

Review Article

Effect of acupuncture on pregnancy related low back pain and pelvic pain: a systematic review and meta-analysis

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Abstract: Objective: Low back pain (LBP) and pelvic pain including pelvic girdle pain (PGP) are very common discomfort during pregnancy. The aim of this meta analysis was to evaluate the efficacy of acupuncture on pain relief among pregnancy and postpartum women. Methods: Two of our current authors separately searched the Pubmed, the Cochrane Library, Embase, CNKI, Wanfang database, and National Science and Technology Library for randomized controlled trials (RCTs) until May 2015. Data were processed using Review Manager. Results: Ten articles with 1094 subjects were included in this meta analysis. Acupuncture caused more VAS score reduction than control group (mean difference (MD) = 22.4, 95% confidence interval (CI): 7.40 to 37.39) which was treated with physiotherapy, conventional therapy and sham acupuncture; Subgroup analysis of total efficacy between the two groups showed acupuncture was more effective than control group (odds ratio (OR) = 5.45, 95% CI: 2.68 to 11.09). Acupuncture tended to be more effective on late pregnancy pain and morning pain without quantified data. Incidence of side effects in the two groups were both low without detailed data. Conclusion: Acupuncture demonstrated advantages in treating pregnancy related low back pain and pelvic pain through quantified experimental data. Data on safety of acupuncture was too few to provide beneficial support. Insertion depth may be a new and interesting direction for acupuncture research.

Keywords: Acupuncture, low back pain, pelvic pain, pregnancy

Introduction

Low back pain (LBP) and pelvic pain including pelvic girdle pain (PGP) are very common complaint during pregnancy, the prevalence is reported to range from 24% to 90%, because there is no clear definition and assessment for that condition [1]. The pain occurs in the first trimester and tends to increase with advancing pregnancy [2]. Some women may have symptoms until postpartum and the prevalence is range from 0.6% to 67% with an average incidence of 24.7% [3]. The pain has seriously affected daily life and work in women of child-bearing age.

PGP commonly localizes between posterior iliac crest and gluteal folds, especially at the area of sacroiliac joints, and can radiate into the posterior thigh. It may occur in conjunction with or separately in the symphysis, whereas LBP arises from the twelfth rib and the gluteal fold [4]. For many women, pain can adversely affect daily life, interfere sleep, lead to more sick leave and bed rest [5].

Current studies have failed to reliably distinguish the two kinds of pain, and the etiologies and pathologies are still unclear. Possible mechanisms may be changes of position combined with increased lumbar lordosis in order

to balance previously increased uterine weight, and neuromuscular control disorders [4]. Risk factors such as hormonal changes, mechanical and circulation changes have also been demonstrated [4]. Hormonal changes can alter laxity of joints and ligaments in lumbar and pelvis [6], while increased uterine volume and fetus weight would affect maternal posture, lumbosacral nerve roots and blood flow [1].

Treatments recommended for low back pain and/or pelvic girdle pain contain pharmacological therapy, land or water based exercise, spinal or osteopathic manual therapy, acupuncture, multi-modal approach, and using pelvic belts and pillows [7]. All the treatment has not yet been determined to be entirely effective for patients. In this article, we mainly discussed the effectiveness of acupuncture on pregnancy related low back pain and/or pelvic pain during gestation period and postpartum.

Materials and methods

Inclusion and exclusion criteria

The current authors included randomized controlled trials (RCTs) focused on the efficacy and safety of acupuncture in women who were undergoing pregnancy or postpartum period and simultaneously suffering from LBP and/or PGP without language limitation. The inclusion criteria contain: (1) RCTs; (2) pregnant or postpartum women with spontaneous symptoms; (3) using acupuncture as an intervention. Studies with following properties were excluded: (1) symptoms caused by surgery, cancer, spinal lesions, especially disc herniation; (2) participants with other pregnancy related complications; (3) no full text; (4) duplications; (5) missing data; (6) inappropriate statistical analysis.

Animal experiments, case reports, reviews and articles reporting other treatments were also excluded.

