Review Article

A Systematic Review and Meta-Analysis of the Effect of Acupressure on Relieving the Labor Pain

Leila Karimi[1], Mitra Mahdavian[2], Somayeh Makvandi[3]

[1]Behavioral Sciences Research Center, Life Style Institute, Nursing Faculty, Baqiyatallah University of Medical Sciences, Tehran, Iran, [2]Department of Midwifery, School of Nursing and Midwifery, Islamic Azad University Bojnourd Branch, Bojnourd, Iran, [3]Department of Midwifery, School of Nursing and Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract

Background: Numerous studies have been conducted on the effect of acupressure on labor pain, some of which have reported conflicting results. Thus, the present study was performed to critically review the previous studies related to the effect of acupressure administered during labor for relieving labor pain. **Materials and Methods:** In this study, databases of the Cochrane Central Register of the Controlled Trials, PubMed/MEDLINE, Scopus, and Web of Science were searched from their establishment until November 5, 2019. All the Randomized Controlled Trials (RCTs) that had compared the use of acupressure with either placebo or nonintervention for relieving the labor pain were included in the study. Meta-analysis was performed using the Comprehensive Meta-Analysis (CMA) software Version 2. The random-effects model was used for pooling the effect sizes across the included studies. The p value <0.05 was considered as statistically significant. **Results:** Totally, 5853 primary papers were identified in the search, which were narrowed down to 22 studies. The results of meta-analysis showed that the acupressure decreased the labor pain in the intervention group vs. control (-1.67 [-2.29 to -1.05], z = -5.25, p < 0. 001) (Q-value = 788.98, p < 0.001, I-squared = 96.83). No publication bias was found in the included studies (Egger's regression intercept = -1.02, p = 0.76). **Conclusions:** Although the findings of this meta-analysis showed that the acupressure significantly reduced the labor pain during the active phase of labor compared to the nonintervention or placebo; considering that the quality of the included studies was generally moderate, rigorous RCTs with better design and higher quality are needed to obtain definitive conclusions.

Keywords: *Acupressure, labor pain, pain management, parturition*

Introduction

Labor pain is one of the most severe pains experienced by most of the women in their lifetime.[1] Labor pain management is among the main tasks of the midwives and is one of the key aspects of intrapartum care.[2] Although the efficacy of the pharmacological methods in reducing labor pain has been confirmed in the previous studies,[3-5] a review of the systematic reviews reveals that these methods have some side effects.[6] Besides, the pharmacological methods focus on reducing physical pain and often neglect the emotional states of laboring women.

Non-pharmacological approaches for relieving labor pain are often practical and inexpensive and can be applied as a complementary treatment with other medications. In contrast, although the majority of these methods are noninvasive and seem to be safe to the mother and infant, their efficacy has remained unknown due to the lack of high-quality studies.[4,7-9] The use of acupressure technique is one of the non-pharmacological methods for labor pain relief. Specifically, acupressure, as a technique being practiced in traditional medicine involves stimulating the "acupuncture points" or "acupoints" by applying the pressure using the hand, fingers, or thumb.[10] According to traditional medicine, a disease is caused by an imbalance in a person's energy or Qi (Chi). It is believed that the stimulation of the acupoints regulates the Qi, activates the energy pathways (meridians) and collateral systems, and therefore, has been reported to be successful in treating the health problems.[11] Several studies have shown the effectiveness of the acupressure for management of insomnia,[12] cancer-related fatigue,[13] chronic low back pain,[14]

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Address for correspondence:
Dr. Somayeh Makvandi, Department of Midwifery, School of Nursing and Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
E-mail: Somayemakvandi@gmail.com

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improvement of sleeping time, quality of the patients in the intensive care unit (ICU),[15] and enhancement of the bowel function during constipation.[16] Besides, the acupressure is widely used in women's health-related issues including improvement of the menstrual distress and low back pain in the dysmenorrheic young adult women,[17] reducing the anxiety of the peri- and early postmenopausal women,[18] relieving insomnia in the postpartum women,[19] and decreasing labor pain and duration.[20] Pouresmail in a study showed that the use of acupressure did not cause any complications[21] and Yip *et al*., found that it has overall acceptability among the patients.[22]

