A systematic review and meta-analysis of the effect of massage therapy in pain relief during labor

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Abstract: **Aims:** This systematic review aimed to evaluate the effectiveness of massage therapy in pain relief during labor. **Methods:** This review searched among five databases: CENTRAL, MEDLINE, CINAHL, Allied and Complementary Medicine Database (AMED), and China National Knowledge Infrastructure (CNKI) from 1 January 2010 to 31 July 2017. This review included randomized controlled trials (RCTs), comparing the application of massage therapy during labor with normal care and other non-pharmacological methods for the reduction of pain intensity during labor. **Results:** This systematic review includes five RCTs among 386 women. Through analyzing the data, the author found that massage reduced pain intensity. Four RCTs were included for meta-analysis. Two of them compared the effect of massage therapy with usual care on pain relief during labor. Massage therapy with statistically significant effect on pain relief ($Z = 4.02$, $P < 0.0001$). When comparing massage therapy with active control (transcutaneous electrical nerve stimulation-TENS or music therapy), the effects of pain relief favors massage therapy but having no statistically significant difference ($Z = 0.92$, $P = 0.36$). Massage therapy also reduced the participants' anxiety levels and improved their satisfaction with pain relief during labor. Massage did not affect the outcomes of fetus. No trials were evaluated as having a low risk of bias in all the quality domains. **Conclusion:** Massage therapy appears to be safer for the mother and fetus; it may reduce labor pain and improve satisfaction with pain relief during labor. However, the efficacy of massage therapy is unclear and more high-quality trials in this area are required.

Keywords: Massage therapy; pain; efficiency; labor; pregnant women

1. Introduction

During the labor process, midwives and other health professionals should provide care that is focused on a range of factors to permit women to conserve their energy in order to cope with the labor pain with more ease, rather than in a painful or aggressive manner. Smith *et al*[1] pointed out that many pregnant women prefer to avoid invasive or pharmacological approaches to pain relief during labor. Therefore, non-pharmacological methods are good options to replace epidural and spinal analgesia during the delivery process. Non-pharmacological pain relief approaches have different advantages, such as lack of side effects for the mother and fetus and also being more pleasant than their pharmacological counterparts[2]. Some of these approaches are muscle relaxation, respiratory techniques, hydrotherapy, music therapy, and massage therapy.

Although non-pharmacological options are still debated and not universally accepted[3], they are safer for women to cope with pain. The most common method was massage therapy [4], although there is no evidence regarding the efficacy of massage therapy and insufficient evidence to support understanding of whether women were satisfied with massage therapy for pain management in labor. While there is an updated Cochrane review which reported the effect of massage during the second stage of labor on the incidence and morbidity associated with perineal trauma, there are no patient reported outcomes for the effect of massage therapy on pain relief [5]. Moreover, there is little information about whether massage therapy could affect other outcomes of the mother and fetus, and thus it is pertinent to evaluate the benefits of massage in reducing pain during labor.

Childbirth is often a fulfilling and positive experience, for many women it is combined with suffering pain during labor. Massage therapy is believed to be safer than pharmacologic approaches because of its non- invasive nature, which appeals to pregnant women and midwives who are seeking some simple but effective methods for relieving labor pain without causing potential side effects or high costs. Smith et al[1]. searched articles prior to 2010 and carried out a Cochrane review on massage, reflexology and other manual methods for pain management in labor, which suggested a need for further studies to examine the effectiveness of massage. In recent years, some RCTs on massage for pain relief have been published, and so there is a real need to conduct a systematic review on studies in the past seven years in order to update the existing information on the effects of massage therapy for reducing pain during labor. Therefore, this systematic review aimed to evaluate the effects of massage therapy in pain relief during labor.

2. Methods

2.1 Data sources and searching strategies

This review searched among five databases: CENTRAL, MEDLINE, CINAHL, Allied and Complementary Medicine Database (AMED), and China National Knowledge Infrastructure (CNKI) from 1 January 2010 to 20 July 2017. This review included randomized controlled trials (RCTs), comparing the application of massage therapy during labor with normal care and other non-pharmacological methods for the reduction of pain intensity during labor. The searching term and strategies were listed in Table 1.