Search strategy

We broadly searched the Pubmed, the Cochrane Library, Embase, CNKI, Wanfang database, and National Science and Technology Library until May 2015 without language limitation. The key words were “back pain”, “low back pain”, “pelvic girdle pain”, “pregnancy”, “postpartum pain” and “acupuncture”. Reference lists of retrieved articles and published journals were separ-

ately reviewed by two authors (Yao and Li) to identify additional related articles.

The title and abstract of all selected articles were browsed by Yao and Li to exclude uncorrelated studies according to the inclusion and exclusion criteria. Subsequently they assessed full text to determine whether or not to include studies. Disagreement was settled with discussion among three reviewers (Yao, Li and Ge).

Quality assessment

Risk of bias and methodological quality of included studies were assessed independently by two authors (Yao and Li) according to the method provided by the *Cochrane Handbook For Systematic Reviews of Interventions Version 5.1.2* [8]. Risk of bias was grouped into six categories including randomization, allocation concealment, blinding of personnel, blinding of outcome assessment, data integrity, selective reporting and other bias. Each category has three evaluation criteria: low risk, unclear risk and high risk.

Data extraction

A predesigned data collection form was used by two of current authors (Yao and Li). The following data were extracted: publication year and the first author, numbers of participants, intervention, outcome measure, trial design, stimulate area, and main parameters of all studies including: gestation weeks, visual analogue scale (VAS) score, numbers of effective individuals and total participants in both acupuncture and control groups. Where the needed data was not provided, mean \pm SD values were retrieved from tables or from figures using *Plot Digitizer* software [9]. The desired outcome measures and initial data were required from the authors by sending e-mails. In studies that contributed multiple correlated comparisons, combining groups to create a single pair-wise comparison would be recommended according to *Cochrane Handbook For Systematic Reviews of Interventions Version 5.1.2* [8]. If the standard deviation (SD) value was not provided, we would use the formula $SD_{\text{change}} = SD_{\text{baseline}}^2 + SD_{\text{final}}^2 - (2 \times \text{Corr} \times SD_{\text{baseline}} \times SD_{\text{final}})$. Corr was hypothesized on reasoned argument and a sensitivity analysis was undertaken to test different values of Corr to make sure the overall results was robust [8], in this article we chose 0.05 as the Corr value.

