Review Paper

Investigating the Effects of Acupressure and Auriculotherapy on Anxiety During Labor, Neonatal Outcomes, and Maternal-fetal Attachment: A Systematic Review and Meta-analysis

Maryam Mirzaei[1], Vahideh Hafezi Siahlarz[2], Sara Saadat[3], Firoozeh Mirzaee[4], Malihe Afiat Milad[5], Masumeh Ghazanfarpour[4*]

1. Department of Obstetrics and Gynecology, Faculty of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran.
2. Department of Obstetrics and Gynaecology, Alzahra Hospital, Guilan University of Medical Sciences, Rasht, Iran.
3. Division of Nephrology, Department of Pediatrics, Dr Sheikh Hospital, Mashhad University of Medical Sciences, Mashhad, Iran.
4. Reproductive and Family Health Research Center, Kerman University of Medical Sciences, Kerman, Iran.
5. Milad Infertility Center, Mashhad University of Medical Sciences, Mashhad, Iran.

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ABSTRACT

Background: Divergent findings reported in the literature on the impact of acupressure on improvement in mothers' anxiety during labor and consequently on birth outcomes. However, there is no existing meta-analysis on this issue.

Objectives: This systematic review assesses the effect of acupressure and auriculotherapy on anxiety during labor, neonatal outcomes, and maternal-fetal attachment.

Methods: The Cochrane central register of controlled trials, MEDLINE/PubMed, ISI, and Scopus online databases were searched by two researchers up to January 2023. The quality of studies was assessed based on the Jade scale.

Results: Nine studies were included in the systematic review and meta-analysis. Acupressure significantly decreased anxiety compared to touching (standardized mean difference=-3.29; P<0.001; I^2=8%; P=0.295; the fixed effect model) and routine care (standardized mean difference=-1.08; confidence interval=-2.46 to 0.30; P=0.12; I^2=96.19%; P<0.001). Maternal-fetal attachment was higher in both groups who received acupressure and auriculotherapy compared to the control group (P<0.001). Meanwhile, auriculotherapy did not impact neonatal outcomes, such as newborns' weight and Apgar score.

Conclusions: Acupressure was an effective tool to improve anxiety during labor and it consequently improved fetal oxygenation.

** Corresponding Author:*
Masumeh Ghazanfarpour, Assistant Professor.
Address: *Reproductive and Family Health Research Center, Kerman University of Medical Sciences, Kerman, Iran.*
Tel: *+98 (913) 6330656*
E-mail: *masumeh.ghazanfarpour@yahoo.com*

Introduction

Childbirth is usually an adverse experience associated with stress, agony, lethargy, fear, and gloominess, which deteriorates as the labor progresses [1]. There is a direct relationship between the dread of childbirth and anxiety [2]. Pain and anxiety during labor have a negative effect on maternal-fetal attachment [3]. Stress and release of cortisol and catechol amines can lengthen the process of labor, reduce placental blood flow, and lead to fetal asphyxia [4] and Apgar score [5]. Although C-section (C/S) has a mortality rate five times higher than normal vaginal delivery, the labor pain pushes mothers to select C/S. The rate of C/S in Iran has risen to 40%–50% and the share of C/S with minor pain among Iranian women is close to 60% [6].

Hence, to mitigate the adverse effects of physiological processes induced by maternal agony and anxiety, which may lead to maternal and fetal losses, the need for interventions is strongly felt [7]. Acupressure is a noninvasive method that eradicates vital energy imbalance, relieves pain, reduces muscle tension, enhances blood circulation and critical activities, and soothes anxiety symptoms [3]. Manual stimulation of acupuncture points has been suggested as a technique to boost the secretion of serotonin and endorphin and refine the regulation of serum cortisol. Consequently, stimulated hormones can alleviate anxiety [8]. Auriculotherapy is a subbranch of acupuncture that alleviates pathological conditions in other parts of the body by stimulating specific points located in the auricle [9].