There are some contradictory results regarding the effect of the acupressure on relieving the labor pain. For instance, Akbarzadeh showed that applying the acupressure in the laboring women is associated with labor pain relief versus no intervention.[23] On the contrary, Heidari concluded that the acupressure did not reduce the labor pain.[24] Lee showed a significant decrease in labor pain immediately and 30 and 60 min after intervention in the acupressure group versus touch group.[25] To our knowledge, no meta-analysis has been conducted to summarize the results of the related studies and reach a comprehensive conclusion so far. Besides, as the acupressure is a very low-cost intervention, probably without the side effects for the mother and fetus, it can be easily used in low-income countries to alleviate the labor pain among the laboring women. For these reasons, the present study was carried out to critique and summarize the results of the trials conducted on the effect of acupressure on labor pain relief.

Materials and Methods

In this systematic review and meta-analysis, the databases of the Cochrane Central Register of the Controlled Trials, MEDLINE/PubMed, Scopus, and Web of Science were searched from their establishment until November 5, 2019. Besides, the Google Scholar database was also searched to obtain the citations in the final studies. The following search terms were used for all the databases: Acupressure, Shiatsu, Shiatzu, "Alternative Medicine," "Complementary Therapies," "Traditional Medicine," "Chinese Medicine," "Complementary Medicine," Childbirth, Birth, Labor, Labor and Delivery. No language restrictions were applied to the search. Randomized controlled trials (RCTs) that had investigated the use of acupressure at any acupoint for the labor pain relief and compared this method with either placebo or nonintervention were included in the study. The studies wherein only their abstracts were available, duplicated papers, ineligible placebo, and the studies with contradictory data were excluded from the study. The outcome measure was the pain reduction at labor, usually measured by a 10 cm Visual Analog Scale (VAS). The studies were selected such that initially, the output of the search was evaluated by two authors independently. After reviewing the titles and abstracts of the papers, unrelated studies were excluded. Then, the full-text of the seemingly relevant papers was reviewed to see whether they meet the inclusion criteria for the systematic review. A form was designed to extract the data from the papers including the information on the name of the first author, year, country, sample size, acupoints, comparisons, and outcomes. Data were extracted independently by two researchers.

The risk of bias for each study was assessed by two independent authors using the criteria set out in the Cochrane Handbook.[26] The Cochrane risk-of-bias tool consists of six domains: sequence generation; allocation concealment; blinding of the participants and personnel, blinding of the outcome assessors; incomplete outcome data; selective outcome reporting; and other sources of bias. The risk of bias for each domain was assessed as either low, unclear, or high. Disagreements were resolved through the discussion, and further information was sought from the primary authors if necessary.

Meta-analysis was performed using the Comprehensive Meta-Analysis (CMA) software Version 2. The random-effects model was used for pooling the effect sizes across the included studies. The guidelines of the Cochrane handbook were followed to impute the standard deviations of changes from the baseline. Cochrane Q value was used for assessment of the heterogeneity and the p value of 0.05 was considered as statistically significant. I-squared index was utilized to quantify the amount of heterogeneity. Egger's regression intercept was used for detection of publication bias and $p < 0.05$ was considered as statistically significant.

Ethical considerations

In writing the manuscript, the researchers found themselves obliged to avoid plagiarism. The results of the analysis were quite honest. The researchers avoided data fabrication. They never manipulated the data for their benefit.

