

Programmed intermittent epidural bolus in parturients

A meta-analysis of randomized controlled trials

Xian-xue Wang, MM^a, Xiao-lan Zhang, BM^b, Zhao-xia Zhang, MM^b, Zi-qin Xin, BM^{b,*}, Hua-jing Guo, BM^a, Hai-yan Liu, BM^b, Jing Xiao, BM^b, Yun-lin Zhang, BM^b, Shu-zhen Yuan, BM^b

Abstract

Background: To evaluate the efficacy and safety of programmed intermittent epidural bolus (PIEB) in parturients

Methods: The PubMed, Embase, and the Cochrane Library (from inception to July 2021) were searched for identification of randomized placebo-controlled trials in which PIEB was applied in parturients. The outcomes were the effect of analgesia, satisfaction score, mode of delivery, duration of labor, neonatal condition, and adverse events. The pooled odds ratios (OR), weighted mean difference (WMD), and 95% confidence intervals (CIs) were calculated using random- and fixed-effects models.

Results: PIEB was found to be associated with decreased total consumption of ropivacaine (WMD = -15.83, 95% CI: -19.06 to $-12.60, P < .00001; I^2 = 61\%; P$ for heterogeneity = .04), total consumption of sufertanil (WMD = -4.93, 95% CI: -6.87 to 2.98, P < .00001; $I^2 = 68\%$; P for heterogeneity = .05), numbers of patients who require patient-controlled epidural analgesia bolus (OR = 0.27,95% CI: $0.14-0.51, P < .0001; I^2 = 65\%; P$ for heterogeneity = .01), the number of attempts (WMD = -4.12, 95\% CI: -7.21 to -1.04, P=.009; I²=100%; P for heterogeneity < .00001), rate of breakthrough pain (OR=0.47, 95% CI: 0.28–0.80, P=.005; I²= 47%; P for heterogeneity = .09). Eight studies focus on the duration of analgesia. After by meta-analysis, we found that the pain visual analogue scale (VAS) score at 30 minutes, 2 hours, 4 hours, and 5 hours in PIEB group was significantly lower when compared with control group, (WMD = -0.15, 95% CI: -0.26 to -0.04, P = .006; $I^2 = 0\%$; P for heterogeneity = .64), (WMD = -0.79, 95% CI: -1.32to 0.25, P = .004; $I^2 = 97\%$; P for heterogeneity < .00001), (WMD = -1.00, 95% Cl: -1.08 to -0.91, P < .00001; $I^2 = 0\%$; P for heterogeneity = .67), (WMD = -1.81, 95% CI: -3.23 to -0.39, P = .01; I² = 98%; P for heterogeneity < .00001), respectively. Nineteen studies discussed the mode of delivery between 2 groups. The results suggest that the rate of normal delivery is significantly higher in PIEB group compared with control group (OR=1.37, 95% CI: 1.08–1.75, P=.01). The time of first and second stage of labor are significantly shorter in PIEB group compared with control group, the result is (WMD=-10.52, 95% CI: -14.74 to 4.76, P < .00001; $I^2 = 0\%$; P for heterogeneity = .86), (WMD = -1.48, 95% CI: -2.26 to -0.69, P = .0002; $I^2 = 35\%$; P for heterogeneity = .10), respectively. Thirteen studies concerned the satisfaction score of patients. The satisfaction score of patients in the PIEB group was significantly higher when compared with control group (WMD = 0.91, 95% CI: 0.42-1.39, P = .0003; $l^2 = 98\%$; P for heterogeneity < .00001). The Apgar score at 1, 5 minutes in PIEB group are significantly higher (WMD=0.07, 95% CI: 0.02-0.13 P = .007; $I^2 = 55\%$; P for heterogeneity = .04), (WMD = -0.08, 95\% CI: -0.12 to -0.05, P < .00001; $I^2 = 21\%$; P for heterogeneity = .27), respectively.

Conclusions: PIEB is a good alternative for labor analgesia with better analgesic effect, maternal and infant outcome.

Abbreviations: CEI = continuous epidural infusion, CI = confidence interval, OR = odds ratios, PCEA = patient-controlled epidural analgesia, PIEB = programmed intermittent epidural bolus, RCTs = randomized controlled trials, VAS = visual analogue scale, WMD = weighted mean difference.

Keywords: analgesic consumption, labor analgesia, meta-analysis, programmed intermittent epidural bolus

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XxW, XIZ, and ZxZ contributed equally.

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^a Department of Anesthesiology of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China, ^b Obstetrical Department of The First People's Hospital of Changde City, ^b Obstetrical Department of The First People's Hospital of Change City, ^b Obstetrical Department of The First People's Hospital of City, ^b Obstetrical Department of The First People's Hospital of City, ^b Obstetrical Department of City, ^b Obstetrical Department of The First People's Hospital of City, ^b Obstetrical Department of City, ^b Obstetrical Depa

^{*} Correspondence: Zi-qin Xin, Obstetrical Department of The First People's Hospital of Changde City, Changde, Hunan, China (e-mail: xzq0736@163.com).

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1. Introduction

The patient-controlled epidural analgesia (PCEA) technique has been recently set up as a preferred mode of epidural drug delivery and used widely. Programmed intermittent epidural bolus (PIEB) is a new way of injecting anesthetics into the epidural space through an epidural catheter at fixed time intervals.^[1,2] It can be used as a background administration with the PCEA technique.^[3] Although the use of a continuous epidural infusion (CEI) is gaining popularity,^[4] it is unknown if the PIEB could improve the analgesic function. Earlier studies have indicated that PIEB, as compared CEI, can increase maternal satisfaction score and decrease the consumption of epidural drugs.^[5–8] This may be ascribed to a more extensive spread of epidural solution when delivered as a bolus rather than continuous infusion.^[9]

In this meta-analysis, we sought to compare the efficacy of PIEB with that of CEI with respect to the maintenance of epidural analgesia during labor, duration of labor, mode of delivery, side effects, and satisfaction score.

2. Methods

Our systematic review was carried out according to the guidelines of the preferred reporting items for systematic reviews and metaanalyses.^[10] We prospectively registered our system review at PROSPERO (Registration number: CRD42016038820). The proposed study utilizes published data, as such, there is no need for ethical approval. We followed the methods of several articles.^[11–14]

3. Data sources and search strategy

The PubMed, Cochrane Library databases, and Embase were searched from inception to July 2021 for relevant studies comparing PIEB with CEI for labor analgesia. The following search terms were used: "programmed intermittent epidural bolus", "regular intermittent bolus", "automated intermittent epidural bolus", "automated intermittent", "intermittent epidural", "continuous epidural infusion", "continuous infusion", "epidural bolus", and "labor analgesia". A manual search of reference sections of included trials, published meta-analyses, and pertinent review articles was conducted to identify additional articles. If duplicated data were found, only the most recent, the largest or the most complete studies were included.

4. Data selection

Original studies included were based on patient, intervention, comparison, outcome, and study design as follows: P: American Society of Anesthesiologists grade I/ II pregnant women undergoing delivery; I and C: PIEB and CEI; O: the rate of side effect (pruritus, hypotension, shivering, nausea, vomiting), the mode of delivery, pain score, total dose of ropivacaine, satisfaction score, duration of labor, duration of second stage of labor, duration of analgesia, number of oxytocin used, fetal birthweight, Apgar score; and S: only randomized controlled trials (RCTs) were included. Only English language studies were selected.

5. Data extraction

Patient characteristics (number of patients, age, gender, type of anaesthesia) and trial design (intervention, control, follow-up

time, and reported outcomes) were accounted for. If the data mentioned above were unavailable in the article, the corresponding authors were contacted for missing information. All of the data were independently extracted using a standard data collection form by 2 reviewers (XX Wang and ZQ Xin), and then the collected data were checked and entered into Review Manager analysis software (RevMan) Version 5.3. All discrepancies were checked, and a consensus was achieved by discussion with a third author (XL Zhang). A record of reasons for excluding studies was kept.

6. Assessment of study quality and risk of bias

A critical evaluation of the quality of the included studies was conducted by 2 reviewers (XX Wang and ZQ Xin) using a 5-point Jadad scale.^[15] The main categories of the Jadad scale consist of the following 5 areas of evaluation: "was the study described as randomized?", "was the method used to generate the sequence of randomization described and appropriate (random numbers, computer-generated, etc.)?", "was the study described as double-blind?", "was the method of double-blinding described and appropriate (identical placebo, active placebo, dummy, etc.)?", and "was there a description of withdrawals and dropouts?". Studies with a score of 4 to 5 were included in this analysis.

Two reviewers (XX Wang and XL Zhang) independently evaluated the risk of bias according to the recommendations from the Cochrane Collaboration.^[16] The principal categories consisted of random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and selective reporting and other bias. Each domain was measured as "high risk", "low risk", or "unclear risk". A designation of "low risk" was for items with sufficient and correct information and a designation of "high risk" was for incorrectly reported items. If the information of an item was insufficient or unsanctioned, it was designated as "unclear risk".

7. Statistical analysis

The weighted mean difference (WMD) or odds ratio (OR) with 95% confidence intervals (CIs) was used as a common measure of the effect between the 2 groups. The meta-analysis was conducted using Review Manager, Version 5.3 (The Cochrane Collaboration, Software Update, Oxford, UK). Statistical heterogeneity across studies was usually investigated using the I² statistic. When I² values of less than 50% were determined, heterogeneity could be accepted, and the fixed-effects model was adopted. Otherwise, the randomized-effects model was adopted. Subgroup analysis was also carried out to investigate potential sources of betweenstudy heterogeneity. Publication bias was evaluated in funnel plot. A *P* value of <.05 was considered statistically significant.

8. Results

8.1. Identification of eligible studies

In total, 696 potentially relevant abstracts were identified. After duplicates were removed, 694 unique abstracts remained. After examining the abstracts, 43 publications seemed to meet the inclusion criteria. Of these, 24 were excluded for the following reasons: unpublished studies,^[17–20] retrospective study,^[21–23]



cohort study,^[24,25] review,^[26] letter,^[27] no available data on the outcome of interest in,^[28–37] and nonEnglish language.^[38] Finally, the remaining 25 studies^[1,5–7,39–59] with existing data met our selection criteria and were enrolled in the systematic review. A flow diagram of the search strategy and study selection is illustrated in Figure 1.

9. Study characteristics

The characteristics of all the included studies are presented in Table 1. All subjects were pregnant patients undergoing delivery. The quality of the included studies was evaluated by a Jadad score. The highest Jadad score of the included studies was 4, and the mean score was 3.3 (range 2–4). Fifteen studies have high score (\geq 4). These studies were published between 2004 and 2020. The sample size of the included studies ranged from 40 to 2865. All were RCTs and a quality assessment of the 25 RCTs is presented. The baseline characteristics of patients were reported in all trials, and all trials mentioned the method of random selection (Fig. 2).

9.1. Meta-analyses of outcomes

9.1.1. Basic situation comparison. We conducted a systematic review of the basic conditions of the 2 groups of patients before the implementation of labor analgesia. These basic conditions include the patient's age, height, weight, BMI, basal blood pressure and heart rate before analgesia, gestational age, usage of oxytocin, and cervical dilatation before analgesia. By meta-analysis, we found that the basic conditions of the 2 groups of patients before labor analgesia were not statistically significant (Table 2).

9.1.2. The effect of analgesia between 2 groups. PIEB was associated with decreases in total consumption of ropivacaine (5 RCTs; WMD = -15.83, 95% CI: -19.06 to -12.60, P < .00001;

 $I^2 = 61\%$; P for heterogeneity = .04) (Fig. 3), total consumption of sufentanil (3 RCTs; WMD=-4.93, 95% CI: -6.87 to 2.98, P < .00001; $I^2 = 68\%$; P for heterogeneity = .05) (Fig. 4), numbers of patients who require PCEA bolus (6 RCTs; OR = 0.27, 95% CI: $0.14-0.51, P < .0001; I^2 = 65\%; P \text{ for heterogeneity} = .01)$ (Fig. 5), the number of attempts (6 RCTs; WMD = -4.12, 95% CI: -7.21to -1.04, P = .009; $I^2 = 100\%$; P for heterogeneity < .00001) (Fig. 6), rate of breakthrough pain (6 RCTs; OR = 0.47, 95% CI: 0.28-0.80, P = .005; $I^2 = 47\%$; P for heterogeneity = .09) (Fig. 7). Eight studies focus on the duration of analgesia. The aggregated results of these 8 studies suggest that PIEB was not associated with a significant increase in the duration of analgesia (WMD = -0.11, 95% CI: -23.48 to 23.25, P = .99; $I^2 = 91\%$; P for heterogeneity <.00001) (Fig. 8). Fifteen studies concerned the pain visual analogue scale (VAS) score at various time points. After by metaanalysis, we found that the pain VAS score at 30 minutes, 2 hours, 4 hours, and 5 hours in PIEB group was significantly lower when compered with control group, (WMD = -0.15, 95% CI: -0.26 to -0.04, P = .006; $I^2 = 0\%$; P for heterogeneity = .64), (WMD = -0.79, 95% CI: -1.32 to 0.25, P = .004; $I^2 = 97\%$; P for heterogeneity < .00001), (WMD = -1.00, 95% CI: -1.08 to -0.91, P < .00001; $I^2 = 0\%$; P for heterogeneity = .67), (WMD = -1.81, 95% CI: -3.23 to -0.39, P=.01; $I^2=98\%$; P for heterogeneity < .00001), respectively (Fig. 9).

9.1.3. Labor in delivery. Nineteen studies discussed the mode of delivery between 2 groups. Fourteen studies with a total of 1574 patients reported the rate of normal delivery. There are no heterogeneity noted among the studies ($I^2=0\%$; P=.86), and a fixed-effects model was selected. The results suggest that the rate of normal delivery is significantly higher in PIEB group compared with control group (OR=1.37, 95% CI: 1.08–1.75, P=.01). Seventeen studies compared the rate of instrumental vaginal delivery. The heterogeneity between 2 groups are accepted ($I^2 = 6\%$; P=.39), and a fixed-effects model was selected. The rate of

Table 1

Characteristic of included studies.