In the literature review, this study found five articles that assessed the effect of acupressure on anxiety during labor [3, 7, 8, 10, 11]. Akbarzadeh [7] showed that acupressure at the BL32 point could reduce the maternal anxiety score [7]. In the study of Kaviani [10], both acupressure and ice massage could significantly ($P \leq 0.001$) reduce anxiety levels in the intervention group compared to the control group [10]. Lee et al. revealed that anxiety level was significantly lower in the group receiving acupressure at SP6 compared to the placebo group [11]. Moradi [3] exhibited that anxiety level in the intervention groups was significantly lower than the control group after 1-h intervention ($P<0.001$). Contrary to the above study, the findings of Samadi revealed that acupressure at S6 and touch on SP6 were not significantly different in terms of their effect on reducing anxiety levels during labor [8].

Mother's anxiety may have significant negative effects on mother-infant attachment [12], newborn's health [10, 4], and neonatal outcomes, such as Apgar [5, 10], prematurity, and low birth weight [13]. Auriculotherapy reduces mothers' anxiety during labor; however, it has no significant effect on birth outcomes, such as newborns' weight and Apgar score [14]. In contrast to the abovementioned study, another study showed that supportive care and acupressure reduced mothers' anxiety and improved fetal oxygenation [4]. There are several reasons stimulating researchers to conduct a systematic meta-analysis. First, this approach has not been used in practice, which could be explained by the lack of a systematic review/meta-analysis assessing the effect of acupressure on anxiety during labor. Second, there are divergent findings reported in the literature on the impact of acupressure on improvement in mothers' anxiety during labor and consequently on birth outcomes. Third, the scarcity of studies in this field has urged authors to conduct this meta-analysis. For this purpose, this systematic review was undertaken to assess the effect of acupressure and auriculotherapy on anxiety during labor, neonatal outcomes, and maternal-fetal attachment and to expand health providers' knowledge about acupressure and enhanced comfort levels of pregnant women during labor.

Methods

This systematic review and meta-analysis was conducted based on the preferred reporting items for systematic reviews and meta-analyses statement guidelines.

Data sources and search strategy

Two researchers searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE/PubMed, and Scopus until January 2023. The search key terms were as follows: "Acupressure" OR "finger massage" OR "auriculotherapy" OR "acupressure" AND "labor" OR "labour" AND "stress" OR "anxiety" OR "apgar" OR "neonatal outcomes" OR "maternal-fetal" attachment".

Moreover, the reference lists of reviewed articles were screened to identify further relevant publications. After removing duplicates, the two researchers independently screened the titles and abstracts for eligibility based on the predefined inclusion criteria. Meanwhile, the two researchers independently screened the full texts. All reviewers discussed any discrepancies in the extracted data.

Inclusion criteria

Randomized clinical trials were included in this review. Studies in which acupuncture had been employed alone or in combination with other interventions for women experiencing labor anxiety, regardless of the labor stage at which it had been administered, were included in this meta-analysis

Quality assessment of chosen articles

The Jadad scale was used to assess the quality of articles based on five criteria, including the following statements: "Was the study randomized?", "Was the randomization method appropriate or inappropriate?", "Was the study described as blind?", "Was the blinding method appropriate?", and "Was there any description of withdrawals and dropouts?". The Jadad scale is in the range of 0-5 [15]. The two researchers independently carried out a quality assessment of articles (Table 1).

Data extraction

Data extraction was conducted by the authors. Accordingly, two researchers extracted data, including the name of authors, country, publication date, age, number of participants, treatment and control groups, type of control, type of anxiety questionnaire, gestational age, main findings, and side effects of studies (Table 2). Disagreements were settled through consensus.

Statistical analysis

All statistical analyses were conducted using comprehensive meta-analysis, version 2. We also used standardized mean difference (SMD) because studies employed different scales and acupressure points to measure anxiety levels. Heterogeneity was assessed by statistic and Cochrane Q test (assessed by P). Meanwhile, I^2>50% exhibited a significant heterogeneity across studies [16]. A random-effects model was adopted in the case of significant heterogeneity; otherwise, the results were combined with the fixed-effects model. As suggested by Cohen, the effect sizes of 0.20, 0.50, and 0.80 were categorized as small, medium and large, respectively [17].