Results

In the initial search of the CENTRAL (from 1998 to November 2019), PubMed/MEDLINE (from 1950 to November 2019), Scopus (from 1924 to November 2019), and Web of Science (from 1990 to November 2019) databases, a total of 5853 records corresponding to our search strategy were identified. Subsequently, the overlap of the identified papers was evaluated and the repeated papers were removed. In this stage, 2401 irrelevant records were excluded based on reviewing the titles and abstracts of the papers. The full text was retrieved for the remaining 214 papers. After reviewing the full-text papers, 192 papers were excluded and 22 studies met our inclusion criteria of a systematic review. Finally, 18 studies were included in the meta-analysis [Figure 1].

A total of 2346 participants were involved, ranging from 60 to 213 subjects per study. Twelve (54.5%)

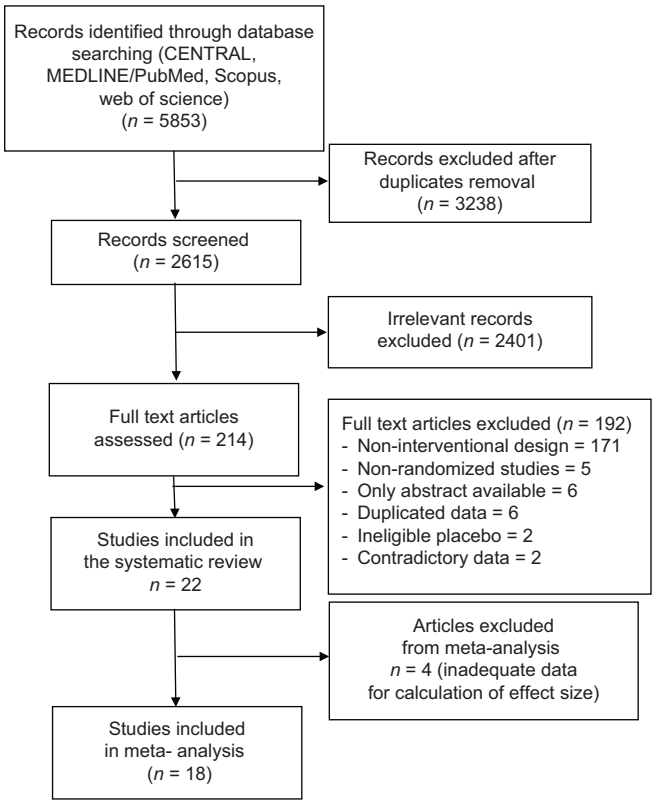


Figure 1: PRISMA* Flow chart of the study. *PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses

studies recruited only the primiparous women[27-38] and 10 (45.5%) studies included both primiparous and multiparous women.[20,23-25,39-44] In 20 (90.9%) trials, the intervention was administered during the active phase of labor. In almost all the studies, the acupressure was performed at term, except for the study by Sebastian where no details were given.[32] Twelve studies were undertaken in Iran,[20,23,24,27,29-31,33,37,40,41,44] four studies were performed in Turkey,[34-36,42] two studies were conducted in India,[28,32] and a study was found for Brazil,[43] Taiwan,[39] Egypt,[38] and Korea[25] [Table 1].

In 17 studies, acupressure was applied at one acupoint: SP6;[24,25,28-30,34-36,38,41,43,44] LI4;[20,32,40,42] BL32,[23] and GB21.[27] Three studies used two acupoints: LI4 and BL67;[39] SP6 and L14,[33] and L14 and BL32[37] and one study had compared the effect of acupressure at two points of LI4 and SP6 on the labor pain.[31]

In seven studies, the amount of pressure used on the points was measured by the electronic weight scales.[23-25,27,29,39,44] In four studies, the applied pressure was about 3–5 kg, and in two of them, this amount was ascertained by one of the researchers who had been trained in a course for acupressure;[20,43] but other studies did not explain about measuring the amount of pressure.[34,42] Gönenç *et al*., located the acupoints using an acupoint device and performed the intervention by the acupressure bands.[36] Hjelmstedt and Dabiri reported that the intensity of pressure was adapted to reach each participant's pain threshold.[28,40] Kordi explained that the amount of pressure on the acupoint was confirmed when the women felt the heaviness, warmth, tingling, or numbness in the targeted area.[41] Sehhatie and Ozgoli identified the amount of the applied pressure by the color of their thumbnail. So, the highest pressure was applied when the thumbnail turned white.[33,37] In the studies by Salehian and Turkmen, a trained person in the field of acupressure performed the intervention but the details were not described.[31,35] Abd El Hamid, Kashanian, and Sebastian did not explain about measuring the amount of pressure on the points.[30,32,38]