Author	No. of patients (PIEB/CEI)	Country	PIEB group	CEI group	Outcomes	Jadad score
A. Ojo 2020	61/59	USA	6-mL programmed intermittent epidural boluses every 45 min	Continuous epidural infusion at 8 mL/h	Patient-controlled epidural analgesia consumption per hour, a need for physician interventions, patterns of patient- controlled epidural analgesia use, motor blockade, number of patients who developed hypotension, pain scores, duration of second stage of labor, mode of delivery, and maternal satisfaction	4
Capogna 2011	75/70	Italy	Levobupivacaine 0.0625% with sufentanil 0.5 g/mL, after an initial epidural loading dose of 20 mL, 10 mL every hour beginning 60 min after the initial dose	Levobupivacaine 0.0625% with sufentanil 0.5 g/mL, 10 mL/h, beginning immediately after the initial dose	Total dose of levobupivacaine/total dose of sufentanil/patients requiring PCEA boluses/PCEA boluses for each patient/ motor block occurred at least once/motor block occurred/ instrumental delivery/cesarean delivery	4
Chua 2004	21/21	Singapore	0.1% ropivacaine and fentanyl $2 \mu g/mL$, 5 mL boluses were given hourly, with the first bolus 30 min postinduction	0.1% ropivacaine and fentanyl 2 µg/mL, at the rate of 5 mL/h was initiated in the minute after CSE	Duration of analgesia/need for supplemental analgesia/hourly consumption of epidural bupivacaine + fentanyl solution/ sensory block/motor block	4
Fan 2019	1454/1411	China	Hourly PIEB dose of 10 mL was given starting 75 min post the loading dose	Maintained at a constant speed of 10 mL/h for CEI group	Baseline demographic characteristics of epidural labor analgesia patients; incidence of maternal fever; visual analog scale pain scores over time; epidural sensory levels over time; epidural obstetric, and neonatal outcomes	4
Fang 2016	100/100	China	In the PIEB group, the background infusion dose was 8mL/h, the administration rate was 6mL/min, and the dose was once an bour	The CEI group was continuously administered at a rate of 8 mL/h	Baseline characteristics; pair VAS Score at various time points; the duration and interval of uterine contractions, fetal heart rate, labor analgesia time, delivery method, and ratio of oxytocin use in the 2 groups	2
Feng 2014	66/66	China	A bolus dose (10 mL of 0.08% ropivacaine + 0.4 μg/mL sufentanil) was manually administrated once an hour	A bolus dose (10 mL of 0.08% ropivacaine + 0.4 μg/mL sufentanil) was manually administrated at a constant rate of 10 ml /b	Cervical dilatation/sensory block levels/apgar score/number of epidural boluses/consumption of ropivacaine, sufentanil/ neonatal weight/instrumental delivery/duration of analgesia, labor/artificial rupture of membranes/rupture of the membranes to delivery/number of vaginal examinations	4
Fettes 2006	20/20	UK	An infusion of ropivacaine 2 mg/mL with fentanyl 2 mg/mL at hourly boluses of 10 ml	An infusion of ropivacaine 2 mg/mL with fentanyl 2 mg/mL at 10 mL/h	Caesarean section/first stage of labour second stage of labour/duration of epidural/ VAS pre-epidural/ropivacaine dose/epidural bolus given/2 epidural boluses or more/ cervical dilatation	3
Fidkowski 2019	41/34	USA	Epidural analgesia regimen of bupivacaine 0.125% with fentanyl 2 µg/mL at PIEB 10 mL every 60 min	Epidural analgesia regimen of bupivacaine 0.125% with fentanyl 2 µg/mL at 10 mL/h continuous infusion	Average pain scores; demographic data; vaginal delivery; cesarean delivery; duration epidural analgesia; maximum bromage score; lowest dermatomal sensory level; physician administered epidural bolus; patient satisfaction	4
Haidl 2020	75/75	Norway	PIEB + PCEA (5 mL bolus every hour, 5 mL PCEA bolus lockout 20 min) using a solution of bupivacaine 1mg/mL, fentanyl 2 mcg/mL, and adrenaline 2 mcg/mL	CEI + PCEA (5 mL/h, 5 mL PCEA bolus, lockout 20 min) using a solution of bupivacaine 1mg/mL, fentanyl 2 mcg/mL, and adrenaline 2 mcg/mL	Baseline characteristics; total epidural solution consumption; No. of completed PCEA boluses;/rejected PCEA boluses/ participants needing any further physician intervention/ physician administered manual boluses of the study epidural solution/rescue bupivacaine boluses/supplemental spinal injections/unilateral epidural effect/new epidural catheter; time from epidural placement to birth (min); modified bromage score at 60 min; modified bromage score at delivery; mode of delivery; hypotension; nausea; purifus; satisfaction with treatment	4
Ji 2016	25/25	China	Epidural boluses of LA 8 mL each 60 min	Maintained at a constant speed of 8 mL/h	Baseline characteristics, gestational age, uterine orifice size before analgesia, and artificial membrane rupture rate between the 2 groups; comparison of the time for maternal block level to reach T10, PCEA usage and breakthrough pain; pain VAS score at various time points; maternal deliver, and newthern Anger score	2
Leo 2010	31/31	Singapore	0.1% ropivacaine + fentanyl 2 μg/mL, automated mandatory boluses of 5 mL/h	0.1% ropivacaine + fentanyl 2 µg/mL, basal continuous infusion of 5 mL/h	Hourly consumption of ropivacaine/sensory block/pain scores/ duration of labor, 2nd stage/mode of delivery/apgar scores/satisfaction/shivering/pruritus/nausea/vomiting/ breakthrough pain/cervical dilation/VAS/oxytocin infusion/ sensory level/time to 1st breakthrough pain	4
Lim 2005	30/30	Singapore	Levobupivacaine 0.1% with fentanyl 2 μg/mL, 5 mL epidural boluses every half hour	Levobupivacaine 0.1% with fentanyl 2 µg/mL at a rate of 10 mL/h	Breakthrough pain/ pruritus/nausea/vomiting/shivering/ hypotension/satisfaction score/pain scores/mode of delivery/Apgar scores at 5 min/cervical dilatation/use of oxytocin/motor block	4
Lim 2010	25/26	Singapore	2.5 mL automated intermittent epidural boluses of ropivacaine 0.1% plus fentanyl 2 µg/mL delivered	Continuous epidural infusion of ropivacaine 0.1% plus fentanyl 2 µg/mL at 10 mL/h	Breakthrough pain/pruritus/nausea/vomiting/shivering/ hypotension/foetal bradycardia, birth weight/urinary catheter inserted/mode of delivery/duration of labour, second stage of labour/total ropivacaine dose/Apgar	3

(continued)

Author	No. of patients (PIEB/CEI)	Country	PIEB group	CEI group	Outcomes	Jadad score
			over a 2-min period every 15 min		score/satisfaction score/mean time to first breakthrough pain/pain score/sensory level/oxytocin being administered/ cryical dilation	
Lin 2016	102/98	China	0.1% ropivacaine mixed with sufentanil 0.3 μg/mL; an hourly IEB of 5 mL and mixed with a PCEA bolus of 5 mL	0.1% ropivacaine mixed with sufentanil 0.3 μg/mL; CEI at a rate of 5 mL/h and mixed with a PCEA bolus of 5 mL	Demographic properties/cervical dilation/and VAS scores/ delivery mode/duration of first stage of labor/duration of second stage of labor/Apgar score at 1 min, Apgar score at 5 min, dosage consumption of ropivacaine, rescue medication dose by PCEA, Time to reach maximum block height (710)	4
Morau 2019	124/125	France	Received an hourly bolus of 8 mL (injection rate of 250 mL/h) beginning 60 min after the loading dose	A continuous infusion rate of 8 mL/h was immediately commenced in the PCEA	Maternal characteristics; reasons for instrumental vaginal delivery; primary outcome and detailed analysis of events included in the composite endpoint; presence of a motor block; data recorded during labour.	3
Nunes 2016	33/60	Portugal	Deliver 10 mL of ropivacaine 0.15% plus suferatanil 0.2g/mL solution every hour beginning 60 min after the administration of the initial epidural loading dose	Deliver the ropivacaine 0.15% plus sufentanil 0.2g/mL solution at a rate of 5 mL/h, with PCEA boluses of 5 mL with a lockout interval of 20 min, and a per hour maximum volume of 15 ml	Subject and labor characteristics, Apgar scores at 1st and 5th minutes	3
Riazanova 2019	42/38	Russia	Programmed intermittent epidural boluses of LA 8.0 mL each 30 min with patient controlled epidural analgesia, LA bolus 8.0 mL, lockout interval 30 min	Patient-controlled epidural analgesia was conducted (8.0 mL LA lockoutinterval 30 min) with continuous background infusion of ropivacaine hydrochloride 0.08% with an infusion rate of 8.0 ml /b	General characteristics of examined patients; indices of blood pressure (BP) and heart rate (HR) during labour pain relief; assessment of pain level using VAS and assessment of motor block using the Bromage scale in different study stages; Apgar score; duration of delivery with epidural analgesia and local anaesthetic consumption	3
Rodríguez– Campoó 2018	100/95	Spain	A 2 mL/h continuous infusion plus a 7 mL/30 min PIEB	A continuous infusion of 5 mL/h plus 6 mL/20min PCEA	Total levobupivacaine dose; pain control; subject satisfaction; type of delivery; vaginal tears; episiotomy	4
Sia 2007	21/21	Singapore	0.1% ropivacaine + fentanyl 2 μg/mL, lockout 10 min, automated mandatory boluses of 5 mL/h	0.1% ropivacaine + fentanyl 2 μg/mL, lockout 10 min, basal continuous infusion of 5 mL/h	Epidural ropivacaine consumed per hour/number of self-bolus/ time to the first self-bolus/number of breakthrough pain requiring an anesthesiologist's intervention/nausea/ vomiting/ pruritus/duration of labor/duration of second stage/mode of delivery/fetal birthweight/Apgar score/ satisfaction score/use of oxytocin at time/cervical dilatation/ pain score/lowest systolic blood/maximum dermatomal block to cold/lower limb motor block	4
Sia 2013	51/51	Singapore	0.1% ropivacaine + fentanyl 2 μ g/mL, automated boluses of 5 mL in addition to the nation-controlled boluses	0.1% ropivacaine + fentanyl 2 μg/mL, PCEA with basal infusion 5 mL/h	Baseline characteristics/breakthrough pain/side-effects/ obstetric and neonatal outcomes	4
Song 2020	38/40	China	The pump was programmed to administer the first bolus of 8 mL 1 h after initiation and every hour afterward	The epidural pump was programmed to deliver at a constant rate of 8 mL/h	Demographic and baseline characteristics; analgesia characteristics and labor outcomes; pain VAS score at various time points	4
Wang 2016	100/100	China	Programmed intermittent epidural boluses of LA 10 mL each 30 min with patient controlled epidural analgesia, lockout interval 30 min	Maintained at a constant speed of 10 mL/h for CEI group.	Baseline characteristics; pain VAS score at various time points; thoracic sensory block level; PCA frequency and total medication; maternal delivery, blood loss, satisfaction scores and newborn Apgar scores; hypotension, nausea, vomiting, itching and others	2
Wang 2017	62/62	China	10 mL/60 min, pulse dosing starts 60 min after the first dose is injected	Maintained at a constant speed of 10 mL/h for CEI group.	Baseline characteristics; pain VAS score at various time points; time to add medication for the first time, the number of PCEA compressions and the total amount of epidural analgesia used by the parturient; satisfaction and newborn situation; the duration and interval of uterine contractions, labor analgesia time, delivery method, and ratio of oxytocin use in the 2 groups	2
Wong 2006	63/63	USA	6 mL bolus every 30 min beginning 45 min after the intrathecal injection	12 mL/h infusion beginning 15 min the after the intrathecal injection	Labor pain/epidural bupivacaine dose/epidural fentanyl dose/ time to first PCEA request/PCEA bupivacaine dose/manual bolus (number of subjects, number per subject)/manual bupivacaine dose (mg/h)/total bupivacaine dose	4
Zhao 2013	29/28	China	Delevered a 3 mL bolus at a rate of 60mL/h per 30 min	maintained at a constant speed of 6 mL/h for CEI group	Baseline characteristics; maternal labor, mode of delivery; oxytocin use, postpartum hemorrhage, and newborn Apgar score	3

CEI = continuous epidural infusion, PCEA = patient-controlled epidural analgesia, PIEB = programmed intermittent epidural bolus, VAS = visual analogue scale.



Figure 2. A. Graph of review authors' assessments of risk of bias for each Cochrane item. B. Summary of review authors' assessments of risk of bias for each Cochrane item and each included study.

instrumental vaginal delivery has no significant difference between 2 groups (OR=0.83, 95% CI: 0.68–1.02, P=.07). Sixteen studies reported the rate of cesarean delivery. There are no heterogeneity noted among the studies (I²=0%; P=.97), and a fixed-effects model was selected. The rate of cesarean delivery has no significant difference between 2 groups (OR=0.89, 95% CI: 0.65–1.20, P = .44) (Fig. 10). Seventeen studies discussed the time of labor, the heterogeneity between 2 groups are accepted and a fixed-effects model was selected. After comparison, the time of first and second stage of labor are significantly shorter in PIEB group compared with control group, the result is (WMD=– 10.52, 95% CI: -14.74 to 4.76, P < .00001; $I^2 = 0\%$; P for heterogeneity=.86), (WMD=–1.48, 95% CI: -2.26 to -0.69, P = .0002; $I^2 = 35\%$; P for heterogeneity=.10), respectively (Fig. 11). Thirteen studies concerned the satisfaction score of patients in the PIEB group was significantly higher when compared with control group (WMD=0.91, 95% CI: 0.42–1.39, P = .0003; $I^2 = 98\%$; P for heterogeneity < .00001) (Fig. 12).

9.1.4. Neonatal condition. PIEB was not associated with increase the rate of bradycardia (4 RCTs; OR=1, 95% CI: 0.30–3.39, P=1; $I^2=0\%$; *P* for heterogeneity=.71) (Fig. 13), and the fetal heart rate between 2 groups was no significantly difference (4 RCTs; WMD=-0.61, 95% CI: -2.53 to 1.31, P=.53; $I^2=0\%$; *P* for heterogeneity=.69) (Fig. 14). Fifteen studies reported the Apgar score between 2 groups. When compared with the control group, Apgar score at 1, 5 minutes in PIEB group are significantly higher (WMD=0.07, 95% CI: 0.02 to 0.12 P=.009; $I^2=49\%$; *P* for heterogeneity=.06), (WMD=-0.08, 95% CI: -0.12 to -0.05, P<.00001; $I^2=21\%$; *P* for heterogeneity=.27), respectively (Fig. 15)

10. Adverse events

PIEB was not associated with decreases the rate of pruritus (10 RCTs; OR = 1.02, 95% CI: 0.71–1.45, P = .92; $I^2 = 0\%$; P for heterogeneity = .95) (Fig. 16), hypotension (9 RCTs; OR = 0.77, 95% CI: 0.33–1.77, P = .53; $I^2 = 0\%$; P for heterogeneity = .61) (Fig. 17), shivering (4 RCTs; OR = 1.04, 95% CI: 0.49–2.18, P = .93; $I^2 = 55\%$; P for heterogeneity = .08) (Fig. 18), nausea (10 RCTs; OR = 2.31, 95% CI: 0.95–5.59, P = .06; $I^2 = 0\%$; P for heterogeneity = .79) (Fig. 19), and vomiting (9 RCTs; OR = 2.08, 95% CI: 0.61–7.09, P = .24; $I^2 = 0\%$; P for heterogeneity = .38) (Fig. 20).

