 24 hours of initial administration, no effect with the first week and a reduction in the second week of the intervention, a benefit in perineal wound healing within 24 hours but no effect thereafter.

These trials were all undertaken on women following an episiotomy. One trial of cupping was found to reduce perineal pain in the short term and at the end of the two weeks postpartum. One trial of herbal tablets found reduced perineal pain in the second week postpartum and an improvement in perineal wound healing. One trial of music was found to increase women's overall satisfaction during the period of the intervention.

Essential oil aromatherapy, utilised at 24 hours, and 8-14 days identified no difference in pharmacological pain relief for women in the postpartum period. Acupressure showed no improvement in perineal pain two hours after use and at 8-14 days post intervention. One acupuncture study found no difference in the number of women reporting perineal pain post intervention. Whilst one music study found an increase in maternal satisfaction, neither of the two music studies included in the review established a reduction in pain compared to a control group within the first 24 hours. Electromagnetic therapy found no difference in the number of women reporting perineal pain post intervention.

A high quality recent Cochrane systematic review examined the evidence for pharmacological and non-pharmacological interventions to reduce pain due to uterine cramps following childbirth¹. This review found evidence for pharmacological medication including non-steroidal anti-inflammatory agents and opioids with reducing pain associated with uterine cramps, with the primary outcome focussing on adequate pain relief. Four studies of herbal preparations were compared to non-steroidal anti-inflammatory medication, it was unclear if there were differences between groups for pain relief, the need for additional pain relief, maternal adverse events. One study of TENS was compared to no TENS found no difference between groups for the outcome adequate pain relief. A number of complementary health interventions identified in this review were not included in the Cochrane review. Some complementary health therapies were excluded from the review

due to uncertainty if the study met the inclusion criteria, and some studies that were included in our review were ongoing at the time the Cochrane review was being prepared. Although this Cochrane review included 28 studies and 2,749 women, the focus was on women who gave birth vaginally only, and therefore the findings from the Cochrane review can be generalised to women with singleton pregnancies and uncomplicated births. A narrative review of aromatherapy examined the effects of essential oils on postpartum women which included the outcome of postpartum pain, and delivered the intervention over an eight week period⁶³. This review by Tsai et al, included additional studies not reported in our review, this may be explained by the inclusion of women receiving an intervention in the eight week period of the post partum period. An earlier review from 2019 included fewer studies of aromatherapy reporting on postpartum pain⁶⁴. This review concluded therapeutic effects from essential oils but highlighted the limitations arising from the variation in the duration of the postpartum period, the inclusion of women undergoing different modes of birth and the different treatment regimens used.

The studies in our review can be generalised to women who gave birth vaginally and who underwent a caesarean birth. We aimed to reduce the review bias by including two authors assessing the eligibility review, and undertaking both data extraction and the risk of bias assessment. There are some limitations to our study with non-English studies being excluded. As a result, it is likely that some relevant literature may have been excluded from the review. Furthermore, it is possible that some literature that relates to non-pharmacological modalities has not been included within the databases included in our search. We excluded pain interventions outside of the immediate two-week postpartum period and nipple/breast pain as well as chronic back pain. As a result, our findings are not generalised to these groups. Whilst grey literature was searched extensively it is possible that some studies have been missed. A sensitivity analysis and analysis of publication bias were not undertaken due to the small number of trials included in the analysis.

This review has highlighted some evidence of benefit from massage and herbal ointment and herbal medication with reducing pain and improving wound healing. There was significant heterogeneity identified within comparisons and this may be explained by different clinical features of the intervention including aspects of dosage or the composition of the intervention itself. There was some heterogeneity in the comparison to a control and this is acknowledged as a limitation of the review. Further high quality research is needed focussing on the therapies identified as showing positive and consistent treatment effects on several outcomes, and future trials should include larger samples of women and comprehensive inclusion of both maternal and neonatal outcomes.

In conclusion, massage, cupping, herbal tablets and herbal ointments may be somewhat effective in the management of postpartum pain. Essential oils, acupressure, acupuncture and electromagnetic therapy studies found no improvement in postpartum pain management. The safety of use of these modalities by postpartum women remains uncertain due to a lack of data, and the overall very low quality of evidence. These conclusions need to be considered in light of the identified review limitations. The area of complementary approaches in the management of postpartum pain requires further study.

Author contributions

Conceptualisation: CS, HD. Methodology and data acquisition: CS, EH, AD, HD. Formal analysis: CS, AD. Writing- original; draft: CS, EH, AD, HD, CT. Writing review and editing: CS, EH, AD, HD, CT.

