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SYSTEMATIC REVIEW

Phenylephrine Infusion for Preventing Hypotension in Obese Parturients Undergoing Caesarean Delivery: A Systematic Review

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Abstract

Introduction: Spinal anaesthesia-induced hypotension is common during caesarean delivery, and the optimal phenylephrine dosing strategy for obese parturients remains uncertain. This systematic review evaluated the efficacy and dosing regimens of prophylactic phenylephrine infusion in this population.

Material and Methods: PubMed, ScienceDirect, the Cochrane Library, and Scopus were searched for randomised controlled trials published from 2010 through 2025. Eligible studies included parturients with singleton pregnancies at ≥36 weeks of gestation, a body mass index ≥30 kg/m², and no major comorbidities. Phenylephrine infusion was compared with bolus regimens or alternative infusion doses. The primary outcome was maternal hypotension; secondary outcomes included reactive hypertension, maternal adverse effects, and neonatal outcomes. Risk of bias was assessed using Cochrane RoB 2, and findings were synthesised narratively because of clinical and methodological heterogeneity.

Results: Three randomised controlled trials involving 334 parturients were included. Phenylephrine infusion was associated with fewer hypotensive episodes than bolus administration, although the certainty of evidence was low. One dose-response trial reported preliminary ED_{50} and ED_{90} estimates of 0.42 and 0.68 μg/kg/min, respectively. Higher infusion doses were associated with more reactive hypertension, whereas bradycardia did not differ significantly across groups. Nausea, vomiting, and neonatal outcomes showed no consistent between-group differences.

Conclusion: The certainty of evidence was low for most outcomes, precluding firm conclusions about the efficacy and optimal dosing of phenylephrine infusion in obese parturients without major comorbidities. Reactive hypertension increased with higher infusion doses, whereas evidence for bradycardia and neonatal safety remained limited. Larger, standardised trials are needed, particularly in parturients with severe obesity or comorbidities.

Keywords: Anesthesia, Spinal; Cesarean Section; Hypotension; Obesity; Phenylephrine

Introduction

Spinal anaesthesia is frequently used for caesarean section in obese parturients. However, spinal anaesthesia-induced hypotension remains the most common complication, posing a risk of impaired placental perfusion, which might affect the fetal outcome. This occurs due to sympathetic blockage leading to venous dilatation, decreased venous return and reduced cardiac output, which further exacerbate aortocaval compression by the uterus.[1]

Obesity is a growing global health issue. As of 2022, obesity affected approximately 16% of adults worldwide.[2] Maternal obesity complicates up to 39 million pregnancies globally each year, with prevalence during pregnancy exceeding 60% in several countries.[3] Phenylephrine, an α-1 receptor agonist, is well established as a preventive treatment of intraoperative hypotension in caesarean surgery.[1] It is considered the first-line vasopressor used for obstetric anaesthesia.[4]

Although prophylactic phenylephrine infusion reduces hypotension, it may cause adverse effects such as reactive hypertension and reflex bradycardia.[5] International consensus guidance recommends prophylactic vasopressor administration during caesarean delivery but does not provide obesity-specific dosing recommendations.[6] A recent trial compared a fixed-rate phenylephrine infusion with rescue boluses in obese parturients but did not establish an optimal dosing strategy.[7] Existing reviews of obesity in pregnancy focus mainly on broad maternal and neonatal outcomes rather than vasopressor dosing.[3] Therefore, this systematic review evaluated the efficacy and dosing regimens of prophylactic phenylephrine infusion for preventing spinal anaesthesia-induced hypotension in obese parturients undergoing caesarean delivery.

Material and Methods

Study Design

This systematic review evaluated phenylephrine infusion for preventing hypotension and was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement. The protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO; CRD420251139013). The completed PRISMA 2020 checklist is provided as Supplementary Material.

Literature Search

Three reviewers independently searched PubMed, ScienceDirect, the Cochrane Library, and Scopus for studies published from January 1, 2010, through the final search date. PubMed, ScienceDirect, and the Cochrane Library were last searched on July 14, 2025; Scopus was updated on September 2, 2025. The strategy combined Medical Subject Headings and free-text terms related to obesity, phenylephrine, hypotension, and caesarean delivery. Complete database-specific strategies, Boolean operators, publication-year limits, and search dates are provided in Supplementary Table 1.

No automated study-design or language filters were applied during the database searches. Eligibility was restricted to randomised controlled trials published in English during screening. Records were imported into Rayyan, and duplicates were removed. Two reviewers independently screened titles and abstracts, followed by full-text assessment of potentially eligible reports. Disagreements were resolved by discussion or consultation with a third reviewer. Reasons for full-text exclusion were recorded and are presented in the PRISMA 2020 flow diagram.