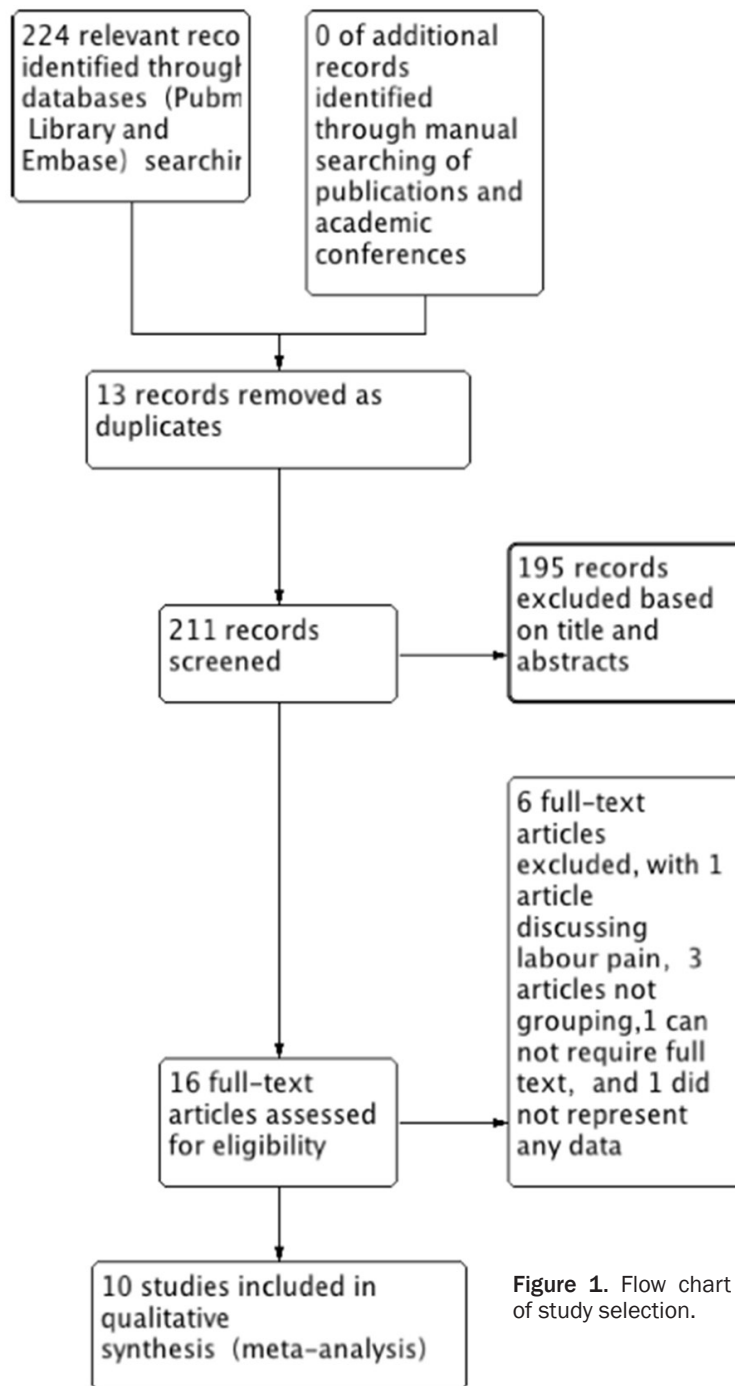


Figure 1. Flow chart of study selection.

Statistical analysis

All retrieved data were entered into the statistical software (by Yao) and rechecked (by Ge). The I^2 statistic and χ^2 test was used to evaluate heterogeneity among studies. We consider heterogeneity substantial if P value < 0.10 and $I^2 > 50\%$, then random effects model would be used to combine the data. Otherwise

fixed effects model was selected. Continuous data was pooled as mean difference (MD) with 95% confidence intervals (CI), dichotomous data was summarized as odds ratio (OR) and numbers treated and total. Subgroup analyses were based on different time for evaluating VAS scores and different acupuncture sites. Sensitivity analysis was performed to test the stability of the results and explore the source of heterogeneity by removing outliers. Review Manager (Revman 5.3, Cochrane library, Oxford, UK) was used to analyze the data and generate forest plot. Egger's test was performed to quantify the publication bias by Stata 12.0 (Stata Corp, College Station, TX, USA).

Results

Study selection

According to search strategy, 224 articles were identified in which 13 of them were duplicates. Screening the title and abstract, 211 studies were subsequently reviewed. Finally, ten trials were included and other 201 studies were excluded following the Inclusion and Exclusion Criteria. The work flow was shown in **Figure 1**.

Risk of bias and quality assessment

The risk of bias was evaluated by two of current authors (Yao and Ge) separately and data was conducted by Review Manager 5.3. Results were shown in **Figure 2**. The blinding of personnel and outcome measure showed high risk of bias in 55% studies, meanwhile, Random sequence generation and allocation concealment showed high risk of bias in about 27% to 36% studies, which may be the main source of bias in our meta analysis. About 64% studies were judged to have unclear risk of bias across

Figure 2. Risk of bias graph: Author's evaluation of all included 11 articles through 6 categories for risk of bias.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
2000 Wedenberg, K.	+	+	-	-	-	+	+
2004 Guerreiro da Silva, J.B	-	-	-	-	+	+	+
2004 Kvorning, N.	+	+	-	+	?	+	+
2005 BS Liu	-	-	-	-	+	+	?
2005 White, A	?	?	?	?	+	+	?
2006 Lund, I.	+	+	?	-	-	+	+
2008 H Elden	+	+	+	+	?	+	+
2009 Wang, S.M.	+	+	+	+	-	+	+
2010 Ekdahl, L	?	-	-	-	+	+	+
2010 ZJ Ma	-	-	-	-	+	+	+

the criteria in one or more domains, which may be the moderate risk of bias.

Main characteristic of included studies

We included 10 RCTs in current meta analysis, 8 studies compared acupuncture and conventional therapy including exercise, herb, local injection and supportive care, another 2 studies investigated superficial and deep acupuncture and acupuncture on different gestation weeks, respectively.