Results

Acupressure and auriculotherapy on mother-infant attachment

In the first study, the mean score of mother-infant attachment was higher in the auriculotherapy than control group 10 days after delivery (P=0.004); however, this difference was significant 24 h after delivery [12]. In the second study, women were randomized into three groups: Acupressure at GB21 acupoint, acupressure at SP6 acupoint, and control group. Maternal-fetal attachment was higher in both acupressure groups compared to the control group (P<0.001) [3].

Table 1. Quality assessment of studies included in the systematic review and meta-analysis

Author, Year	Randomization			Blinding			Report of Dropout
	Randomization Is Mentioned	Appropriate Method	Inappropriate Method	Blinding Is Mentioned	Appropriate Method	Inappropriate Method	
Vakilian et al. 2022 [14]	*	*	-	-	-	-	+
Masoudi et al. 2022 [4]	*	*	-	-	-	-	+
Torkian et al. 2023 [12]	*	*	-	-	-	-	+
Ranjkesh et al. 2019 [18]	*	*	-	-	-	-	+
Samadi et al. 2018 [8]	*	*	-	-	-	-	-
Kaviani et al. 2012 [10]	*	*	-	*	*	-	-
Moradi et al. 2014 [3]	*	*	-	*	*	-	-
Akbarzadeh et al. 2015 [7]	*	*	-	-	-	-	-
Lee et al. 2004 [11]	*	-	-	*	*	-	-

Acupressure and auriculotherapy on neonatal outcomes

In the first study, the effect of auriculotherapy on newborns' weight and Apgar score was investigated as secondary outcomes. There was no significant difference between newborns' weight and Apgar score in the auriculotherapy and control group (P>0.05) [14]. Meanwhile, in the second study, the supportive care and acupressure reduced mothers' anxiety and consequently improved fetal oxygenation [4].

Acupressure and auriculotherapy on anxiety

According to the results of our review, the visual analog scale for anxiety was adopted in one study [11], faces anxiety scale in one study [10], and Spielberger questionnaire in two studies [3, 7, 10]. Three studies had used acupressure point SP6 [3, 7, 8], one LI4 [10], one BL32 [7] and one GB21 [3]. Besides, three studies [3, 8, 10, 11] had applied touch in the control and two studies [7, 8] had used routine care for the control group. Meanwhile, four studies [3, 7, 8, 10] were undertaken in Iran and one was conducted in South Korea. A total of 151 records were identified in the database search, of which only 80 studies remained after removing duplicates. These studies were further screened by reading titles and abstracts and finally, 75 studies were excluded. The remaining 5 full-text articles were assessed for eligibility, all of which were included in the quantitative and qualitative synthesis (Figure 1).

All of the included studies [3, 10, 11], except for one [8], had reported the beneficial effects of acupressure on anxiety during labor. Acupressure could significantly decrease anxiety levels compared to simple touch (SMD=-1.63; 95% confidence interval [CI], -2.71%, -0.56%; P=0.003 (Figure 2)) [3, 8, 10, 11]. However, there was tremendous heterogeneity in the findings (I^2=96.7%; P<0.001; Tau^2=1.4). Sensitivity analysis was performed to identify potential resources of heterogeneity; however, the results were not satisfactory. Subgroup analysis based on acupoint SP6 was conducted,