Table 1. Search terms and strategies

P	I	O
Population	Intervention	Outcome
1.Pregnant women	11.Massage	18.Lower pain 29.Painlessx
2.Pregnant woman	12.Tui na	19.Relieve pain
3.Mother	13.Shiatsu	20.Pain management
4.Mothers	14.Manual therapy	21.Pain intensity
5.Primipara/Primiparous	15.Nonpharmacological	22.Pain reduction
6.Multipara/Multiparous	16.Therapeutical touch	23.Labour pain
7.Women		24.Labor pain
8.Woman		25.Pain control
9.Parturient		26.Reduce pain
		27.Manage pain
		28.Pain relief

P	I	O
10. Combine terms 1－9 using phrase "OR"	17. Combine terms 11－16 using phrase "OR"	30. Combine terms 18－29 using phrase "OR"
31. Combine terms 10, 17 and 30 using phrase "AND"		

2.2 Inclusion and exclusion criteria

This systematic review's selection was based on particular inclusion criteria. The first was an RCT, since this is considered as the golden standard for comparing alternative forms of care [6]. Patients who received massage therapy were all considered, and all participants whether primipara or multipara, in the first or second stage of labor, in induced or spontaneous labor, high risk or low risk, and premature or full term were all included. Interventions involved normal care and other non-pharmacological approaches for managing pain during delivery. Those trials in which participants had problems that meant they could not receive massage therapy, participants who had already planned a caesarean section, or participants who had received analgesic or antipsychotic medications for pain relief at the first instance were not included.

2.3 Critical appraisal of methodological quality

The Review Manager 5.3 software was used to assess the risk of bias of eligible studies. All included trials would be appraised by the following seven primary criteria: adequate random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data addressed, free of selective reporting, and free of other bias.

2.4 Data synthesis

Data were extracted according to the data extraction sheet. For each included trial, the following information was gathered: location of the study, methods of the study, the participants, intervention, and measures. For all results, the author attempted to continue the analysis in order to minimize bias; for example, the author tried to include all women who were randomized to different groups in the analysis, and analyzed all samples in the different groups they were randomly allocated to, regardless of whether they received the intervention or not. Due to the heterogeneity of the data, all the outcomes were analyzed by description.

2.5 Data analysis

This review performed statistical analysis using the RevMan 5.3 software [7]. Because there was clinical heterogeneity sufficient to expect that the underlying intervention effect across different trials, the random-effect model was used to combine statistically heterogeneous RCTs [7]. The results were presented as the average treatment effect (RR) with 95% CI, and the heterogeneity of included RCTs was assessed using the estimates of Tau^2 and I^2 statistics.

3. Results

TA total of five studies were included in this review. The article searching diagram was shown in (Figure 1). The characteristics of included studies were shown in (Table 2). All included studies [8-12] recruited primiparous women with term pregnancy. The massage therapy included back and shoulder massage, sacral pressure and abdominal effleurage, selected according to the mother's preference. All five studies measured pain intensity; the Visual Analogue Scale (VAS) scale was commonly applied to evaluate the level of pain intensity. In addition to VAS, the Altered Labour Pain Assessment Instrument (ALPAI) and Present Pain Intensity (PPI) were used to measure the severity of pain[8,10].

Maternal outcomes and satisfaction with pain relief were reported in two studies[8,10]. Clinical outcomes such as duration and that of delivery were reported in three studies[9-11].
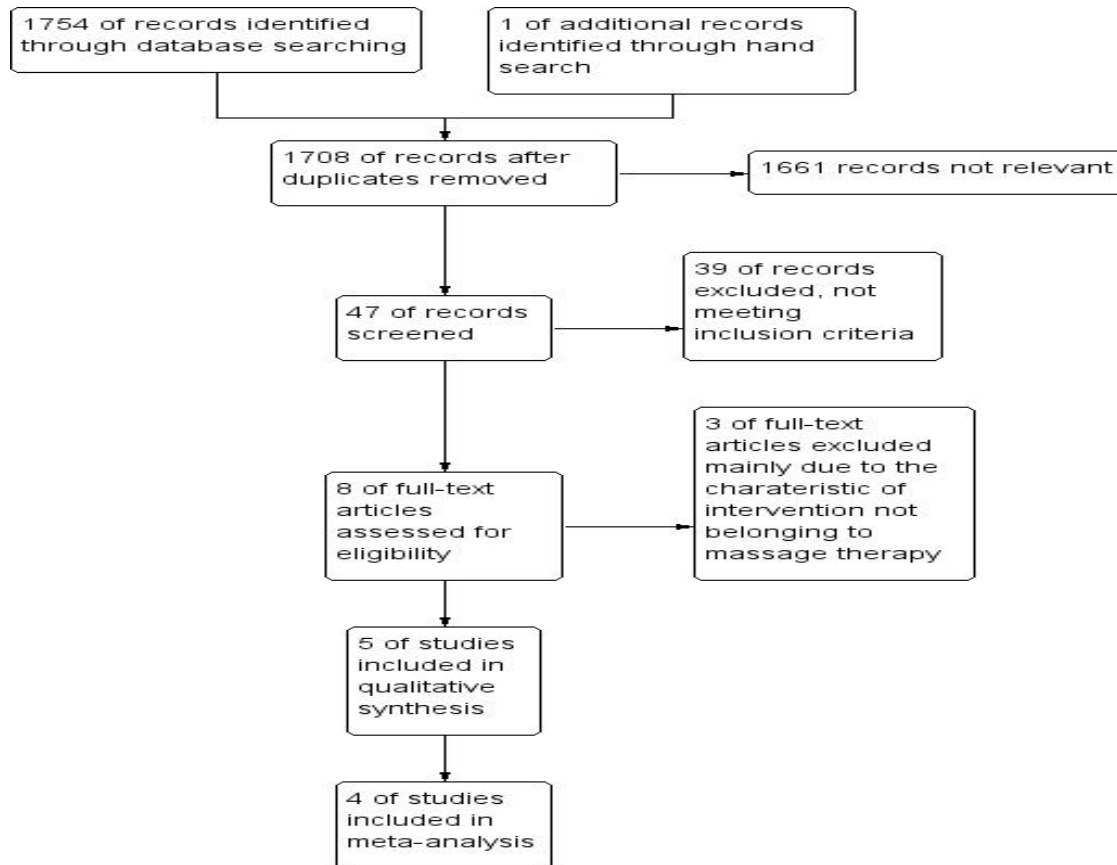