1094 participants were all healthy singleton pregnancies women or postpartum women with LBP and/or pelvic pain. Effects of acu-

puncture on these kinds of pain were assessed by the reduction of VAS score and cure rate. The study design, main outcome measure, acupuncture techniques and stimulated area were summarized in **Tables 1 and 2.**

Reduction of VAS score

Four studies [10-13] including 316 participants compared acupuncture with control group (including physiotherapy, conventional therapy, no intervention, standard treatment and sham acupuncture). The acupuncture group showed more total VAS score reduction before and after intervention than control group (MD = 22.4, 95% CI: 7.40 to 37.39, $I^2 = 95\%$). The subgroup analysis according to different accessing time point was presented in **Figure 3.**

When calculating pooled data in the above articles, we defined Corr = 0.5 to obtain SD, and other numbers for Corr (0.1, 0.3, 0.7) were also possessed for sensitive analysis, the results were consistent with current analysis (data not shown).

Efficacy of acupuncture

Evaluating the effectiveness of the two intervention by subgroup analysis according to different puncture areas in six studies con-

taining 468 participants [10-12, 14-16] (**Figure 4**), acupuncture revealed more effective than other treatment (OR = 5.45, 95% CI: 2.68 to 11.09, $I^2 = 45\%$). A sensitivity analysis was possessed by removing Ma et al [16] and the result had not changed, while the heterogeneity turned to smaller ($I^2 = 0\%$). Result was shown in **Figure 5.**

Heterogeneity among

Other comparisons: There were two studies [17, 18] specially discussed effect of acupuncture in different gestation weeks and distinct insertion depth. They both found acupuncture

Acupuncture for pregnancy related pain

Table 1. Study characteristics and outcome measure

Studies	No. participants	Intervention	Comparison	Outcome Measure	Trail design
2000 KAJ Wedenberg	46	Ear-acupuncture	Physiotherapy	VAS, DRI, effective rate	Prospective randomized trial
2004 João Bosco Guerreiro da Silva	61	Body-acupuncture	Conventional therapy	NRS, effective rate	Prospective, quasi-randomized, controlled study
2004 Kvorning	72	Body-acupuncture	Unclear	VAS, effective rate	Prospective, randomized, open study
2005 White A	386	Unclear	Conventional therapy, physiotherapy	VAS	Randomized single blind controlled trial
2005 Bo-Sheng Liu	112	Body-acupuncture	Local injection	Effective rate	Controlled trial
2006 IRE' NE LUND	47	Body-acupuncture	Superficial and deep acupuncture	RP, RV, effective rate	Randomized controlled trial
2009 Shu-Ming Wang	151	Auricular acupuncture	Sham acupuncture, no-intervention control	VAS, DRI, effective rate	Randomized controlled clinical trial
2010 Lena Ekdahl	32	Body-acupuncture	Unclear	SF-MPQ, VAS (0-10)	Randomized trial
2010 Zhi-Jie Ma	72	Body-acupuncture	Herb medicine	Effective rate	Controlled trial
2008 H Elden	115	Body-acupuncture	Sham acupuncture and standard treatment	VAS, DRI, effective rate	Randomized double-blinded controlled trial

VAS: visual analogue scale. NRS: numerical rating scale. RP: relative position. RV: relative rank variance. DRI: disability-rating index. SF-MPQ: Short-Form McGill Questionnaire.

Table 2. Main characteristic of included studies

Studies	Gestation age	Type of pain	Acupuncture sites
2000 KAJ Wedenberg	<32 w	LBP	B1 26-30, B1 60, Cw2, tender points
2004 João Bosco Guerreiro da Silva	15-30 w	LBP or pelvic pain	K13, S13, BL62, BL40, TE5, GB30, GB41, huatuojiagi points
2004 Kvorning	Average 30 w	LBP or pelvic pain	LR3, GV20, local tender points
2005 White A	12-31 w	PGP	Local tender points
2005 Bo-Sheng Liu	Postpartum	Back pain	Local tender points
2006 IRE' NE LUND	Average 26 w	LBP or pelvic pain	Local tender points
2009 Shu-Ming Wang	25-38 w	LBP or pelvic pain	Kidney, analgesia, and shenmen points
2010 Lena Ekdahl	Unclear	LBP	Known anatomical sites, tender points
2010 Zhi-Jie Ma	Postpartum	Back pain	BL23,shenyangguan, B40, dachangshu, K3, B52, BL24, SP6, BL26
2008 H Elden	12-29 w	PGP	Tender acupuncture points, trigger points