Abd El Hamid explained that the acupressure was used by applying direct pressure using the index finger or thumb on both legs at a time for approximately 1 min during each uterine contraction for 30 min.[38] In the study by Yesilcicek, the acupressure was applied for 35 times in total on the SP6 point of both legs including 15 times when the cervical dilation was equal to 2–3 cm, 10 times when the cervical dilation was equal to 5–6 cm, and 10 times at 9–10 cm of cervical dilation; but the total time of intervention was not described.[34] Ozgoli explained that the acupressure was performed 18 times in total: 6 times in each dilation of 4–5, 6–7, and 8–10 cm, respectively.[37] In one of the studies, the acupressure was applied for 16 times during uterine contraction, 8 times at 4–5 cm of cervical dilation and 8 times at 7–8 cm of cervical dilation, respectively. These applications took approximately 90 min.[42] Turkmen stated that the acupressure was applied for about 90 times (40–48 times in the active stage and 35–45 times in the transition stage).[35] In the other studies, the duration of time assigned to the acupressure intervention varied between 20–40 min.

Ten studies used acupressure vs. standard care or nonintervention[23,29,31,32,34,36-39,42] and seven studies used it vs. the placebo.[20,24,25,27,30,33,35] Applying the pressure only on the ineffective areas or touching at the same points was considered as the placebo. In five studies, the acupressure was compared with both the placebo and nonintervention.[28,40,41,43,44]

In general, none of the trials were at low risk of bias in all the domains. Eight of trials (36.3%) reported the adequate allocation concealment using the sequentially numbered,[39] numbered sealed opaque envelops,[28,30,31,34,35,42] and dissimilar block sizes.[33] In most of the trials, the intervention could not be administered under the blinding condition or it was not clear whether the study was blinded to the participants (n = 15, 68.1%) or clinical care providers (n = 17, 77.2%). So, most of the included studies had a high risk of performance bias. Fifteen studies) 68.1%) had an unclear risk of detection bias; as the blinding of outcome assessors to the group, the allocation was not mentioned in them. Only six studies (27.3%) had a low risk of attrition bias. The risk of reporting bias was low in 14 trials 63.60% [Figure 2].