Figure 1. Study flow diagram

Table 2. The characteristics of included studies

Author & year	Study aim	Study design	Sample	Description of intervention /comparison	Outcome measures	Main findings
Chen et al. (2014)	To evaluate the effect of massage therapy on pain relief during labour	RCT	Forty-two mothers recruited from a central hospital of Hebei province in China between November 2012 and March 2013	Massage group: massages included abdominal massage, sacral and haunch massage TENS group: women received TENS from 3 cm dilation until 10 cm	Pain intensity was measured by Altered Labour Pain Assessment Instrument; Pain relief was measured by A-VDS; Satisfaction with delivery was measured by questionnaire.	Massage can reduce pain in labour, it is more effective and convenient and can improve women's satisfaction with their labour experience.

Author & year	Study aim	Study design	Sample	Description of intervention /comparison	Outcome measures	Main findings
Janssen et al. (2012)	To evaluate the effectiveness of massage therapy in managing pain among women in active labour	RCT	Seventy-seven women were randomised to a massage group and control group	Massage group: Swedish massage administered for up to five hours Control group: standard care	Cervical dilation at the time of administration of epidural; Pain: McGill Present Pain Intensity scale; length of first and second labour; mode of delivery and entonox	Massage has the potential to be an effective means of pain management that may be associated with delayed use of epidural analgesia, which may reduce exposure to epidural analgesia during labour and decrease rates of associated sequelae.
Mortazavi et al. (2012)	To investigate the effects of massage and presence of an attendant on pain, anxiety and satisfaction during labour in order to clarify some aspects of using an alternative complementary strategy	RCT	One hundred and twenty primiparous women were randomly allocated into massage, attendant and control groups	Massage group received firm and rhythmic massage during labour for 30 minutes in three phases. Attendant group were accompanied by an attendant during the entire labour Control group received normal care	Pain intensity: Present Pain Intensity; Anxiety and Satisfaction: VAS; Duration of active phase: time (hour)	Findings suggest that massage is an effective alternative intervention, decreasing pain and anxiety during labour and increasing the level of satisfaction
Silva Gallo et al.(2013)	To examine whether massage relieved pain in the active phase of labour	RCT	Forty-six participants were randomly placed into an experimental group and control group	Massage group: received massage for 30 minutes at the beginning of the active phase of labour. Control group: received routine maternity ward care	Pain severity: VAS; Characteristics of pain: Short-Form McGill Pain Questionnaire; Location of pain: standard body diagram; Duration of labour: time; Path of delivery and neonatal outcomes: weight, length; head circumference, chest circumference, APGAR score	Massage reduced the severity of pain in labour, despite not changing its characteristics or location.
Taghinejad et al. (2010)	To compare the effects of massage and music therapies on the severity of labour pain	RCT	One hundred and one primigravida were randomly stratified into two groups of either massage (n= 51) or music (n= 50) therapy	Massage group: cervix was dilated by up to 3 – 4 cm and received 30 minutes of massage Music group: played soft traditional music without lyrics using headphones for 30 minutes, commencing early in the active phase of labour	Pain: VAS Pain relief: description	Massage therapy was an effective method for reducing and relieving labour pain compared with music therapy and can be clinically recommended as an alternative, safe and affordable method of pain relief where using either pharmacological or nonpharmacological methods are an option