Conflict of interest

The authors declare no conflict of interest.

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No ethical approval was required for this manuscript as this study did not involve human subjects or laboratory animals.

Data availability

Data associated with this paper will be provided upon request.

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Figure 1

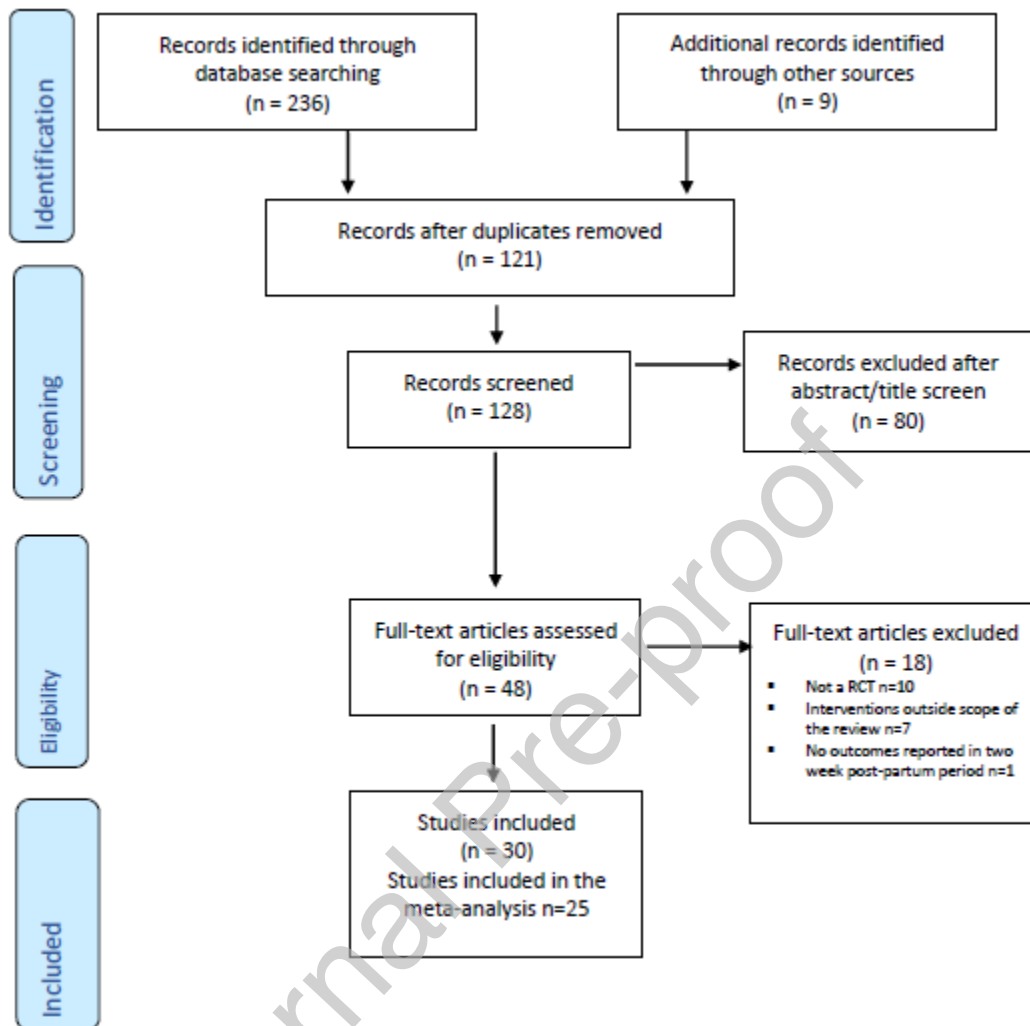


Figure 2 Risk of Bias Assessment

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Abbaspoor 2014	?	?	-	-	+	?	+
Afravi 2019	+	+	+	-	+	+	+
Akbarzade 2016	?	?	-	-	+	?	?
Alvarenga 2016	+	+	+	+	-	?	+
Aradmehr 2017	+	+	+	+	+	?	?
Asgharikhatooni 2015	+	+	+	+	?	?	+
Behmanesh 2011	+	?	?	?	?	?	-