Table 1: Characteristics of included studies

First author (year)	Country	Sample size	Acupressure points	Comparisons	Outcome
Abd El Hamid (2012)[38]	Egypt	100	SP6*	No intervention	A significant difference between groups in subjective labor pain scores at all time-points (immediately after the intervention, 30 min, 60 min, and 120 min after intervention)
Akbarzadeh 1 (2014)[23]	Iran	100	BL32**	No intervention	A significant decrease in labor pain in the acupressure group
Akbarzadeh 2 (2015)[27]	Iran	150	GB21***	Touch	A significant decrease in labor pain at 3-4 cm of cervical dilation in the acupressure group.
					A significant decrease in labor pain at 7-8 cm of cervical dilation in the acupressure group when acupressure was applied at both 3-4 cm and 7-8 cm cervical dilatation
					No significant differences in labor pain scores in both groups at 7-8 cm of cervical dilation when acupressure was applied only at the beginning of the active phase
Chung (2003)[39]	Taiwan	85	LI4**** BL67**	No treatment	A significant decrease in labor pain in the acupressure group vs. control in the active phase of labor
					No significant difference in labor pain among the groups in the latent and transitional phases of labor.
Dabiri (2014)[40]	Iran	149	L14****	No intervention Touch	A significant decrease in labor pain 30 and 60 min after intervention in the acupressure group vs. no intervention.
					Lower pain score for the acupressure group at 30 and 60 min after the intervention compared to the placebo. No details about *p*.
Gönenç (2019)[36]	Turkey	60	SP6*	No intervention	A significant decrease in labor pain in the acupressure group in the active phase and transitional phases of labor
					No significant difference in labor pain among the groups in the latent phase
Hamidzadeh (2012)[20]	Iran	100	LI4****	Touch	A significant decrease in labor pain immediately and 20, 60, 120 min after the intervention and 24 h after delivery in the acupressure group
					No significant difference in labor pain among the groups at 180 min after the intervention and at the onset of the 2nd stage of labor:
Hamlacı (2017)[42]	Turkey	88	LI4****	No intervention	Significant differences between the groups in labor pain scores
Heidari (2008)[24]	Iran	128	SP6*	Touch	No significant difference in labor pain immediately and 30 and 60 min after intervention
Hjelmstedt (2010)[28]	India	213	SP6*	No intervention Touch	A significant decrease in labor pain in the acupressure group vs. no intervention
					No significant difference in labor pain among the intervention and placebo groups 24 h after delivery
Hosseinpour (2012)[29]	Iran	90	SP6*	No intervention	A significant decrease in labor pain immediately and 30 and 60 min after intervention in the acupressure group.
Kashanian (2010)[30]	Iran	120	SP6*	Touch	A significant decrease in labor pain after intervention in the acupressure group
Kordi (2010)[41]	Iran	102	SP6*	No intervention Touch	A significant decrease in overall pain of the active phase of labor in the acupressure group
Lee (2004)[25]	Korea	75	SP6*	Touch	A significant decrease in labor pain immediately and 30 and 60 min after intervention in the acupressure group.
Mafetoni (2016)[43]	Brazil	156	SP6*	No intervention Touch	The mean of labor pain after the intervention was not different in the study groups
Ozgoli (2016)[37]	Iran	105	BL32** LI4****	No intervention	Acupressure on BL32 and LI4 points was effective in reducing labor pain compared to the control group with a slight superiority for BL32 points.
Salehian (2011)[31]	Iran	90	SP6* LI4****	No intervention	Lower pain score for acupressure groups in each of dilatations of 4, 6, 8, and 10 cm

Contd...

Table 1: Contd...

First author (year)	Country	Sample size	Acupressure points	Comparisons	Outcome
Samadi (2010)[44]	Iran	131	SP6*	Touch No intervention	Thirty minutes after the intervention, there was no significant difference in pain intensity between the intervention and control groups
Sebastian (2014)[32]	India	60	L14****	No intervention	A significant decrease in labor pain in the acupressure group
Sehhatie (2013)[33]	Iran	84	SP6* L14****	Pressure on ineffective areas	A significant decrease in the mean of labor pain in each of dilatations of 4, 6, 8, and 10 cm in the acupressure group.
Türkmen (2019)[35]	Turkey	60	SP6*	Touch	The perceived pain level in the active stage in the experimental group was less than the control group There was no statistical significance between groups in the mean pain level during the transition stage.
Yesilcicek Calik (2014)[34]	Turkey	100	SP6*	No intervention	A significant decrease in mean of labor pain in each of dilatations of 2-3 and 5-6 cm and at the second hour after delivery in the acupressure group No significant difference in labor pain among the groups at the dilation of 8-9 cm

*SP=Spleen, **BL=Bladder, ***GB=Gall Bladder, ****LI=Large Intestine

Nineteen studies reported mean labor pain based on a 10 cm VAS. In three studies, the mean differences in the labor pain were also reported based on the VAS.[32,33,44] Chung just reported the mean differences in labor pain.[39] In two studies, only mean labor pain was reported in two study groups and the standard deviation was not reported.[34,38]