3.1 Risk of bias in selected studies

Overall, one trial was showing high quality[11], three trials were moderate risk of bias[9-11], and one trails had high risk of bias[8]. From Figure 2, the high risk of bias was not blinding of participants and personnel. All five included RCTs evaluated the effectiveness of massage. The compared groups varied in terms of TENS, normal care, music and attendant. The main evaluated outcomes were pain intensity, duration of delivery, satisfaction with pain relief, level of anxiety and obstetric and neonatal outcomes. These results are presented as follows:

3.2 Pain intensity

Pain degree was evaluated in all of the five trials with 386 women in total. The most commonly used tool for measuring pain intensity was the VAS, mentioned in two studies[10,11]. Janssen[9] used the Short-Form McGill Pain Questionnaire to measure pain intensity, while Mortazavi[10] adopted the Self-reported Present Pain Intensity Scale, and the Altered Labor Pain Assessment Instrument was applied to measure labor pain intensity in Chen's study[8].

Some studies reported the pain intensity according to different stages of labor. Chen[8] pointed out that massage could reduce pain in the early and late stages of active dilation of the cervix, with the score of pain reduced from 5.52 ± 0.98 to 2.81 ± 0.51 and from 9.04 ± 0.80 to 3.90 ± 0.77, respectively, with significance ($p<0.05$); However, no difference was found between the massage group and TENS group. A similar result was found in Janssen's study[9], where aggregate scores on the Short-Form McGill Pain Questionnaire were consistently lower in the massage group at all three stages of labor; differences were seen, but were not statistically significant ($p>0.05$). On the other hand, Mortazavi's outcome showed that massage generally reduced pain intensity in the latent, active and deceleration phases with significant difference ($p<0.05$)[10].

Meanwhile, the pain degree was significantly lower among participants who received massage therapy compared with the attendant accompanied group in the second and third stages of labor ($p<0.05$). Neither Silva Gallo[11] nor Taghinejad [12] evaluated pain intensity by different stages of labour, and after 30 minutes of massage, Silva Gallo[11] found that massage decreased the pain intensity by a mean of 17 mm (SD 14) from the baseline according to VAS, while the normal care group only decreased a mean of 3 mm. Thus, the efficiency of massage therapy was considered as 20 mm (95% CI: 10 to 31) by VAS.

In the same way, a significant difference was shown between the massage group and music group in the matter of pain intensity after intervention ($p=0.011$), but not prior to the interventions ($p=0.613$)[10]. Women in the massage group showed a lower pain level compared with participants in the music group ($p=0.009$). There was a significant difference between the massage therapy group and music therapy group prior to the interventions and after the interventions in terms of the agonising phase, during which mothers experienced the most serious pain, with a mean difference of 36.3 (95% CI: 13.6-41.4; $p=0.001$). Additionally, Taghinejad et al[12]. reported a significant difference between the massage therapy group and music therapy group in terms of the pain intensity after the interventions ($p=0.01$). Overall, all the results showed that massage reduced pain intensity to some extent in the included papers (see Table 3).

Table 3. Summary of finding regarding pain intensity

Studies	Measurement tool	Reducing pain	Significant difference
Chen (2014)	Altered Labour Pain Assessment Instrument	Y	+/-*
Janssen (2012)	Short-Form McGill Pain Questionnaire	Y	-
Mortazavi (2012)	Self-reported Present Pain Intensity scale	Y	+/+*
Silva Gallo (2013)	VAS	Y	+/+*

Studies	Measurement tool	Reducing pain	Significant difference
Taghinejad (2012)	VAS	Y	+/+*

'Y' : Yes;

'+' : With significant difference;

'-' : Without significant difference;

'+*' : Having significant difference with control group;

'-*' : Having no significant difference with control group.

3.3 Characteristics of pain

One study of 46 women evaluated the characteristics of pain, which were assessed by the Short-Form McGill Pain Questionnaire[11]. The results showed no statistically significant differences between the massage group and normal care group on frequency of words that were chosen, degree of pain intensity and pain index. Meanwhile, the researchers recorded the location of pain using a standard body diagram in the same trial[11]. Before the interventions, most women (i.e.20 participants (83%) in the massage therapy group and 16 participants (70%) in the control group) expressed that the primary pain appeared in the lumbar and suprapubic area. Then, both groups reported similar regions at the end period of the interventions. There were 13 women (57%) in the massage therapy group and 15 women (65%) in the control group who indicated the lumbar and suprapubic pain, while there was no significant difference between the massage therapy group and normal care group (RR=0.87, 95% CI: 0.54 to 1.38). This demonstrated that massage therapy made no change in the location of pain during the active phase of delivery.