Dale 1994	?	?	?	?	-	?	?
de O Santos 2012	+	+	+	+	+	?	+
Golezar 2016	+	?	+	+	+	?	+
Grant 1989	?	+	+	+	+	?	+
Hajhashemi 2016	?	?	+	+	+	?	?
Jaic 2019	+	+	-	-	?	?	?
Kaviani 2017	+	-	?	?	+	?	+
Kim 2019	+	?	-	-	+	?	?
Kindberg 2008	+	+	-	+	+	?	+
Kwan 2014	+	+	+	+	+	?	+
Lee 2015	+	?	-	?	+	?	+
Marzouk 2015	+	+	+	+	+	-	+
Mohammadi 2014	+	+	+	+	+	?	+
Moudi 2018	+	+	-	-	+	?	+
Olapour 2013	?	?	+	+	+	?	+
Reza 2007	+	?	-	?	+	?	+
Saatsaz 2016	+	-	-	+	+	?	+
Sharma 2019	+	?	?	?	?	-	?
Sheikhan 2012	+	?	-	?	+	?	+
Simavli 2013	+	?	-	+	+	?	+
Vakilian 2011	+	?	-	+	+	?	+
Varghese 2014	?	?	-	?	+	?	?
Vaziri 2017	+	?	+	+	+	?	+

Figure 3 Effect of massage on pain using

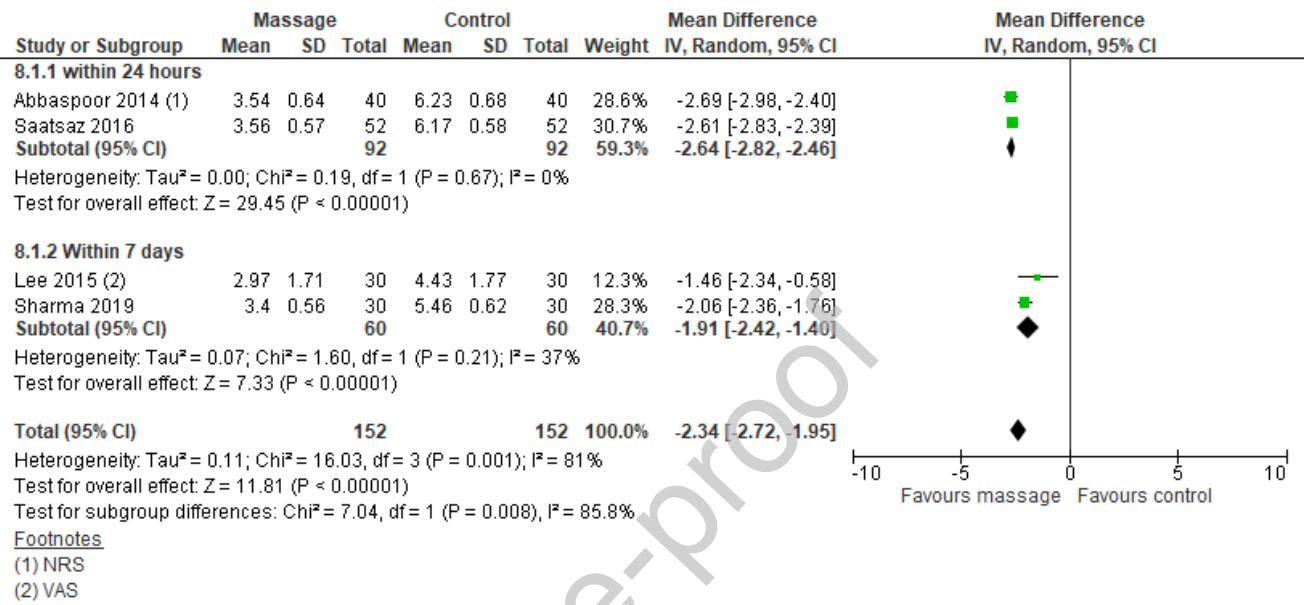
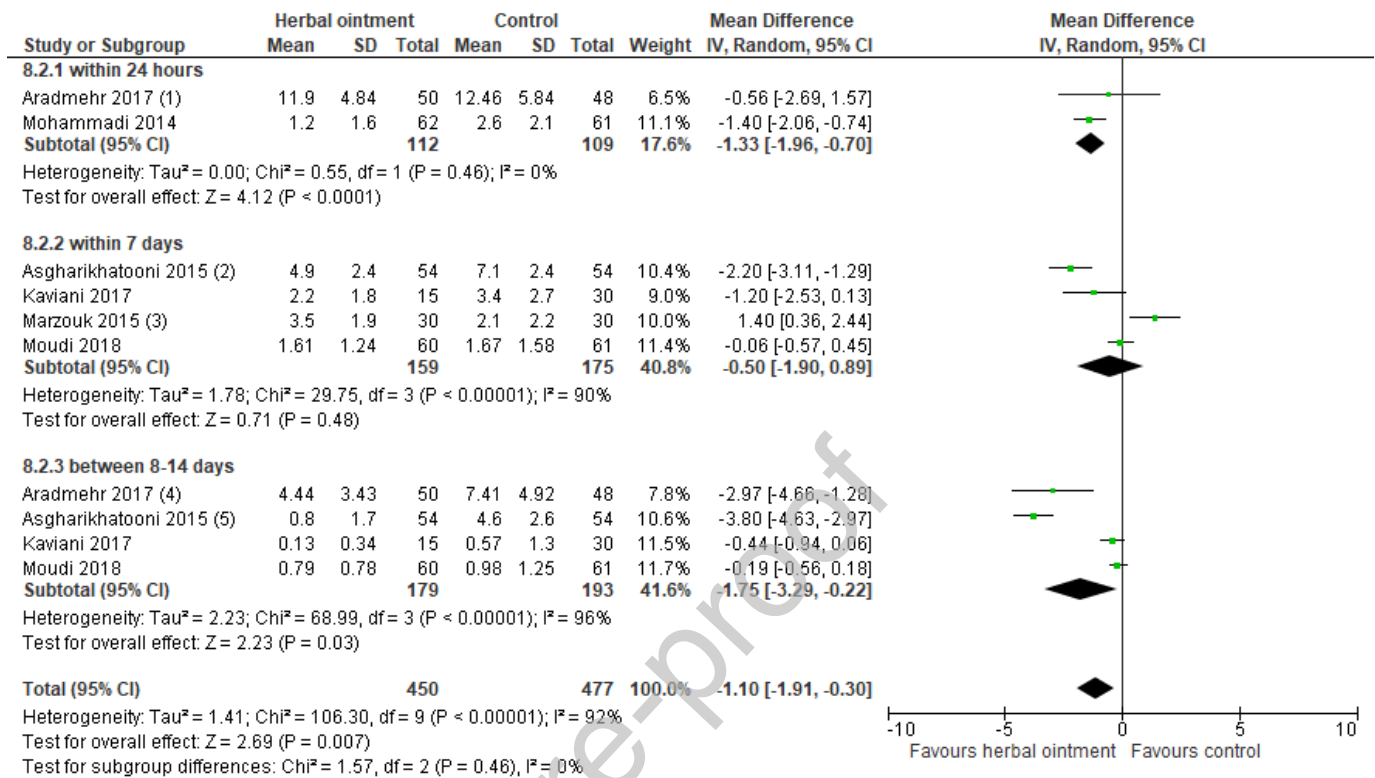