11. Discussion

The finding of our systematic review and meta-analysis study show that PIEB was associated with decreases in total consumption of ropivacaine, sufentanil, numbers of patients who require PCEA bolus, the number of attempts, and rate of breakthrough pain. At the same time, the time of the first and second stage of labor is significantly shorter and the satisfaction score of patients was significantly higher in the PIEB group compared with the control group. There have been similar systematic reviews before, but the included literature is less.^[8] On this basis, this study included more studies for analysis (24 RCTs), thereby improving the credibility of the synthetic analysis data. Also, this study added VAS scores at different time points and neonatal Apgar scores for meta-analysis based on previous studies. In this way, the influence of PIEB on maternal and infant outcomes is more systematic and comprehensive. Our study found that the pain VAS score at 30 minutes, 2 hours, 4 hours, and 5 hours in the PIEB group was significantly lower when compared with the control group and the rate of normal delivery, Apgar score at 1, 5 minutes were significantly higher in PIEB group when compared with the control group. This study is the first to conduct a meta-analysis of the basic conditions of the

Basic conditions of the 2 groups. l² Variable Number of studies RR (95% CI) Effects models P value Age 18 -0.16 (-0.38-0.07) 37 Fixed effects models .18 Height 21 -0.80 (-0.28-0.26) 37 Fixed effects models .94 Weight 21 -0.41 (-1.51-0.69) 51 Random effects models .47 BMI 7 0.01 (-0.16-0.18) .92 1 Fixed effects models 0.02 (-2.00-2.05) Maternal systolic BP 8 0 Fixed effects models .98 Maternal diastolic BP 4 -0.94 (-2.84-0.96) 0 Fixed effects models .33 Maternal heart rate 4 -1.39(-3.97-1.18)29 Fixed effects models .29 Cervical dilation at initiation of analgesia 20 -0.03 (-0.10-0.04) 55 Random effects models .43 .23 Oxytocin infusion 5 1.34 (0.83-2.15) 30 Fixed effects models Gestational age 18 0.02 (-0.11-0.15) 60 Random effects models .75

BMI = body mass index, BP = blood pressure, CI = confidence interval, RR = risk ratios.

		PIEB		c	ontrol			Mean Difference		N	Aean Differe	nce	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% C		IV	Random, S	5% CI	
Fan 2019	60	13	1454	76	17	1411	42.5%	-16.00 [-17.11, -14.89]					
Feng 2014	60	16	63	70	20	62	16.4%	-10.00 [-16.36, -3.64]			-		
Fettes 2006	104.7	29.2	20	124.2	17.9	62	5.0%	-19.50 [-33.05, -5.95]					
Lim 2010	67	27	25	70	36	25	3.1%	-3.00 [-20.64, 14.64]			-		
Lin 2016	51.27	9.61	116	70.44	12.78	118	32.9%	-19.17 [-22.06, -16.28]			•		
Total (95% CI)			1678			1678	100.0%	-15.83 [-19.06, -12.60]			•		
Heterogeneity: Tau ² =	6.07; Ch	ni² = 10	0.20, df	= 4 (P	= 0.04);	12 = 61	%		100	1	-	+	100
Test for overall effect:	Z = 9.60	(P < (0.00001)					-100	-50	PIEB cor	trol	100

Figure 3. Meta-analysis of the net change in total consumption of ropivacaine. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

included patients to further demonstrate the balance of the general conditions of the 2 groups of patients so that the outcome indicators are comparable. In this meta-analysis, eleven trials

reported adverse effects and the incidence of pruritus, hypotension, shivering, nausea, and vomiting were similar in both PIEB and control groups.

		PIEB		c	Control			Mean Difference			Mean Differe	nce	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% Cl		IV	/, Random, 9	5% CI	
Capogna 2011	25	7.407	75	28	7.407	70	28.2%	-3.00 [-5.41, -0.59]			-		
Fan 2019	26	4	1454	32	6	1411	49.0%	-6.00 [-6.37, -5.63]					
Feng 2014	27	8	63	32	9	62	22.9%	-5.00 [-7.99, -2.01]			•		
Total (95% CI)			1592			1543	100.0%	-4.93 [-6.87, -2.98]			•		
Heterogeneity: Tau ² =	1.97; Ch	ni² = 6.1	7, df =	2 (P = 0).05); l²	= 68%			100	50		50	10/
Test for overall effect:	Z = 4.97	(P < 0.	00001)						-100	-50	PIEB cont	rol	100

Figure 4. Meta-analysis of the net change in total consumption of sufentanil. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

	PIEE	3	Contr	ol		Odds Ratio		Odd	s Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI		M-H, Ran	dom, 95% C	1	
Capogna 2011	6	75	28	70	16.5%	0.13 [0.05, 0.34]	_				
Fang 2016	16	100	63	100	20.5%	0.11 [0.06, 0.22]	-	-			
Ji 2016	10	25	13	25	14.6%	0.62 [0.20, 1.89]			1		
Morau 2019	4	124	5	125	12.2%	0.80 [0.21, 3.05]			-		
Song 2020	15	38	30	40	16.5%	0.22 [0.08, 0.57]					
Wong 2006	20	63	34	63	19.7%	0.40 [0.19, 0.82]		_	•		
Total (95% CI)		425		423	100.0%	0.27 [0.14, 0.51]		٠			
Total events	71		173			S (S					
Heterogeneity: Tau ² =	0.39; Chi ²	= 14.2	2, df = 5 (P = 0.0)1); l ² = 65	%	0.01	-		1	100
Test for overall effect:	Z = 4.07 (P < 0.0	001)				0.01	PIEB	control	10	100

Figure 5. Meta-analysis of the net change in rate of patients who need additional PCEA bolus. CI = confidence interval, PIEB = programmed intermittent epidural bolus.

		PIEB		0	Control			Mean Difference			Mean Dif	ference	1	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% C			. Rando	m, 95%	CI	
Capogna 2011	1	0	75	1	0.741	70		Not estimable						
Fan 2019	0.7	0.9	1454	2.2	1.9	1411	20.2%	-1.50 [-1.61, -1.39]						
Feng 2014	1	0.8	63	1.5	1	62	20.2%	-0.50 [-0.82, -0.18]						
Song 2020	0	0.741	38	2	2.037	40	20.0%	-2.00 [-2.67, -1.33]						
Wang 2016	3.4	0.6	100	10.2	0.4	100	20.2%	-6.80 [-6.94, -6.66]			•			
Wang 2017	4	2	62	14	5	62	19.5%	-10.00 [-11.34, -8.66]			•			
Total (95% CI)			1792			1745	100.0%	-4.12 [-7.21, -1.04]			٠			
Heterogeneity: Tau ² = Test for overall effect:	12.26; C Z = 2.62	$Chi^2 = 38$ 2 (P = 0.	804.11, 009)	df = 4 (P < 0.0	0001);	² = 100%	6	-100	-50	PIER	control	50	100

Figure 6. Meta-analysis of the net change on the number of attempts. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.



Programmed intermittent epidural analgesia and continuous epidural analgesia are the 2 main technical methods of labor analgesia, and their different administration methods have different effects on the outcome of the mother and the baby. The speed at which the infusion bolus is delivered and the pressure generated in the epidural space also affects dispersion. Theoretically, intermittent boluses injected at higher pressure should add more widespread and uniform epidural solution dispersion.^[59,60,61] Experimentally, the use of intermittent boluses had been found to result in a greater spread of infusate when compared with a continuous infusion, despite a similar rate of infusion.^[8] In vitro studies,^[62] it confirmed that when a constant rate of 10.5 mL/h is used for continuous administration, most of the drug solution flows out through the proximal hole of

the spinal epidural catheter; and when a single injection is used, the epidural both the proximal and distal holes of the lumen catheter have liquid outflow, suggesting that when the same dose is taken, a single injection will have a wider range of drug block. It may also be that programmed epidural analgesia is better than continuous epidural analgesia.^[63,64] In this study, we also found that, compared with continuous epidural analgesia, programmed epidural analgesia showed good analgesic effects. PIEB was associated with decreases in total consumption of ropivacaine, total consumption of sufentanil, numbers of patients who require PCEA bolus, the number of attempts, and rate of breakthrough pain. We also found that the pain VAS score at 30 minutes, 2 hours, 4 hours, and 5 hours in the PIEB group was significantly lower when compared with the control group.

		PIEB		C	Control			Mean Difference			Mean Di	fference		
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	<u> </u>		V, Rando	om, 95% (
Capogna 2011	335	23.7	75	332	45.93	70	17.0%	3.00 [-9.02, 15.02]			-	-		
Chua 2004	239	24	21	181	17	21	17.0%	58.00 [45.42, 70.58]						
Fan 2019	381	83	1454	384	84	1411	17.6%	-3.00 [-9.12, 3.12]			-	- 2		
Fang 2016	379	97	100	388	95	100	14.5%	-9.00 [-35.61, 17.61]				_		
Feng 2014	362	91	63	382	102	62	13.0%	-20.00 [-53.91, 13.91]		_		-		
Fettes 2006	250.5	78.6	20	276	58.5	20	11.1%	-25.50 [-68.44, 17.44]		-		-		
Nunes 2016	384	240	37	402	276	60	3.9%	-18.00 [-122.20, 86.20]	+					_
Song 2020	384	193	38	427	164	40	5.8%	-43.00 [-122.68, 36.68]	+					
Total (95% CI)			1808			1784	100.0%	-0.11 [-23.48, 23.25]			-			
Heterogeneity: Tau ² =	796.05;	Chi ² =	81.41,	df = 7 (P < 0.0	0001);	1² = 91%		100	1			-	400
Test for overall effect:	Z = 0.01	(P = (0.99)	0.01010.002					-100	-50	DIER	control	50	100

Figure 8. Meta-analysis of the net change on the duration of analgesia. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

Chudu as Cubasaus	Maan	PIEB	Total	Man	Control	Total	Walaht	Mean Difference	Mean Difference
7.3.1 before the block	Mean	50	Total	Mean	50	Total	weight	IV, Kandom, 95% C	IV, Random, 95% CI
bus 2004	65	1 75	21	7	1 75	21	1 4%	-0.50 1-1.56 .0.561	
an 2019	0.5	0 741	1454	6	0 741	1411	22 4%	0.00 1.0 05 0.051	
ang 2016	8.4	1.6	100	8.6	1.4	100	6.8%	-0.20 [-0.62, 0.22]	
2016	8.6	0.6	25	8.6	0.5	25	10.1%	0.00 [-0.31, 0.31]	•
0 2010	7.5	19	31	8	2	31	1.6%	-0 50 1-1 47 0 471	
m 2005	8.07	1 35	30	7 63	1 32	30	3 2%	0.44 1-0 24 1 121	1
m 2010	6.6	1.7	25	6.9	23	25	1.3%	-0.30 [-1.42, 0.82]	
in 2016	7.21	0.52	116	6.94	0.55	118	18.4%	0 27 10 13 0 411	+
iazanova 2019	8.03	1 481	42	8 12	1.481	38	3.4%	-0.09 (-0.74, 0.56)	
ia 2007	7	1.5	21	8	15	21	1.9%	-1 00 (-1 91 -0 09)	
ia 2007	8	17	51	78	1.5	51	3.6%	0 20 1 0 42 0 821	
000 2020	7 97	1 21	39	8.05	12.2	40	0 1%	0 19 1 3 09 3 621	+
long 2020	0.07	0.6	100	0.00	0.91	100	15 19/	-0.10[-3.96, 3.02]	1
ang 2016	0.23	0.0	60	10	1 404	60	6 09/	-0.16 [-0.36, 0.02]	
ang 2017	5.0	1.0	62	5.7	1.401	62	2.0%	0.00 [-0.41, 0.41]	
ubtotal /05% CI	5.9	1.0	2170	5./	1.0	2136	100 0%	0.20 [-0.39, 0.79]	
ibiotal (55 % Ci)	0.00.01	17 - 07	70 -4-		- 0.00	2130	100.070	-0.00 [-0.13, 0.13]	
est for overall effect: 2	Z = 0.04	P = 0.	.97)	14 (P	- 0.02).	1 = 50	70		
2 20 min									
22 30 min			100			100	40 401	0.001.0.05 0.05	1
ing 2016	1.5	0.5	100	1.7	0.6	100	49.4%	-0.20 [-0.35, -0.05]	T
2016	1.9	0.7	25	2.1	0.5	25	10.2%	-0.20 [-0.54, 0.14]	I
m 2005	0	0	30	1.3	5	30		Not estimable	1
m 2010	0	0.2	25	0.1	0.4	25	37.7%	-0.10 [-0.28, 0.08]	T
ong 2020	1.57	1.5	38	1.41	1.4	40	2.8%	0.16 [-0.48, 0.80]	
ubtotal (95% CI)			218			220	100.0%	-0.15 [-0.26, -0.04]	
eterogeneity: Tau ² = 0 est for overall effect: 2	0.00; ChZ = 2.78	$hi^2 = 1.6$ B(P = 0)	9, df = :	3 (P = (0.64); l ²	= 0%			
		0.							
3.3 1 h									<u>_</u>
in 2019	1	0.741	1454	1	0.741	1411	79.9%	0.00 [-0.05, 0.05]	-
ing 2016	2	0.7	100	1.9	0.8	100	5.4%	0.10 [-0.11, 0.31]	
2016	2.2	0.5	25	2.3	0.6	25	2.5%	-0.10 [-0.41, 0.21]	1
ang 2016	1.51	0.63	100	1.45	0.33	100	12.1%	0.06 [-0.08, 0.20]	1
ang 2017	0	0	62	0	0	62		Not estimable	
ubtotal (95% CI)			1741			1698	100.0%	0.01 [-0.04, 0.06]	
eterogeneity: Tau ² = (est for overall effect: 2	0.00; ChZ = 0.41	$hi^2 = 1.8$ I (P = 0.	34, df = 3 .68)	3 (P = ().61); l²	= 0%			
3426									
an 2019	1	0.741	1454	2	0.741	1411	22 0%	-1.00 [-1.05 -0.95]	
ang 2016	14	0.6	100	35	0.0	100	21 4%	-2.10 [-2.30 -1.00]	
m 2005	0.4	0.0	20	3.0	0.6	20	2 39/	1 70 15 17 1 771	+
2005	0.4		30	2.1	9.5	30	17 00	0.501.005 1.001	
2010	2.40	1 70	20	2.65	1.0	40	14 00/	0.30 [-0.05, 1.05]	
ong 2020	2.42	1.79	30	2.00	1.0	40	14.9%	-0.23 [-1.03, 0.57]	1
ang 2016	1./3	0.44	100	2.35	0.62	100	21.1%	-0.62 [-0.77, -0.47]	T
ang 2017	0	0	1000	0	0	1700	100 00/	Not estimable	
aterogeneity: Tau ² = (0.34 Cł	hi² = 17	7.57 df	= 5 (P	< 0.000	01): 12 =	97%	-0.79 [-1.32, -0.25]	1
st for overall effect: 2	Z = 2.86	6 (P = 0.	.004)		0.000				
3.5 3 h									
an 2019	2	0.741	1454	2	1.481	1411	50.0%	100.0 00.0 00.0	
2016	1 24	0.24	100	3 40	0.35	100	50.0%	1 88 1 1 06 1 901	
2017		0.04	60	0.12	0 744	60	50.070	Not actimation	T
ibtotal (95% CI)	0	0	1616	3	0.741	1573	100.0%	-0.94 [-2.78 0.90]	
aterogeneity: Tau? -	1 77. 04	ni² = 95	1.87 #	= 1 /P	< 0.000	01) 12 -	100%	0.04 [-2.10, 0.90]	1
est for overall effect: 2	Z = 1.00) (P = 0.	.32)	. h.	0.000		10070		
3.64h									
in 2019	2	0.741	1454	2	1.481	1411	99 1%	-1 00 (-1 09 -0 91)	
2015	2	0.741	1454	3	1.401	1411	33.170	Not estimation	
m 2005	0	07	30	0.9	3	30	0.00	Not estimable	
2010	0.3	0.7	25	1.1	0.744	20	0.9%	-0.00 [-1.70, 0.10]	
ang 2017	1	0	1574	4	0.741	1539	100 0%	1 00 Lt 08 0 041	
ibiotal (95% CI)	0.00.0		15/1			1528	100.0%	-1.00 [-1.08, -0.91]	
est for overall effect: 2	Z = 22.8	ni* = 0.1 81 (P < 0	9, df = 0.00001) = (P = ().67); l ²	= 0%			
375b									
3.7 3 11		0.744						100//00 000	1
an 2019	2	0.741	1454	3	1.481	1411	34.6%	-1.00 [-1.09, -0.91]	I
ong 2020	3.03	1.83	38	4.46	1.49	40	31.7%	-1.43 [-2.17, -0.69]	3
ang 2017	1	0.741	62	4	1.481	62	33.7%	-3.00 [-3.41, -2.59]	1
ubtotal (95% CI)			1554			1513	100.0%	-1.81 [-3.23, -0.39]	
aterogeneity: Tau ² = 1	1.51; Ch	$hi^2 = 87.$.47, df =	2 (P <	0.0000	1); $ ^2 = 1$	98%		
at for overall effect 2	2 - 2.30	10.							
									-100 -50 0 50 100
	and the second second								PIEB control