3.4 Pain relief during labor

Four RCTs[8,9,11,12] were included for meta-analysis. Two of them[9,11] compared the effect of massage therapy with usual care on pain relief during labor. Figure 3 shows massage therapy with statistically significant effect on pain relief (Z = 4.02, P < 0.0001). When comparing massage therapy with active control (TENS or music therapy)[8,12], Figure 4 shows the effects of pain relief favors massage therapy but having no statistically significant difference (Z = 0.92, P = 0.36). Two studies with 143 women participants reported on the pain relief[8,12]. One small trial found no difference in pain relief between the massage group and TENS group in the 42 women involved[8], and while most of the women in the two groups would agree to the effectiveness of pain relief (95.23% and 85.71%, respectively), the difference was without statistical significance (p>0.05). This may be because massage therapy and TENS have similar principles for pain relief, in that both methods affect the surface skin, soft tissue, muscles, tendons and ligaments. Using an endorphin-release mechanism, controlling nerve gates and stimulating sympathetic nerves, both of these methods could lead to muscular relaxation. Conversely, a significant difference was shown between the massage group and music group in terms of the degree of labour pain after, but not prior to, the interventions in Taghinejad's[12] study. There was a most significant difference between the massage therapy group and music therapy group before and after interventions in the agonizing phase, when women experienced the most severe pain (p=0.001). Women in the massage group expressed pain relief by a lower score on the degree of pain level.
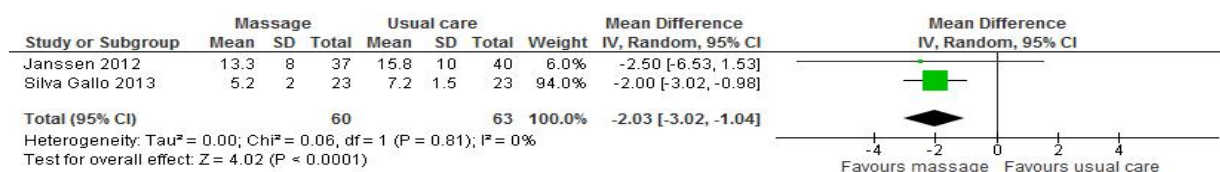

Figure 3 Pain intensity after intervention (Massage therapy versus usual care)
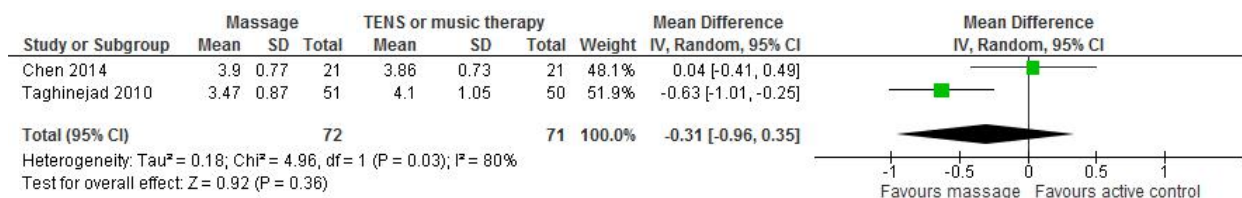
Study or Subgroup	Massage Mean	SD	Total	TENS or music therapy Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Chen 2014	3.9	0.77	21	3.86	0.73	21	48.1%	0.04 [-0.41, 0.49]
Taghinejad 2010	3.47	0.87	51	4.1	1.05	50	51.9%	-0.63 [-1.01, -0.25]
Total (95% CI)			72			71	100.0%	-0.31 [-0.96, 0.35]

Heterogeneity: Tau² = 0.18; Chi² = 4.96, df = 1 (P = 0.03); I² = 80%
Test for overall effect: Z = 0.92 (P = 0.36)

Figure 4 Pain intensity after intervention (Massage therapy versus TENS or music therapy)

3.5 Satisfaction with pain relief during delivery

Three studies featuring 208 women in total reported on the satisfaction with pain relief during the process of delivery [8,10,11]. All of the participants in the massage group in Chen's study[8] expressed satisfaction with the pain relief in the questionnaire; on the contrary, 14.29% of the participants showed dissatisfaction with the pain relief from TENS, and the differences were significant between the two groups (p<0.05). A similar result was found in another study[10], which pointed out that participants in the massage group showed higher satisfaction with pain relief in whole labor compared with the attendant groups (p<0.001). Another study by to Silva Gallo et al[11], all the women expressed the importance of care quality received during delivery. The intervention of massage therapy was considered as excellent by approximately 65% of the massage group, with a higher proportion of 70% shown in the control group. Sixteen women (70%) in the massage group and nine women (39%) in the control group reported that the intervention applied to them played a role in promoting pain relief. All the women in the massage group and 96% of the participants in the control group stated that they would like to receive the same intervention if they were to have additional childbirths in the future. However, none of these differences had statistical significance. On the whole, massage therapy improved the participants' satisfaction with pain relief during the process of delivery.