Figure 4 Effect of herbal ointment on pain

**Footnotes**

- (1) VAS
- (2) VAS
- (3) VAS
- (4) VAS
- (5) VAS

Table 1 Characteristics of included studies

Author	Study Design	Country setting	Participants	Intervention	Control	Outcomes
<i>Essential Oils</i>						
Behmanesh ³⁷	RCT double blind	Iran Setting: hospital	90 primiparous women post episiotomy or perineal tear grade 2.	Lavender essential oil 2% based olive oil sitz bath. 10 drops of essential oil distilled in 5 litres of warm water. Used twice daily for 10 days. Pain relief available to all.	Group 2: olive oil and Group 3 distilled water sitz bath. 5 L of warm water. Pain relief available to all.	Pain VAS, perineal redness, oedema, echymosis, discharge assessed using REEDA at 2 h, 5 and 10 days
Olapour ⁴³	RCT double blind	Iran: Setting: delivery suite	60 pregnant women, admitted for planned caesarean. Postpartum with VAS score > 3.	Aromatherapy inhalation occurred at 4, 8, and 12 h. Three drops of aromatherapy blend containing lavender essence 10% applied to cotton in cast containers and the woman was asked to inhale it for five minutes from a distance of 10cm. Routine medication available.	Using the same procedure as in the intervention group, three drops of placebo oil applied.	Pain severity measured using the VAS. Satisfaction at 4, 8, and 12 h.
Vaziri ⁴⁸	RCT double blind	Iran	56 postpartum primiparous women post episiotomy with pain \geq 4 on the VAS	1% lavender essential oil utilised. 5 drops were placed on a cotton ball and inhaled about 20 cm from their nose for 10-15 minutes. Intervention applied 3 times in 24 h post birth. Analgesia	Sesame oil used as a placebo. Routine care including analgesia	Pain using VAS assessed at the end of the intervention.