Test for subaroup differences: Chi² = 424.45. df = 6 (P < 0.00001). l² = 98.6%

Figure 9. Meta-analysis of the net change on the pain VAS score at various time points. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	M-H, Fixed, 95% Cl
8.1.1 Normal					a sea tha an an	and the second second second second	
Fang 2016	86	100	83	100	10.2%	1 26 10 58 2 711	
Fottos 2006	7	20	5	20	2 9%	1 62 10 41 6 341	
Heidi 2010	47	20	42	20	4.4 40/	1.02 [0.41, 0.34]	
haidi 2019	41	15	43	10	14.170	1.25 [0.65, 2.40]	
Leo 2010	21	31	16	31	4.5%	1.97 [0.70, 5.52]	
Lim 2005	18	30	17	30	6.0%	1.15 [0.41, 3.20]	
Lim 2010	19	25	15	25	3.2%	2.11 [0.62, 7.13]	
Lin 2016	98	116	99	118	13.4%	1.04 [0.52, 2.11]	
Morau 2019	94	124	83	125	17.6%	1 59 10 91 2 761	
Sia 2007	12	21	16	21	E 40/	0 51 10 12 1 021	
Sia 2007	13	21	10	21	0.470	0.51 [0.15, 1.95]	
Sia 2013	33	51	32	51	9.9%	1.09 [0.49, 2.44]	
Song 2020	35	38	36	40	2.4%	1.30 [0.27, 6.22]	
Wang 2017	55	62	44	62	4.4%	3.21 [1.23, 8.38]	
Wong 2006	59	63	59	63	3.3%	1.00 [0.24, 4.19]	
Zhao 2013	25	29	23	28	2.8%	1.36 (0.32, 5.69)	
Subtotal (95% CI)	20	785		789	100.0%	1.37 [1.08, 1.75]	•
Tatal and the state	640	100	674	100	100.070	trat fried, trial	
l otal events	610	1.1.1	5/1				
Test for overall effect: Z = :	2.58 (P = 0	.010)); I* = 0%				
8.1.2 instrumental							
Fan 2019	86	1454	92	1411	42.2%	0.90 10 67 1 221	+
Fena 2014	2	63	5	62	2 20/	0.57 (0.12 2.50)	
Fotter 2006	3	03	0	02	2.370	1 00 10 00 2 101	
rettes 2006	10	20	10	20	2.4%	1.00 [0.29, 3.45]	
Haidi 2019	18	75	19	75	6.9%	0.93 [0.44, 1.96]	
Ji 2016	4	25	3	25	1.2%	1.40 [0.28, 7.00]	
Leo 2010	2	31	6	31	2.7%	0.29 [0.05, 1.55]	
Lim 2005	3	30	3	30	1.3%	1.00 (0.19. 5.40)	
lim 2010	3	25	6	25	2 5%	0 43 10 09 1 971	
Lin 2016	10	140	0	440	2.00/	1 14 10 45 2 021	
Lin 2016	10	110	9	110	3.970	1.14 [0.45, 2.92]	
Morau 2019	30	124	41	125	14.9%	0.65 [0.38, 1.14]	
Rodriguez-Campoo 2018	21	100	11	95	4.3%	2.03 [0.92, 4.48]	
Sia 2007	1	21	2	21	0.9%	0.47 [0.04, 5.68]	
Sia 2013	5	51	8	51	3.5%	0.58 [0.18, 1.92]	
Song 2020	3	38	2	40	0.0%	1 63 10 26 10 331	
Song 2020	0	60		60	0.370	0.11.10.02 0.521	
wang 2017	2	02	14	02	0.070	0.11[0.02, 0.53]	
Wong 2006	3	63	4	63	1.8%	0.74 [0.16, 3.44]	
Zhao 2013	3	29	4	28	1.8%	0.69 [0.14, 3.42]	
Subtotal (95% CI)		2327		2282	100.0%	0.83 [0.68, 1.02]	•
Total events	207		239				
Heterogeneity: Chi ² = 17.0 Test for overall effect: Z =	1, df = 16 (1.80 (P = 0	P = 0.3 .07)	9); I ² = 69	%			
8.1.3 caesaren							
Fang 2016	14	100	16	100	15.7%	0.85 [0.39, 1.86]	
Fettes 2006	3	20	5	20	4.8%	0.53 [0.11, 2.60]	
Fidkowski 2019	8	43	11	34	11.4%	0.48 [0 17 1 37]	
Haid 2019	10	75	12	75	12 8%	0 73 10 30 1 801	
1 2016	10	10	13	10	0.000	1 57 10 04 10 001	
12010	3	25	2	25	2.0%	1.57 [0.24, 10.30]	
Leo 2010	8	31	9	31	7.6%	0.85 [0.28, 2.60]	
	9	30	10	30	8.0%	0.86 [0.29, 2.55]	
Lim 2005		25	4	25	4.0%	0.72 [0.14, 3.59]	
Lim 2005 Lim 2010	3		10	118	10.5%	0.80 [0.30, 2.10]	
Lim 2005 Lim 2010 Lin 2016	3	116				0 33 10 01 8 261	
Lim 2005 Lim 2010 Lin 2016 Morau 2019	3 8 0	116 124	1	125	1.7%	0.00 10.01. 0.01	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007	3 8 0 7	116 124	1	125	1.7%	3 00 10 65 13 751	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2007	3 8 0 7	116 124 21	1	125	1.7%	3.00 [0.65, 13.75]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013	3 8 0 7 13	116 124 21 51	1 3 11	125 21 51	1.7% 2.3% 9.3%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020	3 8 0 7 13 3	116 124 21 51 38	1 3 11 4	125 21 51 40	1.7% 2.3% 9.3% 4.1%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2007 Sia 2013 Song 2020 Wang 2017	3 8 7 13 3 5	116 124 21 51 38 62	1 3 11 4	125 21 51 40 62	1.7% 2.3% 9.3% 4.1% 4.2%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006	3 8 0 7 13 3 5 1	116 124 21 51 38 62 63	1 3 11 4 4 0	125 21 51 40 62 63	1.7% 2.3% 9.3% 4.1% 4.2% 0.6%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013	3 8 0 7 13 3 5 1	116 124 21 51 38 62 63 29	1 3 11 4 4 0	125 21 51 40 62 63 29	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06 16 79]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (85% Ch	3 8 0 7 13 3 5 1	116 124 21 51 38 62 63 29 853	1 3 11 4 4 0	125 21 51 40 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2007 Sia 2013 Song 2020 Wang 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (95% CI)	3 8 0 7 13 3 5 1 1	116 124 21 51 38 62 63 29 853	1 3 11 4 4 0 1	125 21 51 40 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1% 100.0%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (95% CI) Total events	3 8 0 7 13 3 5 1 1 96	116 124 21 51 38 62 63 29 853	1 3 11 4 4 0 1	125 21 51 40 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1% 100.0%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (95% CI) Total events Heterogeneity: Chi ² = 6.60 Test for overall effect: Z = 1	3 8 0 7 13 3 5 1 1 96 . df = 15 (P 0.77 (P = 0	116 124 21 51 38 62 63 29 853 *= 0.97 .44)	1 3 11 4 4 0 1 104 (); I ² = 0%	125 21 51 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1% 100.0%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (95% CI) Total events Heterogeneity: Chi ² = 6.60 Test for overall effect: Z = 1	3 8 0 7 13 3 5 1 1 96 , df = 15 (P 0.77 (P = 0	116 124 21 51 38 62 63 29 853 29 853 2 = 0.97 0.44)	1 3 11 4 4 0 1 104); I ² = 0%	125 21 51 40 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1% 100.0%	3.00 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	
Lim 2005 Lim 2010 Lin 2016 Morau 2019 Sia 2007 Sia 2013 Song 2020 Wang 2017 Wong 2006 Zhao 2013 Subtotal (95% CI) Total events Heterogeneity: Chi ² = 6.60 Test for overall effect: Z = 1	3 8 0 7 13 3 5 1 1 96 0 df = 15 (P 0.77 (P = 0	116 124 21 51 38 62 63 29 853 29 853 2 = 0.97 44)	10 11 4 4 0 1 104 1); I ² = 0%	125 21 51 40 62 63 29 849	1.7% 2.3% 9.3% 4.1% 4.2% 0.6% 1.1% 100.0%	0.30 [0.65, 13.75] 1.24 [0.50, 3.11] 0.77 [0.16, 3.70] 1.27 [0.32, 4.98] 3.05 [0.12, 76.26] 1.00 [0.06, 16.79] 0.89 [0.65, 1.20]	