The meta-analysis was performed on 18 trials. According to the forest plot of the meta-analysis, the overall difference in means of the VAS changes was equal to -1.671 in the acupressure-treated group compared to the control group [-2.29 to -1.05], z = -5.25, $p < 0.001$ [Figure 3] (Q-value = 788.98, $p < 0.001$, I-squared = 96.83) meaning that generally, the amount of increase in the VAS was 1.67 cm less in the acupressure-treated group (change to the baseline) than the control group. Subgroup analyses regarding the type of the control group showed the following pooled difference in the means: Nonintervention group: -2.17[-3.24 to -1.09], $p < 0.001$ and placebo group: -1.15[-1.56 to -0.74], $p < 0.001$. The results showed no publication bias in the included RCTs (Egger's regression intercept =-1.02, $p = 0.76$).

Discussion

Considering the results of this systematic review and meta-analysis, the application of acupressure in the laboring women could be propounded as an effective non-pharmacological method in reducing the severity of labor pain. There are some potential mechanisms to explain why applying acupressure might reduce labor pain. According to the meridian theory of Chinese Medicine, energy (Qi) is one of the fundamental substances circulating the human body through the meridians, which are invisible circuitries or energy channels in the body. This theory assumes that the mental or physical health is disturbed if the flow of Qi is too fast, too slow, turbulent, or static.[45,46] On the other hand, the Qi facilitates the circulation of the air, nutrients, and blood and serves as a nutritive substance to maintain the functional activities of the human body. Thus, Qi must remain balanced to maintain health.[47] Acupressure corrects the flow of Qi by applying the pressure to the given acupuncture points through the fingers.[45,46] In Chinese traditional medicine, the effectiveness of the acupressure in relieving the labor pain is attributed to the reinforcement of the blood circulation and vital energy, relieving the cramping pain in the uterus of the pregnant women.[48] The gate control theory proposed by Melzack and Wall[49] and endorphin-release theory[50] are the other endogenous mechanisms explaining why the acupressure decreases the labor pain intensity. Acupoints are the locations of the sensory receptors with thin afferent fibers placed in the muscles. The gate control theory explains that stimulation of the thick myelinated nerve fibers causes a neural inhibition at the spinal level blocking the transport of the pain stimuli to the brain via the nonmyelinated nerve fibers.[51] According to the endorphin-release theory, the acupressure-related pain relief may be explained by the release of a group of substances called the endorphins, which are the natural opiate-like substances thereby causing the pain suppression.[50] Besides, the decrease in the labor pain occurring during the acupressure might be attributed to the distraction from pain. Distraction includes providing the laboring women with specific activities so that, their conscious thoughts and anxieties are reduced.[52]

Mollart in a review study on the effect of the acupressure on the labor process introduced the exclusion of four trials in Persian because of language restriction as a limitation

of the review.[53] In this review, no time and linguistic restrictions were applied in searching the databases.

There are some important points from the RCTs included in this systematic review that should be borne in mind while interpreting the results. The quality of the RCTs included in the review was mixed and none of the studies was at low risk of bias in all the domains. A high level of high or unclear risk of bias at the domain of incomplete outcome data means that the primary balance applied by the randomization may have been missed and the main results may have been influenced by the confounding variables. The risk of bias was relatively low for the random sequence generation; however, 57.9% of trials had an unclear risk of bias regarding the allocation concealment and the unclear risk of selection bias should be considered in these studies. Schulz explained that the RCTs that had used inadequate or unclear allocation concealment, had estimated the effect size by 40% more than those with adequate allocation concealment.[54] As a challenging issue, in most of the studies, blinding of the participants and their caregivers to the group allocation were not possible meaning that the absence of blinding can increase the rate of performance bias. Additionally, in the control groups, the definition of the standard care or routine care may be varied in the studies, and in most of the studies, the standard care or routine care were not explained by the authors adequately.