				provided.		
Dale ⁵²	RCT double blind	United Kingdom Setting postnatal ward	386 primiparous and multiparous women, vaginal birth.	1. Extract of lavender oil: 6 drops as bath additive. 2. Synthetic laboratory produced oil: 6 drops synthetic laboratory produced oil as bath additive. Daily for 10 days.	6 drops of inert compound. Pl acebo had odour similar odour to the intervention groups.	Pain using VAS, mood, analgesia use, bruising, infection number of days to heal. Collected until day 10 postpartum.
Sheikhan ⁴⁶	RCT single blind	Iran Setting: postnatal ward	60 primiparous women with episiotomy	Lavender oil essence with a concentration of 0.96%; linalyl acetate 20% was extracted and made soluble. 30 minute sitz bath (+25ml lavender oil essence per 5L of water) twice a day for 5 days.	Routine sitz bath care 30 minutes (+10 ml betadine per 4L of water) twice a day for 5 days.	Pain using VAS. Wound healing using REEDA scale. Assessed 4, 12 h and 5 days. Analgesic use
Vakilian ⁴⁷	RCT single blind	Iran Setting: unclear	120 primiparous women with episiotomy.	1.5% lavender essential oil was prepared in olive oil as a carrier A sitz bath using 5-7 drops of essential lavender oil in 4L of water twice a day for 10 days.	Routine care. Povidon e-iodine to sitz bath	Pain using VAS, wound healing using measurements of size on day 10.
Marzouk ⁶⁰	double blind RCT	Egypt Setting labour ward	69 primiparous women with episiotomy	Lavender flowers essence applied to jojoba oil as a carrier. Women were instructed to add 7 drops of the oil to 4 litres of warm tap water. The incision was cleaned by directing the nozzle	Placebo essential oil	Pain using VAS, wound healing using REEDA analgesic intake. Assessed on the 7th day postpartum

				of a bottle towards the incision site twice daily for 7 days.		
<i>Acupressure</i>						
Afravi ³³	RCT double blind	Iran Setting:	62 multiparous women post vaginal birth, complaining of medium to severe postpartum pain	Acupressure to point Hugu LI4 over 20min. Pressure applied for 1 min, pressure released and repeated.	A sham acupressure point applied to the hand	Pain intensity assessed using the VAS at 2, 4, 6, 8 h post-partum. Use of analgesics.
Akbarzade ³⁴	RCT single blind	Iran, Setting: hospital	150 postpartum women, 18-40 years, 4-8 post birth	Dry cupping therapy or acupressure at Shenshu BL23 for 15-20 min up to three times every other day for 3 weeks. The pressure continued for 20 min.	Routine care	Pain using short form Magill questionnaire at 24 h post-partum and 2 weeks postpartum
Kwan ⁵⁷	RCT double blind	Hong Kong Setting: labour ward	256 women both primiparous or multiparous with singleton women with episiotomy or first or second degree of perineal laceration.	Vaccaris segatalis garcke seeds were taped to acupuncture points on both ears (shenmen point, the point of external genitalia and the anus). Women were instructed to press 30 sec onto each of the seeds every 4 h while awake. The intervention commenced during perineal suturing.	Tape applied to the same acupuncture points but with no seeds attached. All women had access to pain relief.	Pain using VAS, analgesia intake, maternal views. Assessments at 2 h post-birth and 12, 18, 24, 26 and 48 h post-birth.
<i>Acupuncture</i>						
Jaic ⁵⁶	RCT	Croatia	60 primiparous	Ear acupuncture	Oral	Pain using VAS