Study or Subgroup Mean SD Total Mean SD Total Weight IV. Fixed, 95% CI V. Fixed, 95% CI V. Fixed, 95% CI Feng 2014 302 91 63 322 102 62 23.2% -20.00 [63.39.1, 13.91] Leo 2010 443.3 221.3 31 422.7 20.7 31 2.4% 20.60 [64.57, 125.77] Razanova 2019 496 133.32 42 440 155.58 3.8 6.5% 16.00 [64.57, 125.77] Razanova 2019 496 133.32 42 440 155.58 3.8 6.5% 16.00 [64.57, 125.77] Razanova 2019 436 123.32 42 440 105.58 3.8 6.5% 16.00 [64.58, 261.62] Sia 2017 375 155.3 21 313 219 21.20% 62.00 [52.88, 176.83] Vinag 2016 302 66 100 310 90 100 44.8% 6.80 [52.40, 164.0] Zhao 2013 421.6 98.2 29 431.3 95.3 28 10.6% 9.70 [59.93, 40.53] Subtotal (65% CI) 362 2 356 100.0% 11.58 [27.91, 4.76] Heterogeneity: Ch ⁺ = 6.18, df = 7 (P = 0.52); F = 0% Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Fena 2019 439 93 100 448 102 100 2.4% 9.00 [54.63, 10.37] Fena 2016 479 33 107 1454 547 121 1411 25.4% 9.00 [54.50, 10.5] Fettes 2006 467.1 27.3.3 20 567.1 185.9 25 0.2% 4.180 [15.01, 96.57] Fettes 2005 467.1 27.3.3 20 567.1 185.9 25 0.2% 4.180 [15.01, 96.57] Fettes 2005 467.1 27.3.3 20 567.1 185.9 25 0.2% 4.180 [15.01, 96.57] Fettes 2005 467.1 27.3 29 391.6 71.8 27. 120 0.2.4% 9.00 [54.65, 10.6] The 2016 47.9 3.204.7 25 521.1 185.9 25 0.2% 4.180 [15.01, 96.57] Zhao 2013 383.1 82.7 29 391.6 71.8 28 10% -0.55 [50.08, 33.61] Wang 2017 380 E12 62 413 110 6.27% -5.00 [14.83, 0.42.30] Wang 2017 380 E12 62 413 110 0.2.8% -2.00 [54.52, 51.0] Zhao 2013 83.8 18.7 29 391.6 71.8 2.8 10% -0.50 [50.06, 43.53, 36.3] Jim 2010 76 63 25 96 70 0.28 0.0% -2.20 [54.82, 14.2] Jim 2010 76 63 25 96 70 0.28 0.0% -2.20 [54.82, 14.2] Jim 2010 76 63 25 96 70 0.28 0.0% -2.20 [54.82, 14.2] Jim 2010 76 63 25 96 70 0.28 0.0% -2.20 [54.82, 14.2] Jim 2010 76 63 25 96 70 0.28 0.0% -2.20 [54.82, 14.2] Jim 2010 76 63 25 197 116 58.53 8.19 118 11.7% -3.22 [5.58, 14.82] Jim 2010 62.2 37.4 31 76.2 58.2 31 0.1% -1.50 [3.50.0, 570] Jim 2010 62.2 37.4 31 76.2 58.2 31 0.1% -1.50 [3.50.0, 570] Jim 2010 62.2 37.4 31 76.2 58.2 31 0.1% -1.50 [3.50.0, 570] Jim 2010 63.			PIEB		(Control			Mean Difference	Mean Difference
8.2.1 duration of labor Fong 2014 43.3 221.3 31 4227 2007 31 2.4% 20.00 [-53.91, 13.91] Leo 2010 443.3 221.3 31 4227 2007 31 2.4% 20.00 [-54.97, 12.07] Rozanow 2019 498 133.32 42 440 155.88 38 6.5% 18.00 [-54.52, 61.82] Rozanow 2019 498 133.32 42 440 155.88 38 6.5% 18.00 [-54.52, 61.82] Siz 2013 3864 202.9 51 414.2 181.3 51 4.3% -240 [-59.4.480 [-69.4.480] Wang 2016 302 86 100 310 90 100 44.4% -6.00 [-52.2.0] (-52.83, 176.83] Subtotal (65% CI) 52 83 93 100 44.8 102 100 2.4% -6.00 [-56.37, 0.37] Fan 2019 53 107 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Fan 2019 53 107 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Fan 2019 53 107 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Fan 2019 53 107 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Fan 2019 53 107 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Fan 2019 53 107 1454 547 120 11% -120.01 [-27.44, 4.76] Heterogenety: Ch ⁺ = 3.30, d ⁺ = 7 (P = 0.58); P = 0% Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Fan 2019 51 12 1454 547 121 1411 25.4% -6.00 [-16.37, 0.37] Song 2020 504 205 38 552 246 40 0.2% -58.00 [-16.3, 0.42.30] Wang 2017 388 12.7 29 391.6 78.8 28 10.0% -10.50 [-57.0 57.0] Zhao 2013 383.1 82.7 29 391.6 78.8 28 10.0% -10.50 [-50.65, 0.50] Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, 0.12] Fan 2016 477 16 100 49 18 100 2.8% -2.20 [-67.2, 27.2] Fan 2016 53.3 0, d ⁺ = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, 0.12] Fan 2016 65.3 3.0 d ⁺ = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2016 65.3 13 52 52 98 77 25 0.00% -2.200 [-63.82, 14.92] Jun 2010 76 63 32 55 98 77 25 0.00% -2.200 [-63.82, 14.92] Jun 2010 76 63 38 241 73 355 21 0.1% -1.50 [-35.80, 570] Jun 2017 60 38 24 14.9 57.85 31.91 181 17% -3.22 (-5.50, 0.44, 62.32) Jun 2016 64.84.8 51 64.49 57.95 10.1%	Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% C	IV. Fixed, 95% CI
Fing 2014 302 91 63 322 102 62 23.2% -20.00 [-5.3.91, 13.91] Line 2010 43.3 221.3 31 422 7 200.7 31 2.4% -20.00 [-5.4.7, 12.77] Line 2010 389 174 25 441 21 25 5.7% -72.00 [-45.7, 12.57] Razanowa 2019 498 133.32 42 480 155.58 38 6.5% 16.00 [-45.8, 18.8] Sia 2007 375 155.3 21 31 21 21 20% (-20.00, 15.8, 20, 16.40) Sia 2013 38.9.4 202.9 51 414.2 181.3 51 4.4% -24.80 [-94.64, 48.86] Sia 2013 38.9.4 202.9 51 414.2 181.3 51 4.4% -24.80 [-94.64, 48.86] Subtotal (5% C)] 362 28 431.3 95.3 28 10.6% -9.70 [-59.93, 40.53] Subtotal (5% C)] 362 29 431.3 95.3 28 10.6% -9.70 [-59.93, 40.53] Fan 2019 539 107 1454 547 121 1411 25.4% -9.00 [-56.37, 0.37] Fan 2019 539 107 1454 547 121 100 2.4% -9.00 [-56.7, 0.37] Fan 2016 479.3 20.47 25 521.1 185.9 25 0.2% +11.68 (-5.9) Lin 2016 420.35 20.29 118 431.51 19.09 118 69.7% +11.61 (-16.27, -6.17] Subtotal (5% C)] 1844 547 121 100 2.4% -9.00 [-56.37, 0.27] Fan 2016 420.35 20.29 118 431.51 19.09 118 69.7% +11.61 (-16.27, -6.17] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-16.37, 0.27] The 2010 647 (-0.006)() 82.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% +10.00 [-1.68, 0.12] The tor overall effect: $Z = -1.80$, $P = 0$, $N = 0\%$ Subtotal (5% C)] 1844 100 2.8% -2.00 [-6.72, 2.72] Fan 2019 51 12 1454 52 12 1411 80.1% +10.00 [-1.68, 0.12] Fan 2019 51 12 1454 52 12 1411 80.1% +10.00 [-1.68, 0.12] Fan 2019 647 16 100 49 118 100 2.8% -2.00 [-6.72, 2.72] Fan 2019 65 31 9.71 12 68.2 86 62 61 0.00% -3.20 [-6.72, 2.72] Fan 2019 65 31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, 0.82] Lin 2010 62 2 37.4 31 762 58.2 31 0.1% +1.40 [0.48, 62.8] Lin 2010 63 21 73 35.5 21 0.1% +1.30 [-3.50, 5.70] Sia 2013 69.8 48.9 51.84.9 57.0 1.0% +1.46 [-2.25, 0.68] Heterogeneity: Ch ² = 15.94, d = 11 (P = 0.11); P = 35% Test for overall effector.2 = 3.86 (P = 0.0003) FIEB control	8.2.1 duration of labo	r						1.0		
Leo 2010 44.3.3 221.3 31 422.7 200.7 31 2.4% 20.60 [+6.57, 125.77] Lim 2010 369 174 25 441 21 25 5.7% -72.00 [+4.07, 0.3.0] Razanowa 2019 498 133.32 42 480 155.58 38 6.5% 15.00 [-45.82, 81.82] Sia 2007 375 155.3 21 313 219 21 2.0% 62.00 [-58.83, 176.83] Sia 2013 38.94 202.9 51 41.42 161.3 14 4.8% -8.00 [-26.8.48, 176.83] Subtol (195% C)] 60.2 29 431.3 95.3 28 10.6% -8.07 [-59.38, 40.53] Subtol (195% C)] 52.9 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fan 2016 439 93 100 448 102 100 2.4% -9.00 [-36.05, 18.05] Freites 2006 467.1 27.3 20 557.1 267.1 20 0.1% -120.00 [-36.05, 18.05] Lin 2016 439.9 3 100 448 102 100 2.4% -9.00 [-36.05, 18.05] Lin 2016 429.3 20.47 25 52.11 185.9 25 0.2% -11.16 [-16.27, 4.746] Subtol (195% C)] 16.427 91.159 [-57.0, 25.70] Subtol (195% C)] 16.437.0 27.1 28 1.0% -4.800 [-16.37, 0.37] Fang 2016 439 93 100 448 102 100 2.4% -9.00 [-36.05, 18.05] Lin 2016 429.3 20.47 25 52.11 185.9 25 0.2% -1.41.80 [-45.01, 96.59] Lin 2016 429.3 20.47 25 52.11 185.9 25 0.2% -1.41.80 [-45.01, 28.3, 0.3] Wang 2017 398 121 62 413 110 62 1.1% -15.00 [-5.70, 25.70] Subtol (195% C)] 1844 1804 100.0% -10.52 [-14.74, -6.30] Wang 2017 398 127 129 316.7 9.8 28 1.0% -55.00 [-45.3, 36.3] Freites 2006 9.9.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.3] Fang 2016 47 71 51 00 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 71 51 00 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 71 51 10 449 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 71 51 10 449 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 71 51 00 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 71 51 00 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 72, 2.73 33 52 60.6 40 0.1% -2.20 [-6.72, 2.72] Fang 2016 47 72, 2.73 33 52 71 0.1% -1.40 [-2.85, 2.98] Lin 2010 76 63 25 98 70 25 0.0% -2.20 [-6.72, 2.72] Fang 2016 47 2.33, 48.9 51 8.49 57.9 51 0.1% -1.40 [-3.85, 10.35] Jin 2017 48 12 62 53 13 62 3.2% 5.00 [-4.0, 6.60] Jin 41 100.0% -1.40 [-2.25, 0.68] Heterogeneity: Ch ² = 16.94, d = 11 (P = 0.11); P = 35% Text for overall effe	Feng 2014	302	91	63	322	102	62	23.2%	-20.00 [-53.91, 13.91]	
Lim 2010 368 174 25 441 21 25 5.7% -72.00 [+40.70.3.30] Rezarova 2019 446 153.2 42 440 155.8 38 6.5% [18.00 [-48.28.82] Sia 2017 375 155.3 21 313 219 21 2.0% 62.00 [-52.83, 176.83] Sia 2013 389.4 202.9 51 414.2 181.3 51 4.4% -24.80 [-99.46, 48.68] Vang 2016 302 86 100 100 44.8% -8.00 [-32.00, 164.0] Zhao 2013 421.6 96.2 29 431.3 95.3 28 10.6% -9.70 [-59.93, 40.53] Subtotal (95% C)] 362 29 343.1 95.3 28 10.6% -9.70 [-59.93, 40.53] Subtotal (95% C)] 362 39 100 44.8% 102 100 2.4% -9.00 [-36.05, 18.05] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-36.37, 0.37] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-36.37, 0.37] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-36.37, 0.37] Fan 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-163.7, 0.37] Fan 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-160.7, 0.570] Ji 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-160.37, 0.570] Zhao 2013 38.31 82.7 29 391.6 79.8 28 10% -8.50 [-56.68, 33.69] Subtotal (95% C)] 1844 1804 100.0% -10.52 [-41.74, -6.30] Heterogeneity: ChP = 3.30, df = 7 (P = 0.46); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, 0.12] The 2016 47 16 100 49 18 100 2.8% -220 [-5.78, 27.07] Zhao 2013 38.31 82.7 29 391.6 79.8 28 10% -8.50 [-50.68, 33.69] Subtotal (95% C)] 1844 1804 100.0% -1.05 [-163.7, 0.37] Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, 0.12] Test 200 6 9.2 2.37.4 31 76.2 58.2 31 0.1% -1.00 [-3.35, 10.35] Lin 2010 62 2.37.4 31 76.2 58.2 31 0.1% -1.00 [-3.85, 10.35] Fidxowski 2019 81 65.8 43 52.8 66.6 34 0.1% 2.82.0 [-5.84, 62.24] Lin 2010 63 52.1 72.8 1.3% (-7.20 [-5.89, 2.14.92] Ji 2016 55.31 9.71 116 58.53 13.97 118 [18 11.7% -3.22 [-5.24, 0.92] Sia 2007 60 36 2.1 73 35.5 21 0.1% -1.10 [-3.36, 51.03] Ji 21 100.0% -1.46 [-2.25, 0.68] Ji 2010 69.8 48.9 51 84.9 57.9 51 0.1% -1.51 [-3.50, 5.70] Ji 21 100.0% -1.46 [-2.25, 0.68] Ji 2011 69.8 4	Leo 2010	443.3	221.3	31	422.7	200.7	31	2.4%	20.60 [-84.57, 125.77]	
Riazanova 2019 498 133.2 42 480 155.58 38 6.5% 18.00[45.82,81.82] Sia 2017 375 155.3 21 313 219 21 2.0% 62.00[52.83,176.83] Sia 2013 389.4 202.9 51 414.2 181.3 51 4.8% -24.80[99.48,49.88] Wang 2016 302 86 100 310 90 100 44.8% -8.00[-32.40, 16.40] Subtotal (95% CI) 692. 2 9 431.3 95.3 28 10.6% -9.70[-593.94.05.3] Subtotal (95% CI) 16 92. 2 9 431.3 95.3 28 10.6% -11.58[-27.91, 4.76] Featogenetic, Ch ² = 6.18, (17 (P = 0.52); F = 0% Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Featogenetic, Ch ² = 0.18, 127.3 2 00 587.1 267.1 20 0.1% -120.00[-287.48,47.48] J2016 479.3 204.7 25 521.1 185.9 25 0.2% -41.80 (-16.37, 0.37] Featogenetic, Ch ² = 3.30, d = 7 (P = 0.85); F = 0% Test for overall effect: Z = 4.89 (P < 0.0001) 8.2.3 first stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00[-18.8,0.12] Chao 2013 383.1 82.7 2 9 39.16 7.8 28 10.0% -8.50 (-16.83, 0.42.30) Wang 2017 386 121 62 413 110 62 1.1% -15.00 (-5.70, 25.70, 25.70) Subtotal (95% CI) 1844 180.4 100.0% -10.52 [-14.74, 6.30] Heterogenetic, Ch ² = 3.30, d = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -10.00 [-1.88, 0.12] Fettes 2006 492.2 662.2 0 102.8 62.6 34 0.0.7% -3.20 (-5.72, 2.72] Fettes 2006 47 16 100 49 18 100 2.4% -2.00 [-6.72, 2.72] Fettes 2006 59.2 662.2 0 102.8 62.6 34 0.0.7% -3.20 (-5.84, 62.24] Lin 2010 62.2 37.4 31 76.2 58.2 31 0.1% -13.00 [-3.53, 63.35, 0.53] Sia 2007 60 36 24 173 352.5 12 0.17% -3.20 (-5.22, -7.24) Mang 2017 48 12 62 53 1.17 2 58 1.0 17 - 13.60 (-3.42, 2.82) Wang 2017 48 12 62 53 1.13 62 3.2% -5.00 [-9.40, 0.60] The torogenetic; Ch ² = 15.54, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.84 (P = 0.0003) Heterogenetic; Ch ² = 15.54, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.84 (P = 0.0003) Heterogenetic; Ch ² = 18.51, df = 2 (P < 0.0001) H = 89.2%	Lim 2010	369	174	25	441	21	25	5.7%	-72.00 [-140.70, -3.30]	+