Eligibility Criteria

Eligible studies enrolled parturients undergoing caesarean delivery under spinal anaesthesia, restricted to singleton pregnancies at ≥36 weeks of gestation, a BMI ≥30 kg/m², and no hypertension,

preeclampsia, diabetes mellitus, or other specified comorbidities. The intervention was intravenous phenylephrine administered as a weight-based or fixed-rate infusion. The primary outcome was maternal hypotension. Additional haemodynamic outcomes included blood pressure trends and rescue vasopressor requirements. Only randomised controlled trials published in English were included. Studies were excluded if phenylephrine dosing was not clearly reported, the population included participants both below and above the BMI threshold without separate data, BMI was not reported, or participants had pre-existing comorbidities.

Data extraction and outcome measures

Three reviewers independently extracted data using a standardised form. Disagreements were resolved by consensus. When multiple publications reported the same trial, the most complete and recent report was retained. Extracted data included author, year, country, study design, sample size, baseline BMI, and phenylephrine dosing regimen.

The primary outcome was the incidence of maternal hypotension. Additional haemodynamic outcomes included blood pressure trends and rescue vasopressor use. Secondary outcomes, when reported, included bradycardia, reactive

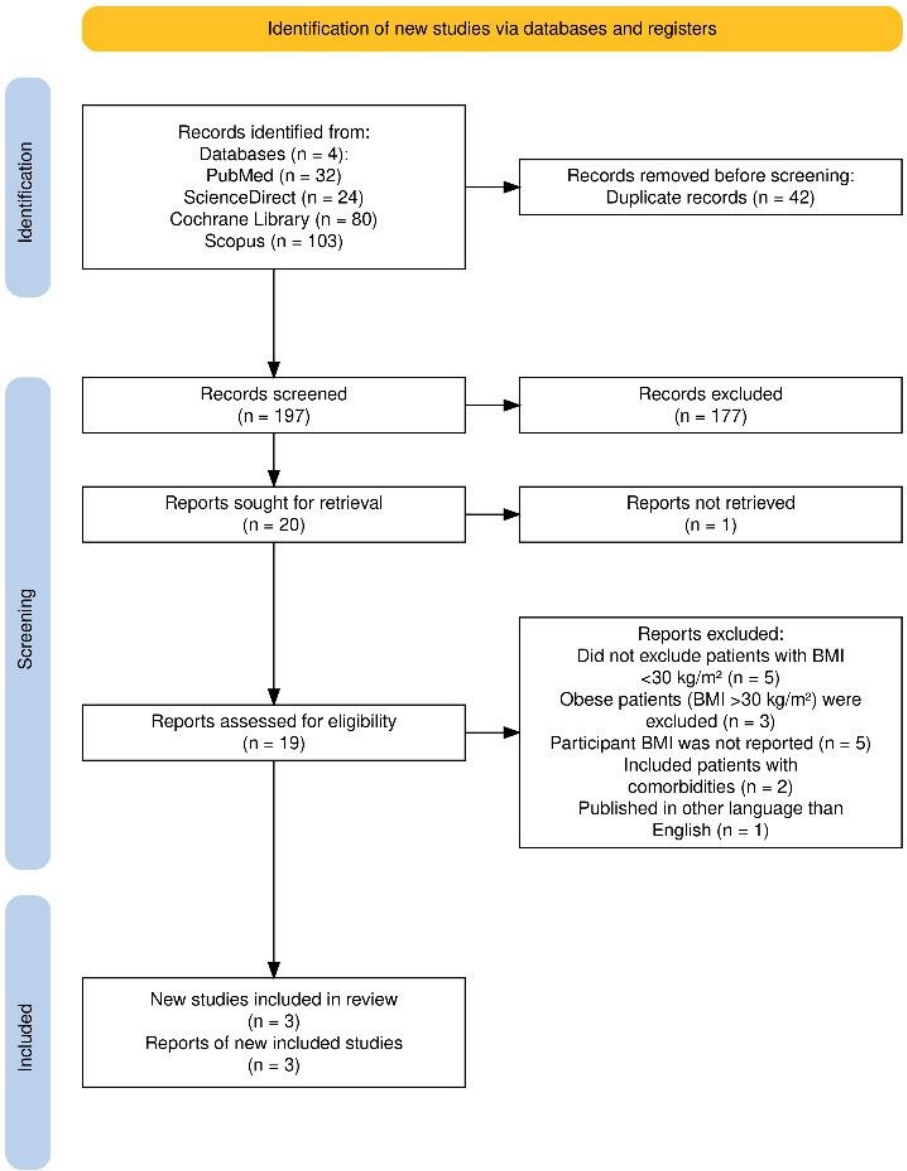

Figure 1. PRISMA Flowchart

hypertension, intraoperative nausea and vomiting, Apgar scores, and umbilical arterial pH.