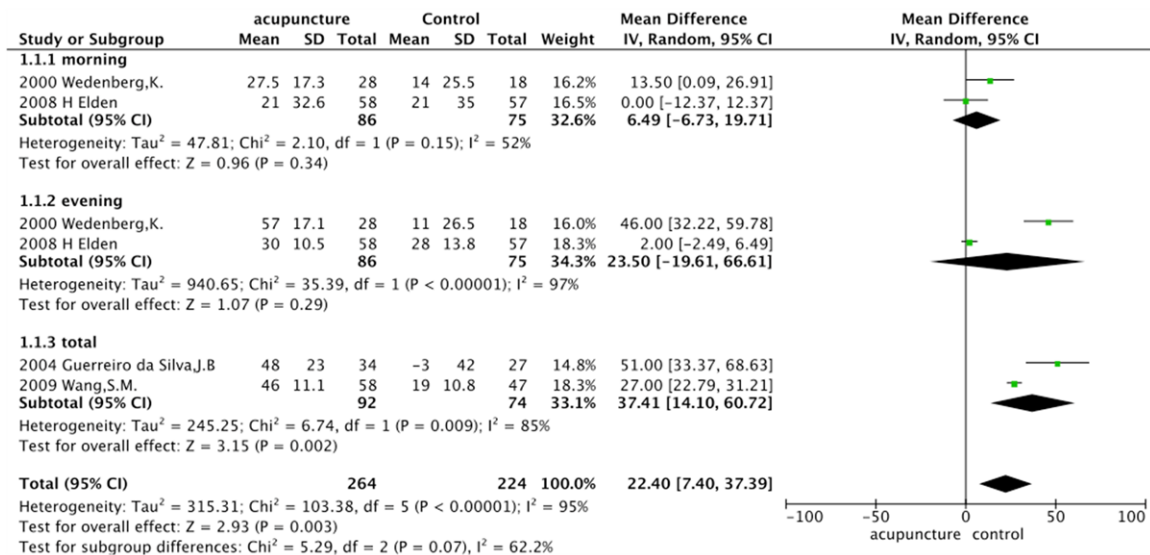


Figure 3. Subgroup analysis of VAS score reduction before and after treatment between acupuncture and control groups.

effectively alleviate the low back and pelvic pain, differences were late pregnancy pain and morning pain tended to relive more. The same phenomenon that acupuncture was more effective on morning pain was reported by other included articles [10, 19]. Main side effects contained preterm contraction, dizziness, discomfort of insertion itself including local hemorrhage, hematoma, pyrexia, and they all presented very low incidence. However, these data could not be quantified to drive a adequate conclusion.

Publication bias: Egger's test suggested no publication bias ($P = 0.761$) in comparison of acupuncture efficacy between the two groups (Figure 6).

Discussion

Women suffered a variety of discomfort during pregnancy and postpartum, low back pain and pelvic pain were two typical symptoms which could greatly influenced daily life and personal well-being. In this study, we mainly discussed the effect of acupuncture for releasing this two kinds of pain. Quantified data showed that reduction of VAS score and overall efficiency in acupuncture group were better than other treatment. Heterogeneity among different studies in VAS score reduction was high, clearly suggested that time points at which VAS score were collected were not the source of heterogeneity. Trough reviewing the full text of all articles, we found the acupuncture sites were diverse and many of them referred to local ten-