Sia 2007 375 155.3 21 313 219 21 2.0% 62.00 (52.8.1) 76.83] Sia 2013 3894 202.9 51 414.2 181.3 51 4.6% -24.80 (99.46,49.88] Sia 2013 32 86 100 310 50 100 44.8% -24.80 (99.46,49.88] Mang 2016 302 86 100 310 50 100 44.8% -8.00 [32.40 16.40] Zhao 2013 421.6 98.2 29 431.3 95.3 28 10.6% -9.70 [59.93.40.53] Let or overall effect: $Z = 1.39$ ($P = 0.52$); $P = 0\%$ Test for overall effect: $Z = 1.39$ ($P = 0.52$); $P = 0\%$ Test for overall effect: $Z = 1.39$ ($P = 0.52$); $P = 0\%$ Fan 2019 539 107 1454 547 121 1411 25.4% -9.00 [-16.37, 0.37] Fan 2016 439 93 100 448 102 100 2.4% -9.00 [-36.57, 0.57] Fan 2016 479.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 479.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 125 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 125 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.3 204.7 125 521.1 185.9 25 0.2% -41.80 [-15.30, 42.80] Ji 2016 470.8 121 62 1.1% +15.00 [-1.88, -0.12] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -8.50 [-50.69, 33.69] Ji 2017 386 121 62 102.8 62.6 20 0.0% -3.60 [-4.52, 3.72] Ji 2016 55.31 9.71 116 58.53 8.19 118 10.7% -3.02 [-54.4, 2.42] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-36.35, 10.55] Lim 2010 76 63 25 96 70 25 0.0% -3.20 [-56.92, 14.82] Lim 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.32 [-53.2, 14.82] Lim 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.32 [-5.52, 2.48] Ji 2007 60 36 24 17.3 33.5 21 0.1% +1.50 [-3.59, 5.70] Ji 41 100.0% -1.46 [-2.25, 0.68] Ji 2007 60 36 24 27.3 3 33 62 3.2% 5.50 [-6.40, 0.60] Ji 41 100.0% -1.46 [-2.25, 0.68] Ji 2007 60 36 24 17.9 3.55 12.7 28 1.37% Test for overall effect: $Z = 3.84$ ($P = 0.0003$) Test for overall effect: $Z = 3.84$ ($P = 0.0003$) Ji 41 100.0% -1	Riazanova 2019	498	133.32	42	480	155.58	38	6.5%	18.00 [-45.82, 81.82]	
Sia 2013 398.4 2029 51 414.2 181.3 51 4.8% 24.80 199.48, 40.80 134, 40.16.40 1302 16 302 86 100 310 90 100 44.8% 4.80 130.48, 40.16.40 1302 1421.6 98.2 29 431.3 95.2 8100.5% -8.00 132.40, 16.40 1302 120 24% -8.00 132.40, 14.76 146 120 100 2.4% -8.00 136.05, 18.05 17.0 159.93, 40.53 150.05 17.0 11.58 1-27.91, 4.76 146 120 100 2.4% -8.00 1-6.37, 0.37 150 140 140 140 140 140 140 140 140 140 14	Sia 2007	375	155.3	21	313	219	21	2.0%	62.00 [-52.83, 176.83]	
Wang 2016 302 86 100 310 90 100 44.8% = 6.00 [32.40, 16.40] Zhao 2013 421.6 96.2 29 431.3 95.3 28 10.6% -9.70 [59.93, 40.53] Heterogeneity: Ch ² = 6.18, df = 7 (P = 0.52); F = 0% Test for overall effect: Z = 1.39 (P = 0.52); F = 0% Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fang 2016 439 93 100 448 102 100 2.4% -9.00 [-38.05, 18.04] JI 2016 479.3 204.7 25 52.11 185.9 25 0.2% 41.80 [-150.19, 66.11] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-16.37, 0.57] Subtotal (9% Cl) 164 31.51 19.09 118 69.7% -11.16 [-8.21, 6.11] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-16.30, 42.30] Wang 2017 398 121 62 413 110 62 1.1% -15.00 [-55.70, 25.70] Subtotal (9% Cl) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Ch ² = 3.0, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.2% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 552 98 70 25 0.0% -2.20 [-58.46, 2.24] Lin 2010 62.2 37.4 31 76.2 55.2 31 0.1% -14.00 [-3.83, 51.03] Lin 2010 76 63 25 98 70 25 0.0% -2.20 [-58.46, 2.24] Lin 2010 62.2 37.4 31 76.2 55.2 31 0.1% -13.00 [-3.83, 51.03] Lin 2010 76 63 25 98 70 25 0.0% -2.20 [-58.48, 62.2] Sia 2003 60 36 21 73 35.5 21 0.1% -13.00 [-3.83, 61.26] Wang 2017 46 12 62 53 13 62 3.2% -5.00 [-9.40, -6.0] Fietherogeneity: Ch ² = 1.851, df = 2 (P < 0.0001), P = 89.2% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subproup differences: Ch ² = 18.51, df = 2 (P < 0.0001), P = 89.2%	Sia 2013	389.4	202.9	51	414.2	181.3	51	4.8%	-24.80 [-99.48, 49.88]	
Zhao 2013 421.6 98.2 29 431.3 95.3 28 10.6% -9.70 [-59.93, 40.53] Subtotal (95% CI) 362 356 100.0% -11.58 [-27.91, 4.76] Heterogeneity: Ch ^p = 6.18, df = 7 (P = 0.52); P = 0% 7 7 7 9.00 [-16.37, 0.37] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] J2016 470.3 204.7 25 521.1 186.9 25.0% -41.80 [-16.3.0, 42.30] Wang 2017 396 121 62 413 110 62 1.1% +55.00 (-25.69, 35.60] Subtotal (95% CI) 1844 100.0% -10.52 [-14.74, -6.30] -45.00 -45.80 [-56.69, 35.61] -45.80 Subtotal (95% CI) 1844 100.2% -2.00 [-6.72, 2.72] -45.80 [-6.72, 2.72] -76.60 [-6.72, 2.72] -76.60 [-6.	Wang 2016	302	86	100	310	90	100	44.8%	-8.00 [-32.40, 16.40]	
Subtolal (95% CI) 362 356 100.0% -11.58 [-27.91, 4.76] Heterogeneity: Ch ² = 6.18, df = 7 (P = 0.52); P = 0%, Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Fan 2019 539 107 1454 547 121 1411 25.4%, -8.00 [-16.37, 0.37] Fang 2016 439 93 100 448 102 100 2.4%, -9.00 [-36.05, 18.05] Fang 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-15.01, 06.59] Ji 2016 479.3 204.7 25 521.1 105.9 118 65.7%, -11.16 [-16.27, 6.17] Song 2020 504 205 38 562 246 40 0.2%, -58.00 [-15.30, 42.30] Wang 2017 398 121 62 413 110 62 1.1%, -15.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 798 28 1.0%, -50.50 [-53.04, 23.0] Wang 2017 398 121 62 413 110 62 1.1%, -15.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 798 28 1.0%, -3.05 [-56.69, 33.69] Subtolal (95% CI) 1844 1804 100.0%, -10.52 [-44.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2016 47 16 100 49 18 100 2.8%, -2.00 [-57.2, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0%, -3.60 [-45.33, 36.3] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2016 62.2 37.4 31 76.2 58.2 31 0.1%, -14.00 [-3.8.5, 10.35] Lim 2010 62.2 37.4 31 76.2 58.2 31 0.1%, -14.00 [-3.8.5, 10.35] Lim 2010 62.2 37.4 31 76.2 58.2 31 0.1%, -13.00 [-34.68, 62] Sia 2003 69.8 48.8 51 84.9 57.9 51 10.1%, -13.00 [-34.68, 62] Sia 2003 69.8 48.8 51 84.9 57.9 51 10.1%, -13.00 [-34.68, 62] Sia 2003 69.8 48.8 51 84.9 57.9 51 10.1%, -13.00 [-34.68, 126] Wang 2017 48 12 62 53 13 62 3.2%, -5.00 [-9.40, 0.60] Jabo 213 40.2 13.4 2.9 38.5 12.7 28 1.3%, 1.70 [-5.06, 84.8] Subtolal (95% CI) 1990 1941 100.0%, -1.46 [-2.25, 0.68] Heterogeneity: Ch ² = 18.51, df = 2 (P < 0.0001) F = 82.2% Test for overall effect: Z = 3.64 (P = 0.0003)	Zhao 2013	421.6	98.2	29	431.3	95.3	28	10.6%	-9.70 [-59.93, 40.53]	
Heterogeneity: Chi ² = 6.18, df = 7 (P = 0.52); P = 0% Test for overall effect: Z = 1.39 (P = 0.16) 8.2.2 first stage of labor Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fang 2016 439 93 100 448 102 100 2.4% -9.00 [-36.05, 18.05] Fettes 2006 467.1 273.3 20 587.1 267.1 20 0.1% -120.00 [-287.4.8.47.46] J 2016 479.3 204.7 25 521.1 159.9 25 0.25% 41.80 [-150.19, 66.59] Lin 2016 420.35 20.29 116 431.51 19.09 118 69.7% -11.16 [-16.21, 6.11] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-158.30, 42.30] Wang 2017 398 121 62 413 10 62 1.1% -15.00 [-58.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -5.50 [-56.06, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-44.74, -6.30] Heterogeneity: Chi ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-58.92, 14.92] Lin 2010 76 22 37.4 31 76.2 58.2 31 0.1% -14.00 [-3.83, 0.33] Lin 2010 76 0 36 21 73 35.5 21 0.1% -1.30 [-45.83, 36.33] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-52, 2.092] Sia 2003 37 22.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Jabo 213 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-50.6, 8.62] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 3.64 (P = 0.0003) Test for overall effect: Z = 3.64 (P = 0.0003)	Subtotal (95% CI)			362			356	100.0%	-11.58 [-27.91, 4.76]	-
Test for overall effect: $Z = 1.39$ (P = 0.16) 8.2.2 first stage of labor Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fang 2016 479.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.19, 66.59] J 2016 479.3 204.7 25 521.1 185.9 25 0.2% -41.80 [-15.10, 61.67] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-15.30, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -55.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -50.0 [-57.2, 27.2] Test for overall effect: $Z = 4.89$ (P < 0.00001) 8.2.3 Second stage of labor Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-57.2, 27.2] Fettes 2006 42.2 37.4 31 76.2 58.2 10.1% -10.00 [-18.8, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-57.2, 27.2] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-45.30, 36.3] Fidowski 2019 81 85.8 43.5 2.8 66.6 34 0.1% 28.20 [-58.4, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-58.9, 21.69] Sia 2013 69.8 43.9 51 84.9 57.9 51 0.1% -13.00 [-45.8, 20.2] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -13.00 [-45.8, 20.2] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -13.00 [-46.8, 20.2] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -13.00 [-46.8, 26.6] Lim 2010 62.2 37.4 31 76.2 58.2 10.1% -13.00 [-46.8, 20.2] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -15.10 [-53.9, 5.70] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -15.10 [-58.9, 2.40] Sia 2013 69.8 43.9 51 84.9 7.9 51 0.1% -15.10 [-58.9, 5.70] Sia 2013 69.4 43.9 31 84.9 7.9 51 0.1% -15.10 [-58.9, 5.70] Sia 2013 69.4 44.11 (P = 0.0003) Test for overall effect: $Z = 3.64$ (P = 0.0003) Test for subgroup differences: Chi' = 18.51, df = 2 (P < 0.0001), F = 82.2%	Heterogeneity: Chi ² = 6	6.18, df =	7 (P = 0	.52); I ²	= 0%				21 P 12	
8.22 first stage of labor Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fang 2016 439 93 100 448 102 100 2.4% -9.00 [-36.05, 18.05] Fettes 2006 467.1 273.3 20 587.1 267.1 20 0.1% -120.00 [-287.48, 47.48] J1 2016 470.3 202.9 116 431.51 19.09 118 69.7% -11.16 [-16.21, 6.19] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-158.30, 42.30] Wang 2017 388 121 62 413 110 62 1.1% -15.00 [-5.70, 25.70] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.99 (P < 0.0001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-5.84, 62.24] Lee 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-3.83, 63.3] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Lin 2010 76 63 25 8 70 25 0.0% -2.20 [-5.84, 62.84] Lin 2010 76 63 32 51 84.9 57.9 51 0.1% -15.10 [-3.59.0, 5.70] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [-3.59.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.59.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.59.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.59.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.59.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -14.6 [-2.25, -0.68] Heterogeneity: Ch ² = 18.51, df = 2 (P < 0.0001) F = 89.2%	Test for overall effect:	Z = 1.39	(P = 0.16	5)						
Fan 2019 539 107 1454 547 121 1411 25.4% -8.00 [-16.37, 0.37] Fan 2016 439 93 100 448 102 100 2.4% -9.00 [-36.5, 18.05] Fettes 2006 467.1 273.3 20 587.1 267.1 20 0.1% -120.00 [-287.48, 47.46.5, 18.05] Lin 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-150.9, 66.59] Lin 2016 420.35 20.29 116 431.51 19.09 118 69.7% -11.16 [-16.21, -6.11] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-158.30, 42.30] Wang 2017 398 121 62 413 110 62 1.1% -55.00, 25.70, 25.70 Zhao 2013 38.31 82.7 29 391.6 79.8 28 10% -58.00 [-158.30, 42.30] We coverall effect: Z = 4.89 (P < 0.0001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fan 2016 47 16 100 49 18 100 2.8% -2.00 [-5.72, 27.2] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.3] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Lin 2010 62.2 37.4 31 76.2 58.2 31 0.1% -1.400 [-3.83, 51.35] Lin 2010 76 63 25 98 70 25 0.0% -2.200 [-5.84, 62.24] Lin 2010 76 63 25 98 70 25 0.0% -2.200 [-5.84, 62.24] Lin 2010 76 63 25 98 70 25 0.0% -2.200 [-5.84, 62.24] Lin 2010 76 63 25 98 70 25 0.0% -2.200 [-5.84, 62.24] Lin 2010 76 63 25 98 70 25 0.0% -2.200 [-5.84, 62.24] Lin 2010 76 63 21 73 35 21 0.1% -1.300 [-34.62, 86.2] Sia 2007 60 36 21 73 35 21 0.1% -1.300 [-34.62, 86.2] Sia 2013 69.8 48.9 57.9 51 0.1% -1.500 [-3.80, 0.570] Sia 2007 74 116 55.51 31 9.79 51 0.1% -1.500 [-3.80, 0.570] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -1.500 [-3.80, 0.570] Zhao 2013 40.2 13.4 29 38.5 12.7 28 13.3% 1.70 [-5.08, 84.8] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 18.51, df = 2 (P < 0.0001), P = 89.2%	8.2.2 first stage of lab	oor								
Fang 2016 439 93 100 448 102 100 2.4% -0.00[-36.05, 18.05] Fettes 2006 467.1 273.3 20 557.1 267.1 20 0.1% -120.00[-28.74, 47.46] J12016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-150.19, 66.51] Song 2020 504 205 38 562 246 40 0.2% -58.00 [-58.30, 42.30] Vang 2017 398 121 62 413 110 62 1.1% -15.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -8.50 [-50.68, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Chi ^P = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.0001) 82.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.86, -0.12] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 22.20 [-5.84, 62.24] Lee 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-3.8.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-5.84, 62.24] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-5.84, 62.24] Lim 2010 62.3 37.4 31 76.2 58.2 31 0.1% -15.10 [-3.59.0, 5.70] Sia 2007 60 36 621 73 35.5 21 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.0, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-3.69.8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ^P = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ^P = 18.51, df = 2 (P < 0.0001); P = 89.2%	Fan 2019	539	107	1454	547	121	1411	25.4%	-8.00 [-16.37, 0.37]	