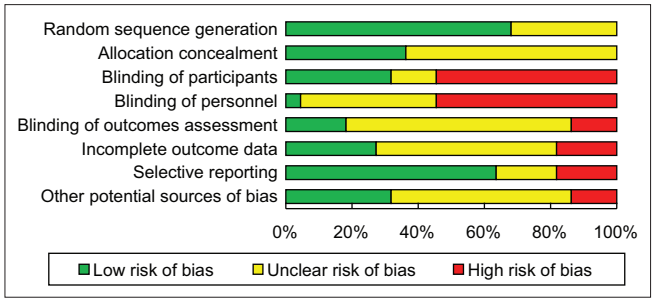
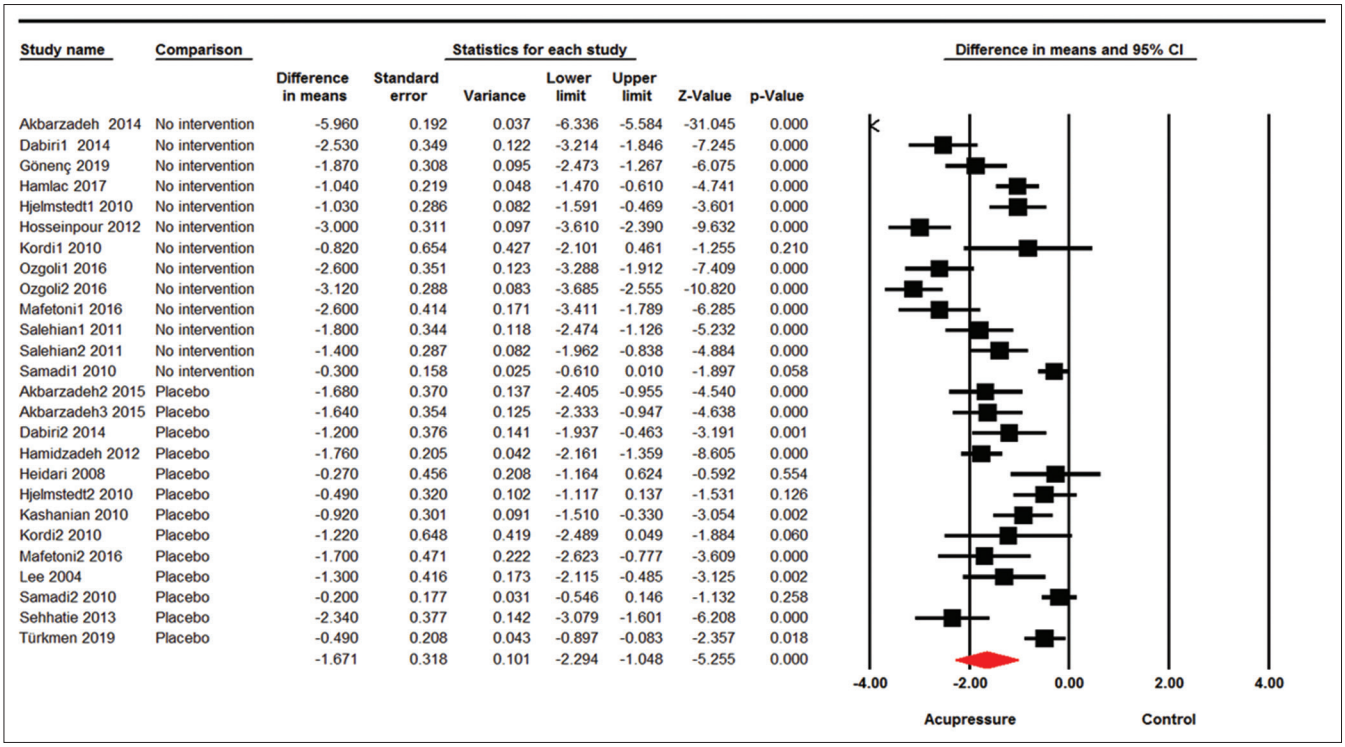


Figure 2: Percentage of risk of bias in each domain in all included studies

In this review, no time and linguistic restrictions were applied in searching the databases. Two reviewers evaluated the eligibility of the studies, extracted the data, and assessed the risk of bias for each study independently. The possibility of missing some previous related studies cannot be ruled out. Because some studies may have not been published in the mainstream journals and therefore, may be excluded from the main databases.