	single blind	Setting: hospital	multiparous women post episiotomy, ≥ 18 years of age, ≥ 36 weeks gestation.	consisted of three acupuncture points internal genital area, external genital area and Shen Men point. Needles inserted 6-8 hrs post-birth by certified practitioner. Needles retained for 3 days. Oral analgesics supplied on patients request.	Analgesics (NSAID) supplied on patients request.	need for analgesics. 3 days postpartum
Kim ⁶¹	RCT single blind	USA Setting: hospital	70 women at least 6 hours post vaginal birth, pain score ≥ 4 .	Battle-field Acupuncture (BFA) and standard analgesia. Qualified physician placed semi-permanent acupuncture needles into 5 bilateral acupuncture points Shenmen, Point Zero, Omega 2, Thalamus, Cingulate Gyrus.	Standard analgesia alone	Pain using the NRS, use of analgesia up to 10 days postpartum
Kindberg ⁵⁹	RCT single blind	Denmark	207 primiparous women a spontaneous or instrumental birth using ventouse after 36 weeks gestation.	Ear acupuncture during postpartum perineal repair. Two 15 mm needles placed on the ear plus points (Shenmen, Genital, Chengfu BI36 and Baihui GV20 point. Manual stimulation of the needles to evoke needle sensation (deQi).	Local anaesthetics: Lidocaine 10mg/ml applied directly into the wound.	Pain using VAS at 24-48 h and 14 days postpartum. Analgesia intake. Maternal views on the intervention. Wound healing used the REEDA scale
<i>Music</i>						
Reza ⁴⁴	RCT double	Iran	100 women	Routine	White music	Post-operative pain. Assessed by

	blind	Setting: delivery suite	scheduled for elective caesarean section under general anaesthesia,	anaesthesia. Spanish guitar music therapy played through earphones to women during caesarean up until the end of wound dressing		VAS immediately in at 0.5, 1, 2, 4 & 6 h postop.
Simavli ⁵⁵	RCT single blind	Turkey Setting: hospital clinic	161 primiparous women aged 18-35 years, 37-41 weeks gestation	Music: pre-recorded CD listen to 30 min/day for two weeks Participants choose types of music. Music commenced >2 cm cervical dilatation until the end of the third stage.	Routine prenatal care.	Pain (VAS), satisfaction (VAS) recorded at 1, 4, 8, 16, 24 h postpartum
<i>Massage</i>						
Abbaspoor ³²	RCT single blind	Iran Setting: hospital ward	80 multiparous women post elective C/S; 18-35 years; 37-42 weeks gestation; previous C/S.	Foot and hand massage included petrissage, kneading, and friction applied to the patients' hands and feet. Massage initiated 1.5-2 h after spinal anaesthesia medication. Hand massage applied to each hand for 5 minutes. Foot massage followed.	Nurse talked to women for 20 min. Analgesics available for both groups	Pain: using NRS, 90 min after the intervention, use of medication
Saatsaz ⁴⁵	RCT single blind	Iran Setting postnatal ward	156 primiparous women undergoing caesarean section.	Group 1: Massage therapy included petrissage, kneading and friction to the target area with the anterior surface of the last phalanx or	Routine care	Pain measured using VAS 90 min post intervention and 4 h after administration of the last dose on analgesia.

				<p>the palm. Massage applied to hands and feet for 5 minutes.</p> <p>Group 2: Foot massage only.</p> <p>Neither groups received oral analgesia during the 90 minute duration of the assessment.</p>		
Sharma ⁵³	RCT single blind	India Setting: postnatal ward	60 postnatal mothers who had undergone planned or emergency C/S in the previous 24 hours with moderate to severe pain.	Foot and hand massage was given for 20 min (5 min in both upper and lower extremities) after 4 h of the analgesic. Massage procedure: (Effleurage, Friction, Petrissage) applies squeezes and strokes. Each hand and foot massaged for five minutes. Repeated over a 3 day period.	Routine care. Analgesics available to both groups	Pain using NRS at day 1, 2 and 3 postnatal.
Lee ⁵⁸	RCT single blind	Taiwan Setting: post- partum bed rest centre	60 primiparous or multiparous women with LBP symptoms defined by a score of <u>>1</u> on VAS scale post vaginal birth	Massage therapist administered 20 minute back massage involving effleurage, kneading, acupressure and friction.. The session conducted once every evening for 5 consecutive days (postpartum days 9-13)	Routine care	Lower back pain assessed by the PVAS at 5 and 14 days postpartum
<i>Herbal ointment</i>						
Aradmehr ³⁵	RCT double	Iran	114 primiparous women, aged 18-	Chamomile cream 1.3% combined	Cold-cream containing no	Pain intensity using VAS and use