Risk-of-bias assessment and data synthesis

Three reviewers independently assessed risk of bias using version 2 of the Cochrane Risk of Bias tool for randomised trials (RoB 2)[8]. The domains were bias arising from the randomisation process, deviations from intended interventions, missing outcome data, measurement of outcomes, and selection of the reported result. Each study was rated as having a low risk of bias, some concerns, or a high risk of bias. A quantitative meta-analysis was considered but was not performed because only three studies were eligible and substantial clinical and methodological heterogeneity was present. Mean baseline BMI ranged from approximately 32 kg/m² in Xing et al. to 34 kg/m² in Hassan et al. and 41 kg/m² in George et al. The trials also differed in hypotension definitions, blood pressure monitoring intervals, fluid co-loading, spinal anaesthetic regimens, rescue vasopressor protocols, and outcome reporting (Table 1). Findings were therefore synthesised narratively.

Table 1. Methodological Heterogeneity Across Included Studies

Domain	Xing et al. 2024	Hassan et al. 2024	George et al. 2018
Mean BMI	~32 kg/m²	~34 kg/m²	~41 kg/m²
Hypotension definition	SBP <90 mmHg or <80% of baseline	Algorithm-based: SBP within 20% of baseline and >90 mmHg	SBP <90 mmHg or <80% of baseline
BP monitoring timing	Every 1 minute	Every 2 minutes	Every 1 minute (first 15 min), then every 2.5 minutes until delivery
Fluid co-loading	Crystalloid 5 mL/kg over ≥20 min	Not reported	Crystalloid bolus targeting 2 L before delivery
Spinal anaesthetic dose	Hyperbaric bupivacaine 10 mg + sufentanil 5 μg	Height-based hyperbaric bupivacaine + fentanyl 15 μg	Hyperbaric bupivacaine 12 mg + fentanyl 15 μg + morphine 150 μg
Rescue vasopressor protocol	Metaraminol bolus (not phenylephrine)	Phenylephrine rate-doubling + supplementary bolus	Phenylephrine rate-doubling + 100 μg bolus
Outcome reporting	Complete	Reactive hypertension not reported	Complete

Certainty of Evidence Assessment

The certainty of evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, considering risk of bias, inconsistency, indirectness, imprecision, and publication bias.

Results

Study selection

The database searches identified 239 records: PubMed (n=32), ScienceDirect (n=24), the Cochrane Library (n=80), and Scopus (n=103). After 42 duplicates were removed, 197 records underwent title and abstract screening, and 177 were excluded. Twenty reports were sought for retrieval; one could not be retrieved because the full text was unavailable. Nineteen reports underwent full-text assessment, of which three met all eligibility criteria. Sixteen reports were excluded because they included participants with BMI <30 kg/m² (n=5), excluded participants with BMI >30 kg/m² (n=3), did not report BMI (n=5), included participants with comorbidities (n=2), or were not published in English (n=1). The selection process is shown in Figure 1.

Risk of Bias Assessment

Two of the three studies were judged to have a low risk of bias across all RoB 2 domains. Hassan et al. was rated as having some concerns in Domain 3 because six participants were excluded after randomisation, with limited reporting of the reasons or whether exclusions were balanced between groups. Allocation concealment was adequate in all three trials, which used sequentially numbered, opaque envelopes opened by personnel not involved in patient management. George et al. reported blinding of participants, clinicians, and outcome assessors. Hassan et al. blinded participants and the anaesthesia team but did not report assessor blinding. Xing et al. described the study as double-blind in the Discussion but did not provide corresponding details in the Methods. Xing et al. had no post-randomisation exclusions, whereas Hassan et al. excluded 6 of 74 participants and George et al. assessed 178 participants for eligibility; 18 were excluded before randomisation, and the remaining 160 participants underwent randomisation and were included in the analysis. Prospective trial registration supported outcome prespecification in Xing et al. and George et al.; Hassan et al. did not report a registration number. The risk-of-bias summary is presented in Figure 2.

Characteristics of the Included Studies

Three randomised controlled trials contributed data from 334 parturients with BMI ≥30 kg/m² who underwent caesarean delivery and had no history of hypertension, diabetes mellitus, or preeclampsia. Definitions of hypotension differed across studies and used relative, absolute, or algorithm-based systolic blood pressure thresholds. Hassan et al. excluded six participants from the analysis because of missing data. Phenylephrine was administered as a fixed-rate infusion beginning at 50 μg/min or as one of four fixed weight-based doses (0.375, 0.5, 0.625, or 0.75 μg/kg/min). Comparators included rescue bolus administration or alternative infusion doses. Study characteristics and outcomes are summarised in Tables 2a and 2b.