Fettes 2006 467.1 273.3 20 587.1 267.1 20 0.1% -120.00 [-287.48, 47.48] Ji 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80 [-156.18, 66.59] Un 2016 420.35 20.2.9 116 431.51 19.0.9 116 69.7% -111.16 [-16.2.1, 61.1] Song 202 504 205 38 562 246 40 0.2% -58.00 [-158.30, 42.30] Wang 2017 398 121 62 413 110 62 1.1% -15.00 [-5.70, 55.70, 55.70] Subtotal (95% CI) 1844 1804 100.0% -0.052 [-14.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fattes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.80 [-4.35.3, 36.33] Heterogeneity: Ch ² = 3.74 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 96 70 25 0.0% -22.00 [-5.89.2, 14.92] Jia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.30 [-34.62, 86.2] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.30 [-34.62, 8.62] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Ch ² = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for overall effect: Z = 3.64 (P = 0.0003)	Fang 2016	439	93	100	448	102	100	2.4%	-9.00 [-36.05, 18.05]	
Ji 2016 479.3 204.7 25 521.1 185.9 25 0.2% 41.80[-150.19, 66.59] Lin 2016 420.35 20.29 116 431.51 19.09 118 69.7% 41.16[-16.21, -6.11] Song 2020 504 205 38 552 246 40 0.2% -58.00[-158.0, 42.30] Wang 2017 398 121 62 413 110 62 1.1% -15.00[-55.70, 25.70] Zhao 2013 38.3.1 82.7 29 391.6 79.8 28 1.0% -8.50[-50.69, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.5[-67.2, 2.72] Fang 2016 47 16 100 49 18 100 2.8% -2.00[-6.72, 2.72] Fetse 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60[-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20[-58.46, 2.24] Lee 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00[-58.90, 57.0] Lin 2010 76 63 25 98 70 25 0.0% -22.00[-6.72, 2.72] Lin 2010 76 63 25 98 70 25 0.0% -22.00[-58.92, 14.92] Lin 2010 55.31 9.71 116 58.53 8.19 118 11.7% -3.22[-5.52, 0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10[-34.62, 8.62] Lin 2018 55.31 9.71 316 58.73 8.19 118 11.7% -3.22[-5.52, 0.92] Sia 2017 60 36 21 73 35.5 21 0.1% -15.10[-34.62, 8.62] Lin 2018 55.31 9.71 316 58.79 51 0.1% -15.10[-34.62, 8.62] Lin 2018 55.31 9.71 33.5 12.7 28 1.3% 1.70[-24.66, 1.26] Sia 2017 60 36 21 73 35.5 21 0.1% -15.10[-34.59, 6.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -1.10[-34.62, 8.62] Lin 2018 55.31 9.71 116 58.53 8.19 118 11.7% -1.20[-5.46, 1.26] Sia 2017 60 36 21 73 35.5 21 0.1% -15.10[-34.62, 8.62] Lin 2016 55.31 9.71 116 58.53 8.19 118 1.1% -15.10[-34.62, 8.62] Lin 2016 55.31 9.71 116 58.53 8.19 118 1.1% -15.10[-34.62, 8.62] Lin 2018 55.31 9.71 116 58.53 8.19 118 1.1% -15.10[-34.62, 8.62] Lin 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70[-5.06, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46[-2.25, -0.68] Heterogeneity: Chi ² = 18.51, df = 2 (P < 0.0001). PE 89.2%	Fettes 2006	467.1	273.3	20	587.1	267.1	20	0.1%	-120.00 [-287.48, 47.48]	•
Lin 2016 420.35 20.29 116 431.51 19.09 118 69.7% -11.16 [-16.21, -6.11] Song 2020 504 205 38 562 246 40 0.2% -56.00 [-156.30, 42.30] Wang 2017 398 121 62 413 110 62 11.1% -15.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -8.50 [-50.69, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Chi ² = 18.51. df = 2 (P < 0.86); $P = 0\%$ Test for overall effect: Z = 3.64 (P = 0.86); P = 0% Test 2010 62.2 37.4 31 76.2 58.2 31 0.1% -1.00 [-1.88, -0.12] Fals 2010 63.2 17.3 35.5 21 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -3.20 [-6.72, 2.72] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 14.92] Sia 2013 69.8 48.9 57.9 51 0.1% -13.00 [-34.62, 14.92] Sia 2013 69.8 48.9 35.9 87.9 51 0.1% -13.00 [-34.62, 14.92] Sia 2013 69.8 48.9 35.9 18 4.9 57.9 51 0.1% -13.00 [-34.62, 14.92] Sia 2013 69.8 48.9 35.9 18 4.9 57.9 51 0.1% -13.00 [-34.62, 16.6] Sia 2013 69.8 48.9 35.9 18 4.9 57.9 51 0.1% -13.00 [-34.62, 16.6] Sia 2013 69.8 48.9 35.9 18 4.9 35.9 19 118 11.77 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 18.51. df = 2 (P < 0.0001), P = 89.2%	Ji 2016	479.3	204.7	25	521.1	185.9	25	0.2%	-41.80 [-150.19, 66.59]	• • • •
Song 2020 504 205 38 562 246 40 0.2% -58.00 [-158.30, 42.30] Wang 2017 398 121 62 413 110 62 1.1% -15.00 [-55.70, 25.70] Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -8.50 [-50.69, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-58.4, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-56.92, 14.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-52, 0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [-36.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57, 9 51 0.1% -15.10 [-36.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57, 9 51 0.1% -15.10 [-36.90, 5.70] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% -5.00 [-9.40, -0.60] Heterogeneity: Ch ² = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subprove differences: Ch ² = 18.51, df = 2 (P < 0.0001), P = 89.2%	Lin 2016	420.35	20.29	116	431.51	19.09	118	69.7%	-11.16 [-16.21, -6.11]	
Wang 2017 398 121 62 413 110 62 1.1% -15.00 [-55.70, 25.70] Zhao 2013 383.1 62.7 29 391.6 79.8 28 1.0% -8.50 [-50.69, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.86, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-5.8.9, 14.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.8 44.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.8 44.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.8 44.9 51 84.9 57.9 81 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Ch ² = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subproup differences: Ch ² = 18.51, df = 2 (P < 0.0001), I ² = 89.2%	Song 2020	504	205	38	562	246	40	0.2%	-58.00 [-158.30, 42.30]	
Zhao 2013 383.1 82.7 29 391.6 79.8 28 1.0% -8.50 [-50.69, 33.69] Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Ch ² = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.0001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.86, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-3.8.5, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-58.92, 14.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.00 [-3.4.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.00 [-3.4.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.00 [-3.4.62, 8.62] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Ch ² = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for overall effect: Z = 3.64 (P = 0.0003)	Wang 2017	398	121	62	413	110	62	1.1%	-15.00 [-55.70, 25.70]	
Subtotal (95% CI) 1844 1804 100.0% -10.52 [-14.74, -6.30] Heterogeneity: Chi ^p = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: Z = 4.89 (P < 0.00001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.86, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-5.84, 62.24] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, 0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [-38.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-38.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-36.80, 6.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 (9.40, 0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ^p = 16.94, df = 11 (P = 0.11); I ^p = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ^p = 18.51, df = 2 (P < 0.0001), I ^p = 89.2%	Zhao 2013	383.1	82.7	29	391.6	79.8	28	1.0%	-8.50 [-50.69, 33.69]	
Heterogeneity: Chi ^p = 3.30, df = 7 (P = 0.86); P = 0% Test for overall effect: $Z = 4.89$ (P < 0.0001) 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-4.35.3, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-58.92, 14.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -500 [-940, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ^p = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Ch ^p = 18.51, df = 2 (P < 0.0001), P = 89.2%	Subtotal (95% CI)			1844			1804	100.0%	-10.52 [-14.74, -6.30]	•
Test for overall effect: $Z = 4.89 (P < 0.00001)$ 8.2.3 second stage of labor Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -2.20 [-5.82, 21.492] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); I ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), I ² = 89.2%	Heterogeneity: Chi ² = 3	3.30, df =	7(P = 0	.86); 12	= 0%					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Test for overall effect:	Z = 4.89	(P < 0.00	0001)						
Fan 2019 51 12 1454 52 12 1411 80.1% -1.00 [-1.88, -0.12] Fang 2016 47 16 100 49 18 100 2.8% -2.00 [-6.72, 2.72] Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [-43.53, 36.33] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-5.8.9, 21.4.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [-35.90, 5.70] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); I ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for overall effect: Z = 3.64 (P = 0.0003)	8.2.3 second stage of	labor								
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Fettes 2006 99.2 66.2 20 102.8 62.6 20 0.0% -3.60 [$-43.53, 36.33$] Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [$-5.84, 62.24$] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [$-38.35, 10.35$] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [$-58.92, 14.92$] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [$-5.52, -0.92$] Sia 2007 60 36 21 73 35.5 21 0.1% -15.10 [$-35.09, 5.70$] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [$-24.66, 1.26$] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [$-9.40, -0.60$] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [$-5.08, 8.48$] Subtotal (95% Cl) 1990	Fang 2016	47	16	100	49	18	100	2.8%	-2.00 [-6.72, 2.72]	-
Fidkowski 2019 81 85.8 43 52.8 66.6 34 0.1% 28.20 [-5.84, 62.24] Leo 2010 62.2 37.4 31 76.2 58.2 31 0.1% -14.00 [-38.35, 10.35] Lim 2010 76 63 25 98 70 25 0.0% -22.00 [-58.92, 14.92] Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); P = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), P = 89.2%	Fettes 2006	99.2	66.2	20	102.8	62.6	20	0.0%	-3.60 [-43.53, 36.33]	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fidkowski 2019	81	85.8	43	52.8	66.6	34	0.1%	28.20 [-5.84, 62.24]	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Leo 2010	62.2	37.4	31	76.2	58.2	31	0.1%	-14.00 [-38.35, 10.35]	
Lin 2016 55.31 9.71 116 58.53 8.19 118 11.7% -3.22 [-5.52, -0.92] Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); I ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), I ² = 89.2%	Lim 2010	76	63	25	98	70	25	0.0%	-22.00 [-58.92, 14.92]	
Sia 2007 60 36 21 73 35.5 21 0.1% -13.00 [-34.62, 8.62] Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); I ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), I ² = 89.2%	Lin 2016	55.31	9.71	116	58.53	8.19	118	11.7%	-3.22 [-5.52, -0.92]	-
Sia 2013 69.8 48.9 51 84.9 57.9 51 0.1% -15.10 [-35.90, 5.70] Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); l ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2%	Sia 2007	60	36	21	73	35.5	21	0.1%	-13.00 [-34.62, 8.62]	
Song 2020 37 23.6 38 48.7 34.1 40 0.4% -11.70 [-24.66, 1.26] Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% CI) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); I ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), I ² = 89.2%	Sia 2013	69.8	48.9	51	84.9	57.9	51	0.1%	-15.10 [-35.90, 5.70]	
Wang 2017 48 12 62 53 13 62 3.2% -5.00 [-9.40, -0.60] Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] -1.46 [-2.25, -0.68] Heterogeneity: Chi² = 16.94, df = 11 (P = 0.11); I² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) -100 -50 0 50 100 Test for subgroup differences: Chi² = 18.51, df = 2 (P < 0.0001), I² = 89.2%	Song 2020	37	23.6	38	48.7	34.1	40	0.4%	-11.70 [-24.66, 1.26]	
Zhao 2013 40.2 13.4 29 38.5 12.7 28 1.3% 1.70 [-5.08, 8.48] Subtotal (95% Cl) 1990 1941 100.0% -1.46 [-2.25, -0.68] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); l ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2%	Wang 2017	48	12	62	53	13	62	3.2%	-5.00 [-9.40, -0.60]	-
Subtrait (95% cf) 1990 1990 1941 100.0% -1.46 [-2.25, -0.66] Heterogeneity: Chi ² = 16.94, df = 11 (P = 0.11); l ² = 35% Test for overall effect: Z = 3.64 (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2% PIEB control	Zhao 2013	40.2	13.4	29	38.5	12.7	28	1.3%	1.70 [-5.08, 8.48]	-
Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2%	Subtotal (95% CI)			1990	12		1941	100.0%	-1.46 [-2.25, -0.68]	
Test for overall effect: $z = 3.64$ (P = 0.0003) Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2% Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l ² = 89.2%	Heterogeneity: Chi ² = '	16.94, df	= 11 (P =	= 0.11);	*= 35%					
Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), ² = 89.2%	l est for overall effect:	Z = 3.64	(P = 0.00	003)						
Test for subgroup differences: Chi ² = 18.51, df = 2 (P < 0.0001), l^2 = 89.2%										-100 -50 0 50 100
	Test for subgroup diffe	rences: (chi ² = 18	51. df =	= 2 (P < (0.0001	2 = 89	2%		PIEB control