	blind	Setting hospital	35 years, post episiotomy	with cold cream was provided to participants 2 h after episiotomy recovery applied twice a day for 10 days.	chamomile	of medication 2 h and day 1, 7 and 14.
Asgharikhatooni ³⁶	RCT double blind	Iran Setting hospital	108 nulliparous mothers, aged 18-35 years, post episiotomy	Equisetum Arvanse (horse tail) herbal ointment applied topically twice a day at 12 h intervals for 10 days.	Placebo ointment. Each participant was provided with 20 acetaminophen 500 mg pills	Pain intensity measured using the VAS, wound healing, side effects and medication used
Hajhashemi ³⁹	RCT double blind	Iran Setting hospital;	140 nulliparous women with an episiotomy	Group 1 Hypericum perforatum infused into vaseline (5% weight ratio). Group 2. Achillea millefolium with anti inflammatory effects, extracts packed with sterile vaseline base (5% weight ratio). Both groups administered using 30 g tubes, 1cm of ointment applied to perineum. Treatment twice a day for 10 days.	Group 3 vaseline ointment with no extract. Group 4 Control group - no intervention	Pain using VAS, redness, oedema, ecchymosis, wound dehiscence and wound secretion. Outcomes assessed on days 7, 10 and 14
Kaviani ⁴⁰	RCT double blind	Iran Setting hospital	90 primiparous women following episiotomy.	Group1 Olive leaf extract. 1 gram of ointment applied onto the suture area every 8 hours for 10 days post birth.	Placebo ointment	Pain using VAS, wound healing using REEDA scale 4 hours, 3, 7, 10, and 14 days post birth
Mohammadi ⁴¹	RCT double blind	Iran Setting delivery ward	114 multiparous postpartum women vaginal birth with episiotomy	Cinnamon extract ointment applied twice daily at 12 h intervals (+2 hrs for 10 days). Participants	Placebo ointment applied in the same manner as the intervention	Pain measured using the VAS. Wound healing using the REEDA, analgesic use Data

				were provided 10 400mg mefenamic acid capsules	group	recorded 1 h and 8hrs after perineal repair 10-11 days postpartum.
Moudi ⁴²	RCT single blind	Iran Setting: postnatal ward	147 primiparous women following an episiotomy	15 gm of mastic oleoresin provided to women to administer twice a day over 3 days. Women lay the MO on hot coal. Standing with legs apart and knees slightly bent to a distance of 30 cm from a brazier to smoke the episiotomy incision Mefenamic and cephalixin pills administered during the first three and 7 days postpartum	Routine care	Perineal pain using the VAS and wound healing using REEDA scale. Assesses postpartum day 3,7 and 10.
<i>Laser</i>						
Alvarenga ⁴⁹	RCT double blind	Brazil Setting: postnatal ward	54 primiparous postpartum women, 37-42 weeks, following episiotomy. Invited 6-10 hrs post birth	Low-level laser therapy applied to specific points of the episiotomy. Irradiation time was 90 seconds. Three sessions with intervals of 24 h before discharge (1st, 2nd and 3rd sessions carried out at 6-10 h postpartum and 40-48 h after the first session)	Same procedure but with no irradiation. Routine care	Perineal pain NRS, wound healing, maternal views on pain relief. Assessment at 7-10 days post birth.
De Santos ⁵⁰	double blind RCT	Brazil Setting: postnatal	114 primiparous women with mediolateral episiotomy with	Three sessions of irradiation with laser therapy. Laser	No active laser therapy unit applied.	Perineal pain assessed before and immediately after and 30 min

		rest unit	perineal pain \pm 3 on a numeric scale of 1–10	performed by touching the tip of the device to the incision for 10 seconds at three points of the episiotomy (central, upper and lower portions). Group 1 Red. Group 2 Infrared.	All groups 24 hour post-birth before intervention commenced	after application of intervention.
<i>Reflexology</i>						
Varghese ⁵⁴	RCT single blind	India	60 post-caesarean section women 1st-3rd post-operative Parity not specified.	Feet warmed and soaked for 10 minutes. Therapist applied thumb and finger walking to the reflexology zones of the feet relating to the brain, eye, adrenal gland, respiratory organ, spine, circulating systems and lower abdomen. 15 minute session applied for 5 consecutive days.	Routine post-partum care.	Pain using the VAS and sleep quality using the Pittsburgh sleep quality index. Assessed at day 5.
<i>Herbal tablet</i>						
Golezar ³⁸	RCT double blind	Iran Setting:	82 primiparous women, with episiotomy	Bromelain 3 tablets daily for 6 days. Derivative from pineapple.	Placebo	Pain (VAS), days 3, 7, and 14 post-partum, wound healing assessed using REEDA scale.
<i>Electro-magnetic therapy</i>						
Grant ⁵¹	RCT double blind	United Kingdom Setting	414 women with operative vaginal birth; or perineal trauma within 24	Group 1: Pulsed electromagnetic energy intervention at frequency of 27MHz, pulse	Placebo therapy	Pain, wound healing, analgesia use. VAS 0-10 scale. Midwife assessed wound