3.6 Anxiety

One study of 120 women reported on anxiety, which was measured according to the standard VAS[10]. This scale presented in a line which was divided into 10 cm quadrants, in which the left side indicated no anxiety and the right side indicated the worst anxiety possible. Although the median of score was lower among women in the massage group compared with the control group, the trend of anxiety level in the massage group increased from the first stage to the third stage of labor (p=0.000). On the contrary, the trend of anxiety level in the attendant and control groups decreased (p=0.000, p=0.46, respectively). These results highlighted that massage therapy was effective and important in reducing women's anxiety levels during labor.

3.7 Duration of labor

Three studies including 243 participants in total reported on the duration of labor[9-11]. Mortazavi[10] found that the mean length of active phase was 2.6 hours (SD=0.95h) in the massage therapy group and 5.7 hours (SD=1.87h) in the normal care group. There was a significant difference among the three groups in terms of the length of active phase, in that massage reduced this (p<0.001). However, Janssen[9] had a different opinion and suggested there were no significant differences in duration of labor. In comparison of the massage and usual care, the length of the first stage of labor was 897.4 vs 788.6 minutes, with a p value of 0.28, and the length of second stage of labor was 136.0 vs 125.0, with a p value of 0.36. However, what was most interesting was that the massage group had a longer mean length of labor by 1.1 hour, and this difference reached the borderline of statistical significance (95% CI: 0.2 to 2.0) in Silva Gallo's study[11]. In the same way, massage therapy increased the mean time for requesting pain medication to 2.6 hours (SD 1.3) in the massage therapy group and 1.9 hours (SD 1.2) in the normal care group. However, this difference was not statistically significant, with a mean difference of 0.7 hours (95% CI: -0.1 to 1.5). Massage techniques differed in these three trials,

which may have different effluence on the duration of labor. There was not enough information to judge the effect that massage therapy has on length of labor.

3.8 Mode of delivery

Two trials of 123 women reported on the delivery approach[9,11]. Interventions did not affect the mode of delivery in Silva Gallo's study[11], where the massage therapy group had six cases of caesarean section, while four cases of caesarean section occurred in the normal care group (RR=1.5, 95% CI: 0.5 to 4.6). Janssen[11] reached the same conclusion, although more participants in the massage group required assisted vaginal and caesarean section than in the usual care group (45.9% vs 37.5%). No statistically significant difference was shown in the mode of delivery, with a p value of 0.71. The two studies found that massage had no influence on the mode of delivery.

3.9 The time for requesting pain medication

In two studies, the participants were permitted epidural analgesia[9,11]. Women in Janssen's[9] massage group were admitted to the maternity ward on average at an earlier stage of labor, but they asked for epidural analgesia with on average a higher dilation of cervix compared to the normal care group (5.7 cm vs 5.3 cm). There was no statistically significant difference. When analyzing the covariance, Janssen $et\ al$[9] calculated that the marginal mean for dilation of the cervix when participants requested epidural insertion was 5.9 cm (95% CI: 4.2 to 5.8). This operation was allowed on condition that healthcare professionals evaluated the cervical dilation, status of membranes, and the station of the presenting part. In another study[9], one women did not request analgesic medication in both the massage group and normal care group, while the length of time for epidural insertion from the end of the interventions had mean (SD) details like 2.6 (1.3) vs 1.9 (1.2) hours, with RR=0.7 and 95% CI of -0.1 to 1.5. In Janssen's[9] study, augmentation of labor (amniotomy and oxytocin), entonox, and intravenous or intramuscular narcotic analgesia were also taken into consideration. Except for the amniotomy, 35.1% of the women in the massage group and 60% of the women in the usual care group used it, with a p value of 0.03. However, no statistically significant differences were found in the use of oxytocin, entonox and intravenous or intramuscular narcotic analgesia (p>0.05).

3.10 Neonatal outcomes

Neonatal outcomes including head circumference, weight, length, chest circumference, and Apgar scores were reported in Silva Gallo's study[11]. There was no difference between the massage and normal care groups in terms of the anthropometric measures of those new babies.

3.11 Additional summary of the findings

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) recommended to evaluate the level of evidence and strength of recommendation, and has been widely accepted[13]. According to table format created by the GRADEprofiler software, the quality level of the evidence for all the outcomes and strength of recommendations could be easily identified (see Table 4).