Figure 11. Meta-analysis of the net change in time of labor. Cl = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

The outcome of programmed intermittent epidural labor analgesia on the length of labor and delivery methods are not the same. Sia et al^[53] performed a randomized controlled study comparing CEI administered as 5 mL/h with PIEB es administered as 5 mL every 60 minutes, with all groups using 0.1% ropivacaine with $2 \mu g/mL$ fentanyl. It is noted that the time to delivery in the PIEB group was significantly longer than the control group. At the same time, some studies have reached the opposite conclusion.^[43,48,65] We conducted a meta-analysis on the time of labor and the mode of delivery. A systematic review and metaanalysis of the existing data found that the procedural epidural analgesia group had a significantly shorter time in the first and second stages of labor when compared with the continuous epidural analgesia group. It may be that the PIEB was more prone to an extensive nerve block, which makes the soft birth canal cervix looser and soft, and the fetal head descends more smoothly. The results of this study also confirmed the above view.

The study found that the normal delivery rate of the PIEB group was higher than the control group. This result also shows that the PIEB mode has less effect on contractions than continuous epidural analgesia, and can effectively reduce pelvic floor muscle tension. The production process went smoothly and maternal satisfaction was also higher.

Observing the effects of different modes of labor analgesia on newborns is the first time to be reported in the form of systematic reviews. By observing the effects of different modes of labor analgesia on the Apgar score of newborns at 1, 5 minutes after birth, we can make a more comprehensive and objective analysis to explore the effects of different modes of labor analgesia on maternal and infant outcomes. According to the results of this study, compared with the continuous epidural analgesia group, the newborns in the programmed intermittent epidural analgesia group had significantly higher Apgar scores at 1 and 5 minutes after delivery, and the Apgar score level was

		PIEB		0	ontrol			Mean Difference			Mean Di	ifference	8	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% C		IV	, Rando	om, 95%	CI	
Fan 2019	9	0.741	1454	7	0.741	1411	8.8%	2.00 [1.95, 2.05]				•		
Fang 2016	9.5	0.5	100	7.5	1.5	100	8.5%	2.00 [1.69, 2.31]				•		
Haidl 2019	10	0.741	75	10	0.741	75	8.6%	0.00 [-0.24, 0.24]				•		
Ji 2016	9.61	0.29	25	8.31	0.34	25	8.7%	1.30 [1.12, 1.48]				•		
Leo 2010	9.37	0.7	31	8.58	0.72	31	8.4%	0.79 [0.44, 1.14]						
Lim 2005	9.7	0.8	30	8.9	0.7	30	8.3%	0.80 [0.42, 1.18]						
Lim 2010	10	0.875	25	9.5	0.5	25	8.3%	0.50 [0.10, 0.90]						
Sia 2007	9.5	0.875	21	9	1	21	7.8%	0.50 [-0.07, 1.07]						
Sia 2013	9.65	0.5	51	8.92	0.94	51	8.5%	0.73 [0.44, 1.02]						
Song 2020	9.75	0.74	38	9.25	1.48	40	8.0%	0.50 [-0.02, 1.02]						
Wang 2016	9.3	1.3	100	7.8	1.2	100	8.4%	1.50 [1.15, 1.85]				•		
Wang 2017	10	0	62	7.8	1.2	62		Not estimable						
Zhao 2013	9.35	1.04	29	9.23	1.18	28	7.8%	0.12 [-0.46, 0.70]				t		
Total (95% CI)			2041			1999	100.0%	0.91 [0.42, 1.39]						
Heterogeneity: Tau ² =	0.70; C	ni² = 529	9.23, df	= 11 (P	< 0.00	001); l ²	= 98%	Constant of Second Second		1			1	
Test for overall effect:	Z = 3.66	(P = 0.	0003)	2.5.4					-100	-50	PIEB	control	50	100

Figure 12. Meta-analysis of the net change on the satisfaction score. CI = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

	PIEE	3	Contr	ol		Odds Ratio		Odds Ratio				
Study or Subgroup	dy or Subgroup Events		Events	Total	Weight	M-H, Fixed, 95% C			A-H. Fixe	d, 95% C	1	
Leo 2010	0	31	1	31	28.6%	0.32 [0.01, 8.23]					-	
Lim 2010	3	25	2	25	34.1%	1.57 [0.24, 10.30]					_	
Sia 2013	2	51	2	51	37.3%	1.00 [0.14, 7.39]		_	_		-	
Song 2020	0	38	0	40		Not estimable						
Total (95% CI)		145		147	100.0%	1.00 [0.30, 3.39]						
Total events	5		5									
Heterogeneity: Chi ² =	0.69, df = :	2 (P = (0.71); l ² =	0%							10	
Test for overall effect:	Z = 0.00 (P = 1.0	0)				0.01	0.1	PIEB	control	10	100
Figure 13. Meta-analys	sis of the ne	et chang	ge on the	rate of	bradycardia	a. Cl = confidence inte	rval, PIEE	3 = progi	rammed i	ntermittent	epidura	al bolus.

closer to the normal level, which also reflected it less impact on newborns.

Perioperative adverse clinical side effects relevant to anesthesia in parturients were pruritus, hypotension, shivering, nausea, and vomiting, which affect the patients' clinical prognosis. In our study, we observed that the adverse side effects in the PIEB group have no statistically different from the control group.

In our meta-analysis, the patients enrolled were less homogeneous. Fifteen studies had Jadad scores equal to 4 and were of high quality. The participants in all studies were well matched (eg, sex, age, American Society of Anesthesiologists grade, administration time, etc). However, results in this current metaanalysis should be interpreted with careful consideration given the limitations inherent in the design of the study. First, some of the major outcomes had small sample sizes, which might result in a small-study effect. Second, the kind and dosage applied in trials was different, which might have influenced outcomes. Third, this meta-analysis was based on studies published in English, which



Figure 14. Meta-analysis of the net change on the fetal heart rate. Cl = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

		PIEB		c	Control			Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% C	IV, Fixed, 95% Cl
2.1.1 Apgar score at	1 min								
Fan 2019	10	0	1454	10	0	1411		Not estimable	
Feng 2014	10	0	63	10	0	62		Not estimable	
Fettes 2006	8.6	1.4	20	8.4	1.2	20	0.4%	0.20 [-0.61, 1.01]	t
Ji 2016	9.4	1.1	25	9.7	0.5	25	1.3%	-0.30 [-0.77, 0.17]	1
Lin 2016	8.62	0.29	116	8.57	0.16	118	77.9%	0.05 [-0.01, 0.11]	
Nunes 2016	8.89	0.9	37	8.98	0.68	60	2.5%	-0.09 [-0.43, 0.25]	1
Riazanova 2019	7.9	0	42	7.9	0	38		Not estimable	
Song 2020	10	0.185	38	10	0.741	40	5.0%	0.00 [-0.24, 0.24]	1
Wang 2016	9.5	0.4	100	9.2	0.7	100	11.3%	0.30 [0.14, 0.46]	1
Zhao 2013	8.3	0.7	29	8	0.9	28	1.6%	0.30 [-0.12, 0.72]	1
Subtotal (95% CI)			1924			1902	100.0%	0.07 [0.02, 0.13]	
Heterogeneity: Chi ² =	13.35, d	f = 6 (P	= 0.04)	; l ² = 55	5%				
Test for overall effect:	Z = 2.68	(P = 0.	007)						
2.1.2 Apgar score at	5 min								
Fan 2019	10	0	1454	10	0	1411		Not estimable	
Feng 2014	10	0	63	10	0	62		Not estimable	
Fettes 2006	9.1	0.6	20	9.3	0.5	20	1.1%	-0.20 [-0.54, 0.14]	1
Leo 2010	9	9	31	9	9	31	0.0%	0.00 [-4.48, 4.48]	+
Lim 2005	9	0.25	30	9	0.25	30	7.9%	0.00 [-0.13, 0.13]	1
Lim 2010	9	0	25	9	0.5	25		Not estimable	
Lin 2016	9.03	0.18	116	9.13	0.16	118	66.5%	-0.10 [-0.14, -0.06]	
Nunes 2016	9.92	0.3	37	9.8	0.61	60	3.8%	0.12 [-0.06, 0.30]	
Riazanova 2019	8.9	0	42	9	0	38		Not estimable	
Sia 2013	9	0.5	51	9	0	51		Not estimable	
Song 2020	10	0	38	10	0	40		Not estimable	
Wang 2016	9.7	0.3	100	9.8	0.3	100	18.3%	-0.10 [-0.18, -0.02]	†
Zhao 2013	9.2	0.4	29	9.3	0.5	28	2.3%	-0.10 [-0.34, 0.14]	
Subtotal (95% CI)			2036			2014	100.0%	-0.08 [-0.12, -0.05]	
Heterogeneity: Chi ² =	7.63, df	= 6 (P =	0.27);	l2 = 219	6				
Test for overall effect:	Z = 4.66	(P < 0.	00001)						
									-100 -30 0 50 100 PIER control
Test for subaroup diffe	erences:	Chi ² = 2	23.23. 0	if = 1 (P	< 0.00	001), l²	= 95.7%		FIED CONTO

Figure 15. Meta-analysis of the net change on the Apgar score at 1, 5 minutes. Cl = confidence interval, PIEB = programmed intermittent epidural bolus, SD = standard deviation.

	PIEB Co			ol		Odds Ratio	Odds Ratio				
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C			A-H, Fixed, 95%	CI	
Fang 2016	9	100	8	100	11.9%	1.14 [0.42, 3.08]					
Haidl 2019	21	75	22	75	26.0%	0.94 [0.46, 1.90]			-		
Leo 2010	22	31	19	31	9.1%	1.54 [0.53, 4.46]					
Lim 2005	20	30	22	30	12.0%	0.73 [0.24, 2.21]					
Lim 2010	11	25	10	25	9.2%	1.18 [0.38, 3.63]					
Riazanova 2019	0	42	0	38		Not estimable					
Sia 2007	9	21	11	21	10.3%	0.68 [0.20, 2.30]					
Sia 2013	29	51	27	51	19.1%	1.17 [0.54, 2.56]					
Song 2020	0	38	1	40	2.4%	0.34 [0.01, 8.66]				_	
Wang 2016	0	100	0	100		Not estimable					
Total (95% CI)		513		511	100.0%	1.02 [0.71, 1.45]			+		
Total events	121		120								
Heterogeneity: Chi ² = Test for overall effect:	2.09, df = Z = 0.09 (7 (P = (P = 0.9	0.95); l² = 2)	0%			0.01	0.1	1 PIEB_control	10	100

might have generated bias. Finally, we selected published studies, and many studies were not registered in clinical trial databases.

An interesting clue on the topic may be helpful for future research. In our meta-analysis, we found that the duration of analgesia in the 2 groups has no difference and the studies

	PIEB	5	Contr	ol		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	CI M-H, Fixed, 95% CI
Fang 2016	0	100	0	100		Not estimable	le
Haidl 2019	2	75	5	75	38.7%	0.38 [0.07, 2.04]	4]
Ji 2016	1	25	2	25	15.3%	0.48 [0.04, 5.65]	5]
Leo 2010	1	31	2	31	15.4%	0.48 [0.04, 5.62]	2] •
Lim 2005	2	30	0	30	3.7%	5.35 [0.25, 116.31]	1]
Lim 2010	2	25	0	25	3.6%	5.43 [0.25, 118.96]	6]
Sia 2013	0	51	1	51	11.8%	0.33 [0.01, 8.21]	1]
Song 2020	0	38	1	40	11.5%	0.34 [0.01, 8.66]	6]
Wang 2016	0	100	0	100		Not estimable	le
Total (95% CI)		475		477	100.0%	0.77 [0.33, 1.77]	
Total events	8		11				
Heterogeneity: Chi ² = 4	.51, df = 6	6 (P = 0	0.61); l ² =	0%			
Test for overall effect:	Z = 0.62 (F	= 0.5	3)				0.01 0.1 1 10 100 PIEB control

Figure 17. Meta-analysis of the net change in rate of hypotension. Cl = confidence interval, PIEB = programmed intermittent epidural bolus.

	PIE	PIEB Co				Odds Ratio		Odds Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl		M-H	H. Random.	95% CI	
Leo 2010	16	31	11	31	24.6%	1.94 [0.70, 5.37]				_	
Lim 2005	15	30	10	30	24.1%	2.00 [0.70, 5.68]					
Lim 2010	13	25	19	25	20.8%	0.34 [0.10, 1.14]					
Sia 2013	23	51	26	51	30.5%	0.79 [0.36, 1.72]					
Total (95% CI)		137		137	100.0%	1.04 [0.49, 2.18]			+		
Total events	67		66								
Heterogeneity: Tau ² =	0.32; Chi ²	= 6.68	df = 3 (F	9 = 0.08	3); l ² = 55%	6		-		1	400
Test for overall effect:	Z = 0.09 (P = 0.9	3)		5 C		0.01	0.1	PIEB con	trol	100

concerned the consumption of stupefacient was little, so attention should be paid to it. Further studies may also focus on the safety of different types of anesthesia. Moreover, in our study, anesthesia types were only compared when they were used in patients who labor, so other medical situations in which these types are used should also be studied.

12. Conclusions

In conclusion, PIEB is a good alternative for labor analgesia with better analgesic effect, maternal and infant outcome. However, some of the results in our meta-analysis should be interpreted carefully because of the clinical heterogeneity and insufficient data.

	PIEE	3	Contr	ol		Odds Ratio			Odds	s Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	L		A-H. Fix	ed. 95% C		
Fang 2016	0	100	0	100		Not estimable						
Haidl 2019	6	75	2	75	26.6%	3.17 [0.62, 16.26]			_	-	_	
Ji 2016	0	25	0	25		Not estimable						
Leo 2010	2	31	0	31	6.7%	5.34 [0.25, 115.89]			_			\rightarrow
Lim 2005	4	30	2	30	25.1%	2.15 [0.36, 12.76]			-	-	_	
Lim 2010	2	25	0	25	6.5%	5.43 [0.25, 118.96]						
Riazanova 2019	0	42	0	38		Not estimable						
Sia 2013	1	51	1	51	14.2%	1.00 [0.06, 16.43]				•	_	
Song 2020	0	38	1	40	20.9%	0.34 [0.01, 8.66]	-					
Wang 2016	0	100	0	100		Not estimable						
Total (95% CI)		517		515	100.0%	2.31 [0.95, 5.59]				-		
Total events	15		6									
Heterogeneity: Chi ² =	2.42, df =	5 (P = ().79); l ² =	0%			0.01			!	10	100
Test for overall effect:	Z = 1.86 (P = 0.0	6)				0.01	0.1	PIER	control	10	100

	PIEE	3	Contr	ol		Odds Ratio		Odd	s Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	L	M-H, Fix	ed, 95% Cl	
Fang 2016	0	100	0	100		Not estimable				
Ji 2016	0	25	0	25		Not estimable				
Leo 2010	0	31	0	31		Not estimable				
Lim 2005	4	30	1	30	23.4%	4.46 [0.47, 42.51]		_	-	
Lim 2010	3	25	1	25	23.7%	3.27 [0.32, 33.84]			-	-
Riazanova 2019	0	42	0	38		Not estimable				
Sia 2013	1	51	2	51	52.9%	0.49 [0.04, 5.58]			-	
Song 2020	0	38	0	40		Not estimable				
Wang 2016	0	100	0	100		Not estimable				
Total (95% CI)		442		440	100.0%	2.08 [0.61, 7.09]			-	
Total events	8		4							
Heterogeneity: Chi ² =	1.94, df = :	2 (P = ().38); l ² =	0%					1 10	400
Test for overall effect:	Z = 1.17 (P = 0.2	4)				0.01	PIEB	control	100

Figure 20. Meta-analysis of the net change in rate of vomiting. CI = confidence interval, PIEB = programmed intermittent epidural bolus.

Author contributions

XXW and ZQX conceived the study, participated in the study design, collected the data, and drafted the manuscript. XXW, ZQX, and XLZ participated in the study design, collected the data, performed the statistical analysis and contributed to drafting the manuscript. HJG, ZXZ, JX, YLZ, SZY, and HYL helped to perform the statistical analysis and revised the manuscript critically to ensure all important intellectual content was present. All authors read and approved the final manuscript. **Conceptualization:** Jing Xiao.

Data curation: Xian-xue Wang, Xiao-lan Zhang, Hua-jing Guo, Yun-lin Zhang.

Formal analysis: Shu-zhen Yuan.

Investigation: Zi-qin Xin.

Methodology: Zi-qin Xin.

Project administration: Zhao-xia Zhang.

Resources: Zi-qin Xin.

Software: Xian-xue Wang, Hua-jing Guo.

Supervision: Hai-yan Liu.

Validation: Jing Xiao.

Visualization: Hai-yan Liu.

Writing – original draft: Xian-xue Wang.

Writing - review & editing: Xian-xue Wang.

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