Conclusion

Despite the above-mentioned challenges, it is believed that applying the acupressure in the labor phase compared to the placebo or nonintervention could provide an effective and low-cost intervention to reduce the labor pain for the parturient women, especially in the low-resource settings. However, more high-quality RCTs are needed to provide high-quality evidence on the use of acupressure for women during labor to reduce labor pain. Given the limitations of the included studies, it is suggested to perform more powerful randomized interventional studies with the least



Study name	Comparison	Difference in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Akbarzadeh 2014	No intervention	-5.960	0.192	0.037	-6.336	-5.584	-31.045	0.000
Dabiri1 2014	No intervention	-2.530	0.349	0.122	-3.214	-1.846	-7.245	0.000
Gönenç 2019	No intervention	-1.870	0.308	0.095	-2.473	-1.267	-6.075	0.000
Hamlac 2017	No intervention	-1.040	0.219	0.048	-1.470	-0.610	-4.741	0.000
Hjelmstedt1 2010	No intervention	-1.030	0.286	0.082	-1.591	-0.469	-3.601	0.000
Hosseinpour 2012	No intervention	-3.000	0.311	0.097	-3.610	-2.390	-9.632	0.000
Kordi1 2010	No intervention	-0.820	0.654	0.427	-2.101	0.461	-1.255	0.210
Ozgoli1 2016	No intervention	-2.600	0.351	0.123	-3.288	-1.912	-7.409	0.000
Ozgoli2 2016	No intervention	-3.120	0.288	0.083	-3.685	-2.555	-10.820	0.000
Mafetoni1 2016	No intervention	-2.600	0.414	0.171	-3.411	-1.789	-6.285	0.000
Salehian1 2011	No intervention	-1.800	0.344	0.118	-2.474	-1.126	-5.232	0.000
Salehian2 2011	No intervention	-1.400	0.287	0.082	-1.962	-0.838	-4.884	0.000
Samadi1 2010	No intervention	-0.300	0.158	0.025	-0.610	0.010	-1.897	0.058
Akbarzadeh2 2015	Placebo	-1.680	0.370	0.137	-2.405	-0.955	-4.540	0.000
Akbarzadeh3 2015	Placebo	-1.640	0.354	0.125	-2.333	-0.947	-4.638	0.000
Dabiri2 2014	Placebo	-1.200	0.376	0.141	-1.937	-0.463	-3.191	0.001
Hamidzadeh 2012	Placebo	-1.760	0.205	0.042	-2.161	-1.359	-8.605	0.000
Heidari 2008	Placebo	-0.270	0.456	0.208	-1.164	0.624	-0.592	0.554
Hjelmstedt2 2010	Placebo	-0.490	0.320	0.102	-1.117	0.137	-1.531	0.126
Kashanian 2010	Placebo	-0.920	0.301	0.091	-1.510	-0.330	-3.054	0.002
Kordi2 2010	Placebo	-1.220	0.648	0.419	-2.489	0.049	-1.884	0.060
Mafetoni2 2016	Placebo	-1.700	0.471	0.222	-2.623	-0.777	-3.609	0.000
Lee 2004	Placebo	-1.300	0.416	0.173	-2.115	-0.485	-3.125	0.002
Samadi2 2010	Placebo	-0.200	0.177	0.031	-0.546	0.146	-1.132	0.258
Sehhatie 2013	Placebo	-2.340	0.377	0.142	-3.079	-1.601	-6.208	0.000
Türkmen 2019	Placebo	-0.490	0.208	0.043	-0.897	-0.083	-2.357	0.018
		-1.671	0.318	0.101	-2.294	-1.048	-5.255	0.000

Figure 3: Forest plot of the meta-analysis

biases to more identify the real effects of the acupressure on the labor pain.

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Conflicts of interest

Nothing to declare.

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