Table 4.Quality level of the evidence and strength of recommendation by GRADE

Massage therapy for pain relief during labour					
Patient or population: patients with pain relief Settings: delivery Intervention: massage					
Outcomes	Illustrative comparative risks* (95% CI) Assumed risk Corresponding risk	Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments

	Control	Massage		No of Participants (studies)	Quality of the evidence (GRADE)
Pain intensity VAS, Short-Form McGill Pain Questionnaire, PPI, ALPAI	**Moderate**		Not estimable1	346 (5 studies)	⊕⊖ ⊖ ⊖ very low
Characteristics of pain Short-Form McGill Pain Questionnaire	**Moderate**		RR 0.87 (0.54 to 1.38)	46 (1 study)	⊕ ⊕ ⊕⊖ moderate
Pain relief A-VDS	**Study population**		Not estimable1	143 (2 studies)	⊕⊖ ⊖ ⊖ very low
	Moderate				
Satisfaction with pain relief during labour Questionnaire, VAS	**Study population**		Not estimable	208 (3 studies)	⊕ ⊕ ⊕⊖ moderate
	Moderate				
Anxiety VAS	**Study population**		Not estimable	120 (1 study)	⊕ ⊕⊖ ⊖ low
	Moderate				
Duration of labour time	**Study population**		Not estimable	243 (3 studies)	⊕ ⊕⊖ ⊖ low
	Moderate				
Mode of delivery	**Study population**		Not estimable	123 (2 studies)	⊕ ⊕ ⊕⊖ moderate
	Moderate				
The time for requesting pain medication	**Study population**		Not estimable	123 (2 studies)	⊕ ⊕ ⊕⊖ moderate
	Moderate				
Neonatal outcomes	**Study population**		Not estimable	46 (1 study)	⊕ ⊕ ⊕⊖ moderate
	Moderate				

*The basis for the assumed risk (e.g. the median control group risk across studies) is provided in footnotes. The corresponding risk (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
CI: Confidence interval; RR: Risk ratio;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

4. Discussion

4.1 Summary of main results

This systematic review appraised all the currently available RCTs that the author could obtain regarding the effectiveness of massage therapy for the management of pain during labor. Overall, the evidence from the five studies and 386 participants in this systematic review showed a limited effectiveness of massage therapy on pain intensity, pain

relief, women's anxiety about labor, satisfaction with pain relief, and other outcomes of mothers and newborns. Massage reduced the pain degree and anxiety level during delivery, while simultaneously also improving the satisfaction with pain relief and delaying time requests for pain medication. Nevertheless, massage showed no effect on the mode of delivery and outcomes of neonatal. Because the sample size of the participants included in the current systematic review is small, and some of the studies featured poor methodological quality, the results may be not representative. The evidence was judged to be moderate, low or very low, with the principal reasons for downgrading the evidence level being imprecision and risk of bias of the study. The comparison group varied in each trial, such as TENS, control attendant, music and normal care, which created challenges in extracting data. This also limited the power of the current systematic review's ability to conclude on the statistical differences between the different comparison groups. Then, the author could not get sufficient evidence regarding the efficiency and safety of the intervention of massage, and thus even the limited benefits of massage therapy should be considered with caution.

4.2 Overall completeness and applicability of the evidence

There were few studies of other non-medicine approaches that compared the effectiveness of massage therapy on pain relief during labor. No study had the same control group, nor reported all of the outcomes. Therefore, the outcomes' data could not be analyzed in a meta-analysis due to the different comparisons in each trial. There were also differences in the outcome measures, especially in terms of the measurement of the pain degree and satisfaction with pain relief, which enhanced the difficulties of pooling the results from the different studies. None of the studies reported on breastfeeding, side effects, feeling of control in delivery, or admission to special care unit for infants and mothers. The formation of relevant outcomes was very limited in most of the included trials, lacking in outcomes that related to both efficiency and safety.

The completeness and applicability of the evidence is limited according to these five included trials, and there are no well-designed trials with low risk of bias in all the domains. The recruited population included primipara and multipara at term in spontaneous labor, with the interventions administered in the delivery room setting with small sample sizes, which cannot represent all of the pregnant women. The trials took place in several countries, which reflected the adoption of particular techniques or modalities as part of different cultures, such as China was different from other countries, which made the conclusion was not representative. The included studies also showed variation in how massage therapies were practiced; moreover, despite all the included trials receiving ethics committee approval, some issues still remained, such as whether it is ethical to conduct RCTs among laboring women. Actually, the allocations of concealment were not explained clearly in most of the trials, and thus the completeness and applicability to massage therapy for pain relief during labor is limited.