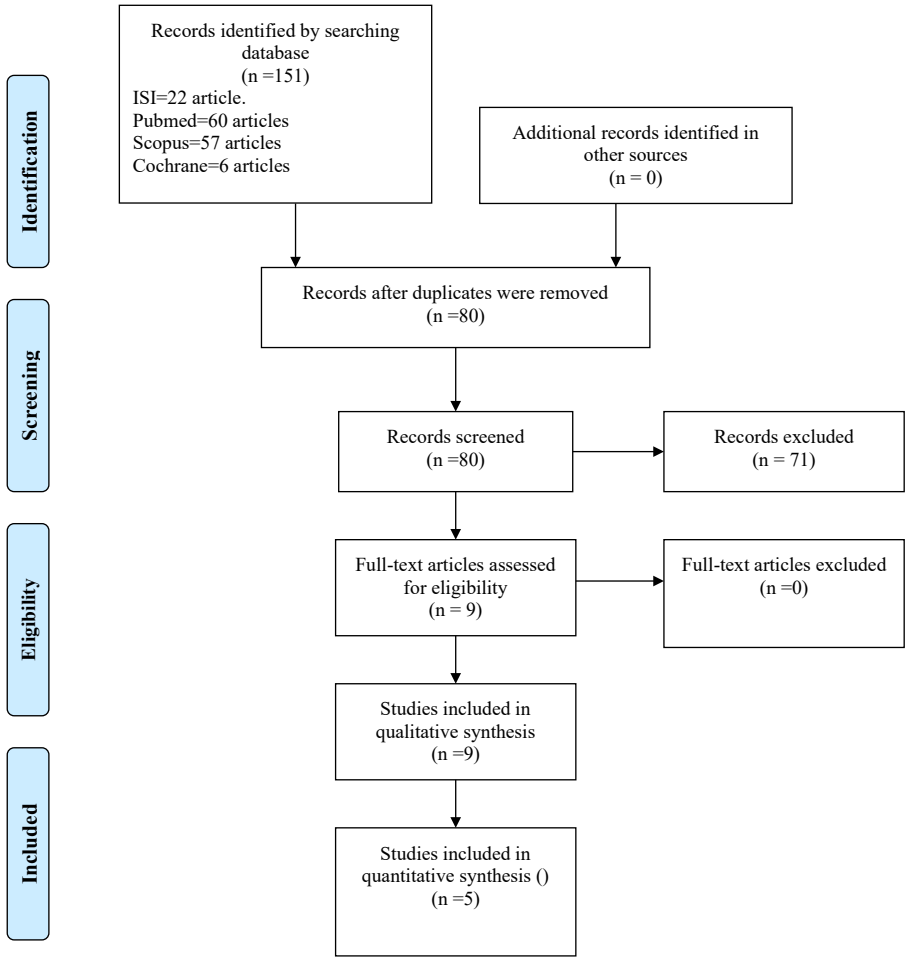

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Figure 1. PRISMA 2009 flow diagram, the preferred reporting items for systematic reviews and meta-analyses flowchart for the selection of studies

Table 2. Characteristics of studies included in the systematic review and meta-analysis

Author, Year	Age (y)	Gestational Age	Questionnaire	Type of Control	Number of Participants Treatment/ Control	Adverse Effect	Drop out	Acupressure Point	Main Findings
Vakilian et al. 2022 [14]	-	37<	STAI	Routine care	83/83			Shenmen, thalamic, zero, brain, and brain stem	
Torkian et al. 2023 [12]	28.6	37<	MPAS	Routine care	53/53		9	Oxytocin, uterus, shenmen, thalamic, lung 1, and lung 2	
Masoudi et al. 2022 [4]	18–35		STAI PO2	Control, supportive	50/50/50		0	BL32	The difference between the three group was significant (P<0.001) regarding STAI and PO2.
Ranjkesh et al. 2019 [18]	24	37-42	STAI	Routine care	64/66		14	H7, LI4, SP6 NEIMA	Anxiety levels were significantly lower in the (7, LI4, SP6, NEIMA) acupressure group compared to the control group (P=0.04).
Akbarzadeh et al. 2015 [7]	18-35	37-41	STAI	Routine care	50/50	NA	0	BL32	Anxiety rose by 21.1% in the control group, but it decreased by 34.8% in the acupressure group, and the difference was statistically significant (P<0.001).
Samadi et al. 2018 [8]	18-35	37<	FAS	Routine care/ touch group	Touch=41; routine care=49	NA	0	SP6	Acupressure point SP6 and touch point SP6 were not significantly different.
Lee et al. 2004 [11]	29	37<	VAS	Touch group	36/39	NA	0	SP6	Anxiety levels were significantly lower in the SP6 acupressure group than in the SP6 touch group (t=2.214, P=0.030).
Kaviani et al. 2011 [10]	NA	37<	STAI	Touch group	55/55	NA	0	LI4	Anxiety levels were significantly lower than the control group (P<0.001).
Moradi et al. 2014 [3]	25.88±3.47, 24.86±3.90, and 25.02±4.65 years in the GB21, SP6, and the control groups, respectively.	37-42	STAI AOF	Touch	50/50	NA	NA	SP6, GB21	1 h after the intervention, this measure was significantly lower in the intervention group than in the control group (P<0.001).