			hrs of birth.	repeat rate of 100 pulses, pulse width of 65us, pulse ratio normal. Three treatments of 10 min duration. Therapy commenced within 12-24 h post-birth. Maximum of three treatments in a 36 h period. Group 2: Ultrasound therapy intervention also administered.		healing. Assessments pre and post treatment and at day 10.
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Table 2 Quality of Evidence for postpartum, wound healing and use of analgesics

Quality of Evidence	Intervention	Outcome	References	Trials	Participants	MD 95% CI
1,2,3,4 VERY LOW	Essential oils	Pain within 24 hrs	Behmanesh ³⁷ Dale ⁵² Olapour ⁴³ Vaziri ⁴⁸	4	423	0.33, 95% - 0.71 to 1.36
1, 3, 4,5 VERY LOW	Acupressure	Pain within 24 hrs	Afravi ³³ Akbarzade ³⁴	2	135	-2.61, 96% CI - 4.13 to -1.09
1,2,3,5 VERY LOW	Music	Pain within 24 hrs	Reza ⁴⁴ Simavli ⁵⁵	2	241	-0.57, 95% CI - 1.74 to 0.59
1,3,5 VERY LOW	Massage	Pain within 24 hrs	Abbaspoor ³² Saatsaz ⁴⁵	2	184	-2.64, 95%CI - 2.82 to -2.46
3 MODERATE	Herbal ointment	Pain within 24 hrs	Aradmehr ³⁵ Mohammadi ⁴¹	2	221	-1.33, 95% CI - 1.96 to -0.70
2, 3, 4, 5 VERY LOW	Essential oils	Pain with 7 days	Behmanesh ³⁷ Dale ⁵² Sheikhan ⁴⁶	3	368	0.76, 95% - 1.90 to 3.41
1, 3, 5 VERY LOW	Massage	Pain with 7 days	Lee ⁵⁸ Sharma ⁵³	2	120	-1.91, 95% CI 2.42 to -1.40
2, 3, 5 VERY LOW	Herbal ointment	Pain with 7 days	Asgharikhatooni ³⁶ Kaviani ⁴⁰ Marzouk ⁶⁰ Moudi ⁴²	4	334	-0.50, 95% CI - 1.90 to 0.89
3,5 LOW	Essential oils	Pain with 14 days	Behmanesh ³⁷ Dale ⁵²	2	296	0.22, 95% CI - 0.22 to 0.67
2, 3, 5 VERY LOW	Herbal ointment	Pain within 14 days	Kaviani ⁴⁰ Marzouk ⁶⁰ Moudi ⁴² Aradmehr ³⁵	4	372	-0.74, 95% - 1.02 to -0.47

1, 2, 3,5 VERY LOW	Essential oils	Wound healing within 24 hrs	Behmanesh ³⁷ Sheikhan ⁴⁶	2	120	0.96, 95%CI - 1.36 to -0.56
2, 3, 5 VERY LOW	Herbal ointment	Wound healing within 7 days	Asgharikhatooni ³⁶ Kaviani ⁴⁰ Marzouk ⁶⁰ Moudi ⁴²	4	334	-0.67, 95% CI - 1.36 to 0.02
2, 3, 5 VERY LOW	Herbal ointment	Wound healing with 14 days	Asgharikhatooni ³⁶ Marzouk ⁶⁰ Moudi ⁴²	3	289	-0.52, 95% CI - 0.67 to -0.38
1, 3, 5	Acupuncture	Use of analgesics	Jaic ⁵⁶ Kindberg ⁵⁹	2	267	RR 1.23, 95% CI 0.79 to 1.93
3, 5 LOW	Essential oils	Use if analgesics	Dale ⁵² Olapour ⁴³	2	322	RR 0.58, 95% CI 0.45 to 0.75

1 Downgraded one level due to serious imprecision: small sample size

2 Downgraded one level due to serious inconsistency: substantial heterogeneity present

3 Downgraded one level due to serious risk of bias: one study high or unclear risk of bias on six domains.

4 Downgraded one level for imprecision due to wide confidence intervals.

5 Downgraded one level due to serious risk of bias: one study did not blind participants to group allocation, or it was unclear.