4.3 Quality of the evidence

Five studies with 386 participants in total were included in this systematic review. The trials were evaluated as being unclear and at a high risk of bias for some of the quality domains in the Cochrane Collaboration tool. The risk of bias graph (Figure 2) demonstrated that previous researchers had not evaluated massage therapy rigorously. Some trials were unclear regarding the methods of adequate randomization and allocation concealment, with only four and one trial, respectively, describing clearly the methods that had been used. For all five included studies, blinding of the participants and the practitioner was not practical, while blinding of the person for outcome assessment was unclear in most of the studies, which suggests that some outcomes may have been influenced by a lack of blinding in parts of the trials. None of the included studies lost participants or stopped early. Viewed as a whole, the quality of the papers was varied across all the articles. As a result, it is difficult to examine the overall risk of bias in all the domains across the studies. With the

help of the GRADE profiler software, the quality of the evidence was divided into different levels, ranging from moderate to very low. The evidence regarding the characteristics of pain, satisfaction with pain relief during delivery, mode of delivery, the time for requesting pain medication, and neonatal outcomes was moderate, which indicated that further research may have an important effect on changing the recommendation. The evidence quality of the anxiety and duration of labor was low. Furthermore, the evidence level of pain intensity and pain relief was very low, which means these outcomes were uncertain. The small number of included studies with different comparisons and lack of high quality RCTs suggests that currently there is insufficient evidence of any consistent effectiveness and safety from massage therapy trials included in this systematic review.

Figure 2. Risk of bias summary

4.4 Limitations of this review

Due to the nature of massage, it is not a standardized manipulation and many factors may affect its potential effectiveness and safety on painful conditions, for example, the massage techniques, the duration, the rhythm, the frequency and quantity of treatment sessions, the intensity of power, the location on the body parts, the person who carries out the massage, the therapists' experience, the level of anxiety, the heterogeneity of women and confounding variables such as emotional effect from the therapists and co-interventions. One of other limitations of the current systematic review is the relative lack of studies for each special technique of massage therapy, since many factors are related to the massage techniques

5. Conclusions

Massage therapy appears to be safer for the mother and fetus; it may reduce labor pain and improve satisfaction with pain relief during labor. However, the efficacy of massage therapy is unclear and more high-quality trials in this area are

required.

5.1 Implications for future clinical practice

The limited accessible data provided information that massage therapy might be efficient for managing pain during labor; however, the evidence was not sufficient to make strong clinical recommendations. Regarding pain intensity, massage reduced pain intensity but made no difference with other non- pharmacological methods. For pain relief, massage therapy had an effect on pain relief and functioned better then music, but when compared with TENS it offered no advantage. Massage also reduced participants' anxiety and improved their satisfaction with pain relief during labor, which demonstrated better function than TENS and attendant company.

Above all, there is insufficient evidence to suggest whether massage therapy is more effective when compared with normal care and other non- pharmacological methods. Because of the limited number of studies and uncertainty or high risk of bias in some domains among the included trials, suggestions for clinical practice cannot be offered until further more high quality research has been undertaken.

5.2 Implications for future research

As the main outcomes in terms of labor pain are measured subjectively, the best control group is one that can guarantee interventions are equally reliable and accredited to subjects to minimize the influence of usual care[14]. There are a number of massage techniques, and each of these techniques should be assessed for its respective efficiency, safety, and cost effectiveness. There are different types of patients, and various countries with diverse cultures that need to be evaluated separately. In the future, research should consider whether the effectiveness of massage therapy can be improved if midwives, therapists or anyone who applies the massage has rich experience.

Despite the increasing use of massage therapy, there is a lack of well-designed RCTs to evaluate the efficacy and safety of massage for pain management during labor. Therefore, well-designed RCTs about massage therapy for reducing pain during delivery are needed, with the aim of improving the humanized care for women during labor. Studies should examine the experience of midwives, therapists or anyone who applies massage by recruiting various types of people with different experience and training them. Researchers should also discuss the clinical significance of the outcomes and are encouraged to report their trials with standard outcomes to provide homogenous evidence for further meta-analyses and reviews. Moreover, further research is required to provide data that include neonatal outcomes together with other maternal and obstetric findings. When displaying the outcomes in reports, researchers are encouraged to demonstrate the baseline characteristics with point estimates, such as mean and median, or to use standard deviation for continuous data, and to report the occurrence rate of each category. Finally, there is a methodological challenge for studies regarding massage therapy, which is the selection of a suitable comparison group. According to the nature of massage, it appears to be difficult to blind the participants during trials; thus, consideration should be given to the study design

6.Research Fund

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