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Abbreviations: FAS: Faces anxiety scale; STAI: The state-trait anxiety inventory; VAS: Visual analog scale; MPAS: Maternal postnatal attachment scale; AOF: Avant observation form; PO2: The umbilical cord of infants.

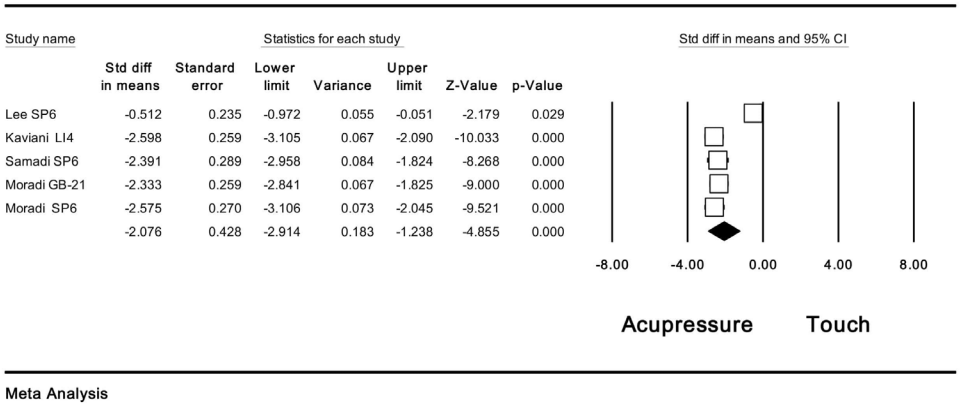

Figure 2. Effect of acupressure versus touch on anxiety score

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Notes: The horizontal lines denote 95% confidence interval.

■A point estimate (the size of the square corresponds to its weight), ◆Combined overall effect of treatment.

with the results suggesting that acupoint SP6 and touch point SP6 were not significantly different at mitigating anxiety (SMD=-1.07; 95% CI, -2.47%, 0.319%; P=0.13; I^2=96.19%; P<0.001; Tau^2=146; the random effect model (Figure 3)) [3, 7, 8]. By omitting the study by Moradi [3] from the pooled analysis, heterogeneity dropped to 12% (P=0.285), making the difference between the two groups non-significant (P=0.56). Acupressure was more effective than routine care in improving anxiety (SMD=-4.58; 95% CI=-5.65%, -3.52%; P<0.001; I^2=71.33%; P=0.062; Tau^2=0.424; the random effect model (Figure 4)) [7, 8].

Three trials had no appropriate data to enter into meta-analysis. Therefore, we reported them qualitatively. One study applied a combination of acupressure points [18], the data of a study was reported as a percentage [4], and one study assessed the effect of auriculotherapy on anxiety [14]. Three studies were not in the acupressure point SP6 and Neima was stimulated in cervical dilatation of 4 cm and then from cervical dilatation of 8 cm. LI4 and H4 point was stimulated and continued until the end of delivery of women in the intervention group. Anxiety levels were significantly lower in the (7 LI4, SP6mNEIMA) acupressure group compared to the control group (P=0.04) [18]. In the second study, the mean of anxiety score decreased by 21.1%, 37.5%,