Acupuncture for pregnancy related pain

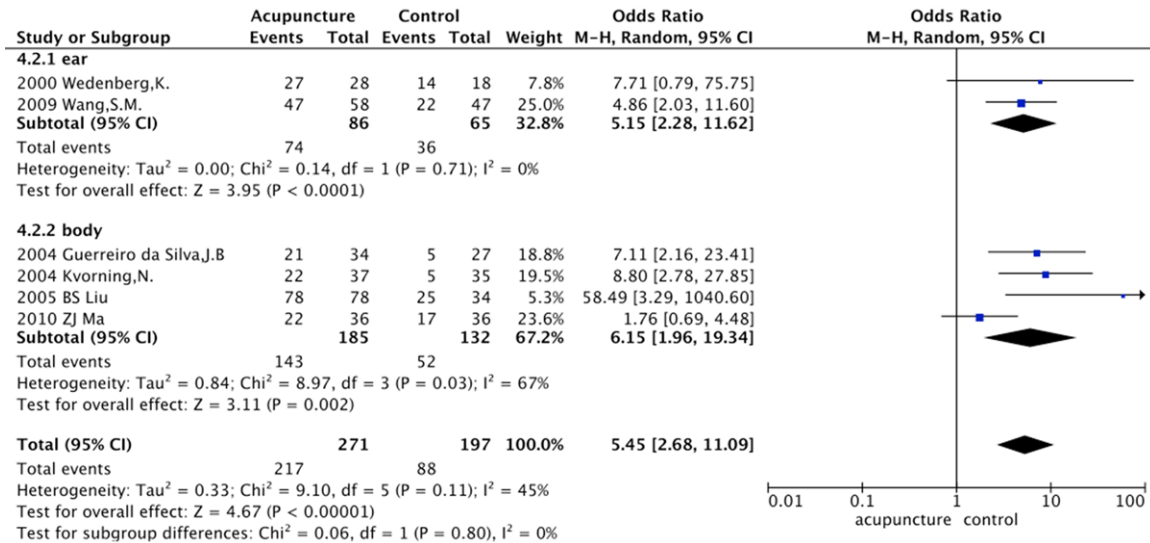


Figure 4. Subgroup analysis of total efficacy between acupuncture and conventional treatment groups.

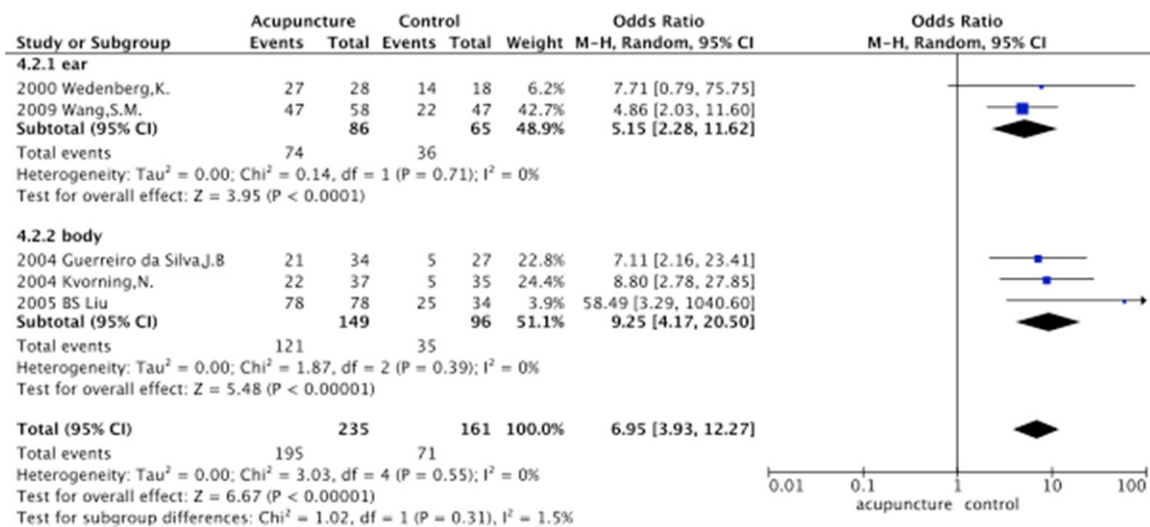


Figure 5. Sensitivity analysis of total efficacy between acupuncture and conventional treatment groups.

der points, that might be the main source of clinical heterogeneity. As to total efficacy of acupuncture, sensitivity analysis demonstrated that the article [16] was the source of heterogeneity. The side effects showed very low incidence, in line with that, follow up after delivery suggested good Apgar score and neonatus status in all studies. In general, acupuncture presented to be a safe and efficient therapy for low back pain and pelvic pain for pregnant and postpartum women.

Acupuncture is a traditional Chinese medicine therapy, generally refers to insertion needles

in accordance of certain angle into specific point in the body and/or ear, usually called acupoint, and then stimulates these points with acupuncture manipulation such as twisting or lifting needles to achieve therapeutic effect. It is widely used in analgesic therapy, especially for low back pain and headaches [20]. Other reports also indicated acupuncture was effective on acute pain [21], musculoskeletal pain [22] and menopausal symptoms [23]. The mechanism of how acupuncture worked was not clearly understood so far. Studies [24-26] represented that stimulation of acupuncture could affect local microcirculation and influ-

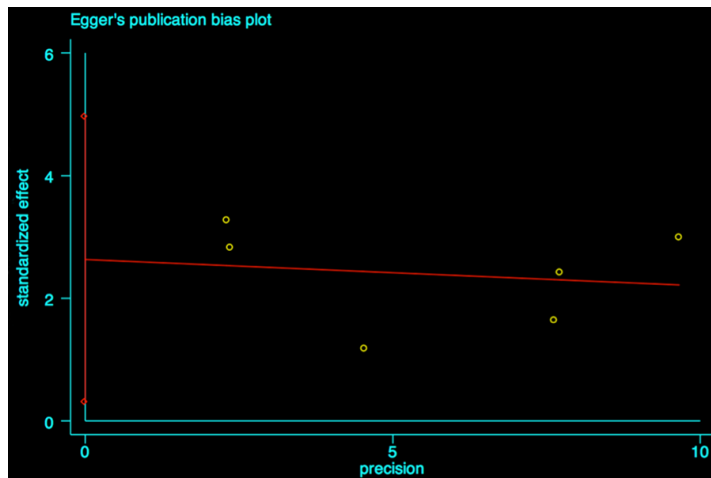


Figure 6. Publication bias accessed by Egger's test.

ence the blood flow so then improved the pain conditions. However, evidence was limited because of very few convincing studies.

As one relatively effective and safe therapy for analgesia, it was fully considered to treat low back and pelvic pain during pregnancy and postpartum, which was characterized as sacroiliac joint inflammatory and musculoskeletal pain [27], and the results showed impressive analgesia effect and patient acceptance. Gutke A. et al [28] reported that acupuncture had strong positive effect on pregnancy related lumbopelvic pain, and consistent with our results, Liddle SD. et al [29] also showed in single studies acupuncture did improve pain condition during pregnancy. The safety of this treatment was also widely discussed, and results from our included studies indicated few adverse effects comparing with other treatments, similarly, Park J. et al [30] presented analogous conclusion if acupuncture were correctly performed.

Other interesting research including acupuncture on different gestation weeks and different time point in one day demonstrated diverse influence on pain, and insertion depth of needles also function distinctly. Unfortunately, studies discussing the former two issues were very few. Depth of needles insertion had increasingly caught much attention, and it presented to be related with exact effect and safety of acupuncture [31]. Others may consider insertion into effective layer to be critical rather than depth itself [32]. Anyhow, this is an interesting direction for acupuncture research.

The results of our study should be explicated with some limitations. First, available data was few to comprehensively describe this therapy, such as efficacy on different pregnant weeks, effect of distinct processing time and depth of insertion. Second, heterogeneity among studies was obvious, especially in the aspect of VAS score, that might be caused by heterogeneous clinical treatment, specifically, the acupoint. More related well-designed studies were needed to further illustrate how and under what condition could acupuncture safely function targeting to kinds of pain. Also we had

made certain contribution to the exploration of this subject that acupuncture was proved to have exact analgesia effect by quantitative analysis of all pooled data, which may improve use of acupuncture as many therapist and patients did not have faith in this treatment because of lacking of knowledge [33].

In conclusion, acupuncture demonstrated definite advantages, compared with physical and conventional therapy, in treating pregnancy related low back pain and pelvic pain through quantified experimental data, acceptance among patients was also very high. The safety was discussed in included articles, however, data was too few to provide beneficial support through quantitative analysis. Insertion depth may be a new and interesting direction for acupuncture research.

Disclosure of conflict of interest

None.

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