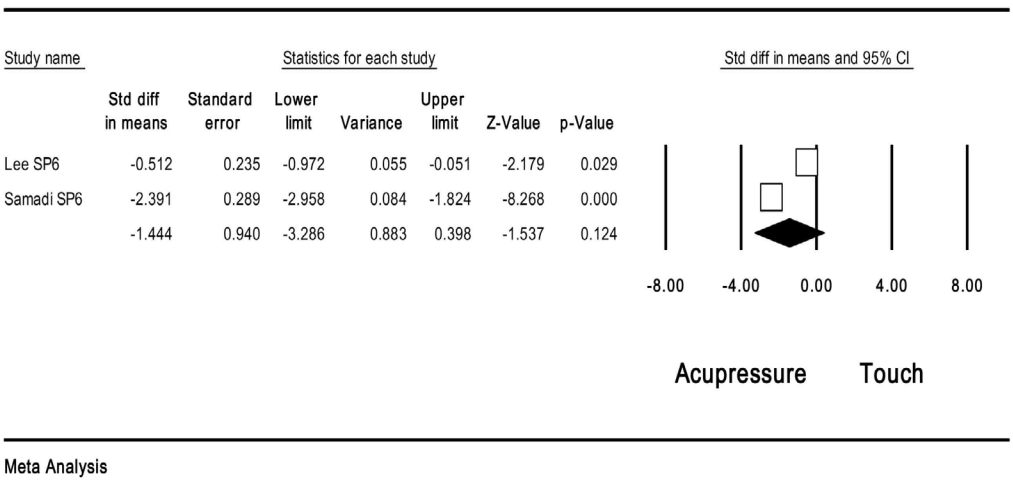

Figure 3. The effect of acupressure SP6 on anxiety score

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Notes: The horizontal lines denote a 95% confidence interval.

■A point estimate (the size of the square corresponds to its weight), ◆Combined overall effect of treatment.

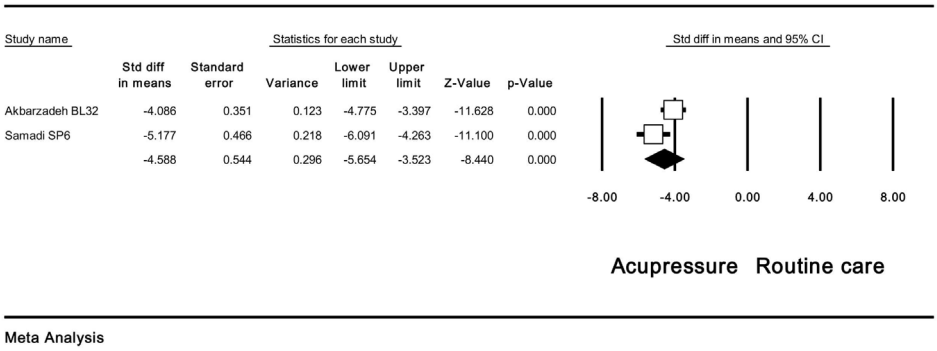

Figure 4. Effect of acupressure versus control on anxiety score

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Notes: The horizontal lines denote 95% confidence interval.

■A point estimate (the size of the square corresponds to its weight), ◆Combined overall effect of treatment.

and 34.8% in the control, supportive, and acupressure groups, respectively. The difference between the three groups was significant (P<0.001) [4]. In the third study, the auriculotherapy was effective in reducing the anxiety state in the intervention group compared to the control group (P=0.001) [14].

Discussion

To the best of our knowledge, this is the first systematic review and meta-analysis to assess the effect of acupressure on anxiety during labor. All reviewed trials [3, 10, 11], except for one [8], had reported that acupressure stimulations were more effective than simple touching in relieving anxiety during labor. Maternal-fetal attachment was higher in both groups who received acupressure and auriculotherapy on anxiety during labor than the control group. The effect of auriculotherapy did not have an impact on neonatal outcomes, such as on newborns' weight and Apgar score

Stress and anxiety can stimulate the secretion of epinephrine and norepinephrine. Epinephrine acts on the β-adrenergic receptors in the uterus, leading to uterine muscle hypoxia, disruption of the uteroplacental blood perfusion, and fetal hypoxia. Also, norepinephrine via α-adrenergic receptors leads to the disruption of uterine contractions and lasted labor, which might result in C/S. Therefore, it is important to relieve anxiety during labor [3].

Although the basic mechanism of acupressure is unclear, it acts via two potential mechanisms. At first, it triggers the release of neurotransmitters, such as serotonin, which has a bearing on serenity. Also, acupressure can be applied to some specific peptides with analgesic properties, thereby restraining the activity of the sympathoadrenal system, which is activated under stressful conditions [3].

A combination of these four studies exhibited that acupressure at acupoints (GB21, BL32, and LI4) could significantly relieve anxiety compared to both simple touching and routine care immediately after the intervention.

One study reported that the effect of acupressure at GB21 and SP6 points lasted for 60 min [3], while another declared that acupressure at SP6 persisted for 30 min [8]. Therefore, the anti-anxiety effects of acupressure can continue for at least 30-60 min. The subgroup analyses of three studies in our meta-analysis [3, 8, 11] showed that acupressure point SP6 and touch point SP6 yielded relatively similar outcomes in terms of mitigating anxiety.

A quantitative analysis of 23 studies suggested that acupoint stimulation could be an effective technique for mitigating anxiety and depression in patients with cancer [19].

In a clinical systematic review, Sniezek and Siddiqui. provided ample evidence that supported the effectiveness of acupuncture as an intervention to improve major depressive disorders in pregnancy [20]. In Allan et al.'s meta-analysis, the comparison of acupuncture with a no-intervention control group exhibited significant clinical mitigation in the anxiety level of dental patients, though an insignificant drop was observed when acupuncture was compared with a sham/placebo control [21]. A meta-analysis compared acupuncture and non-acupuncture interventions in the treatment of anxiety, but it did not report any significant difference between

the two groups. The authors reported a general trend in favor of acupuncture, but the presented evidence is insufficient due to the publication bias and low-quality methodology of studies included in the systematic review [22].

Recently, several review papers have explored the effectiveness of this approach in mitigating anxiety induced by other problems. An integrative review reported inconsistent results regarding the effect of acupressure on anxiety and agitation in the elderly [23]. According to the preliminary review, acupuncture or acupressure at EX-HN3 points can be used to alleviate preoperative anxiety in patients [24]. The review of Dehghanmehr found that acupressure at P6, GB21, and LIV3 could be used to relieve the anxiety of patients undergoing hemodialysis [25]. A systematic review and meta-analysis of five studies concluded that acupressure could be effective in relieving pretreatment anxiety of adults with a medium effect size [26].

Conclusion

Acupressure at GB21, BL32, and LI4 points but not SP6, provides an effective way of relieving anxiety during labor. Acupressure is a simple, low-cost, and safe technique. Therefore, the authors suggest further well-designed, randomized, blinded, and sham-controlled studies to investigate this issue in the future. In addition, further studies on the potential mechanism of anxiolytic effect are needed to shed light on this topic.

Study limitations

There were several limitations in the current systematic review. Given the nature of acupuncture, blinding was either ignored or implemented inappropriately in some trials, which may decrease methodological quality. Despite the small number of trials, there was huge heterogeneity between studies. This heterogeneity could be explained in terms of pressure duration, the type of pressure and analgesic given to women, the support of nurses and midwives, hospital policies, cultural differences affecting the perceived anxiety level, and the experience of previous labor pain. Despite the potential limitations described above, acupressure at GB21, BL32, and LI4 points can be used in clinical settings to promote the quality of care in women during labor.

Ethical Considerations

Compliance with ethical guidelines

This article is a meta-analysis with no human or animal sample.

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Authors contributions

Conceptualization, project administration, and funding acquisition: Vahideh Hafezi Siahlarz, Malihe Afiat Milad, Sara Saadat and Masumeh Ghazanfarpour; Methodology: Vahideh Hafezi Siahlarz, Firoozeh Mirzaee, Sara Saadat and Masumeh Ghazanfarpour; Software: Masumeh Ghazanfarpour, Malihe Afiat Milad and Vahideh Hafezi Siahlarz; Validation and supervision: Vahideh Hafezi Siahlarz and Sara Saadat; Formal analysis: Vahideh Hafezi Siahlarz, Firoozeh Mirzaee and Malihe Afiat Milad; Investigation: Masumeh Ghazanfarpour, Malihe Afiat Milad and Sara Saadat; Resources: Vahideh Hafezi Siahlarz, Firoozeh Mirzaee and Masumeh Ghazanfarpour; Data curation: Vahideh Hafezi Siahlarz, Malihe Afiat Milad and Firoozeh Mirzaee; Writing the original draft: Masumeh Ghazanfarpour, Vahideh Hafezi Siahlarz and Sara Saadat; Review and editing: All authors.

Conflicts of interest

The authors declared no conflict of interest.

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