Table 2a. Study Characteristics and Intervention

Author, Year	Country	Design	Sample Size	BMI (Mean ± SD)	PE Dose & Type	Comparator
Xing et al., 2024	China	RCT	100	32.1–32.4 (range across 4 dose groups)	PE infusion 0.375–0.75 μg/kg/min	Dose-response design (4 fixed dose)
Hassan et al., 2024	Malaysia	RCT	74 (68 analysed)	33.7 ± 3.3 (A), 34.5 ± 3.5 (B)	PE infusion 50–100 μg/min (Group A)	100 μg PE bolus (Group B)
George et al., 2018	Canada & USA	RCT	160	40.8 ± 4.2 (Inf), 41.1 ± 4.5 (Bolus)	PE infusion 50 μg/min (adjusted)	100 μg PE bolus

Table 2b. Maternal, Adverse Event, and Neonatal Outcomes

Author, Year	Hypotension	Reactive Hypertension	Adverse effects	Neonatal Outcomes
Xing et al., 2024	1) Dose-dependent reduction (52% → 0%, P<0.001) 2) ED_{50} 0.42, ED_{90} 0.68 μg/kg/min	Dose-dependent ↑ (0–40%)	No significant differences across dose groups for nausea/vomiting, shivering or bradycardia	Apgar 10/10, pH 7.29–7.32
Hassan et al., 2024	Lower mean SBP, DBP and MAP in bolus compared to infusion (P<0.01)	Not reported	No adverse effects reported.	Apgar 8/9 (both groups)
George et al., 2018	Lower incidence and fewer episodes with infusion (P<0.01)	More frequent pre-delivery with infusion (P=0.002); no difference in hypertensive episodes overall	1) Lower intraoperative nausea/vomiting (P<0.001); lower 0–2h postoperative vomiting (P=0.02); lower antiemetic use (P=0.04) with infusion; higher pruritus scores with infusion (1 vs 0, P=0.048) 2) No difference in 2–24h vomiting or post-delivery haemodynamic stability	Not reported

BMI : body mass indeks, DBP : diastolic blood pressure, MAP : mean arterial pressure, PE : phenylephrine, RCT : randomised controlled trial, SBP : systolic blood pressure

Table 3a. GRADE Summary of Findings Table : Prophylactic Phenylephrine Infusion Versus Rescue bolus

Outcome	Studies/participants	Main finding	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Certainty
Maternal hypotension	1 RCT/160	Hypotension was less frequent with infusion	Not serious	Not assessable	Serious[1]	Not serious	Not strongly suspected[6]	⊕⊕⊕◯ Moderate
Maternal blood-pressure control	1 RCT/68	SBP, DBP, and MAP were better maintained with infusion	Serious[2]	Not assessable	Not serious	Serious[3]	Not strongly suspected[6]	⊕⊕◯◯ Low
Intraoperative nausea and vomiting	1 RCT/160	46% versus 75%; RR 0.61 (95% CI 0.47–0.80)	Not serious	Not assessable	Serious[1]	Not serious	Not strongly suspected[6]	⊕⊕⊕◯ Moderate
Vomiting within 2 hours after delivery	1 RCT/160	11% versus 25%; RR 0.44 (95% CI 0.21–0.90)	Not serious	Not assessable	Serious[1]	Serious[4]	Not strongly suspected[6]	⊕⊕◯◯ Low
Reactive hypertension	1 RCT/160	Pre-delivery reactive hypertension was more frequent with infusion	Not serious	Not assessable	Serious[1]	Serious[3]	Not strongly suspected[6]	⊕⊕◯◯ Low
Bradycardia	1 RCT/160	No significant between-group difference	Not serious	Not assessable	Serious[1]	Very serious[5]	Not strongly suspected[6]	⊕◯◯◯ Very low
Neonatal Apgar scores	1 RCT/68	No significant between-group difference	Serious[2]	Not assessable	Not serious	Very serious[5]	Not strongly suspected[6]	⊕◯◯◯ Very low

Table 3b. GRADE Summary of Findings Table : Comparison of Fixed Weight-Based Infusion Doses

Outcome	Studies/participants	Main finding	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Certainty
Maternal hypotension and dose requirement	1 RCT/100	Hypotension decreased from 52% to 0% across increasing doses; ED_{50} 0.42 and ED_{90} 0.68 μg/kg/min	Not serious	Not assessable	Not serious	Serious[3]	Not strongly suspected[6]	⊕⊕⊕◯ Moderate
Reactive hypertension	1 RCT/100	Dose-dependent increase from 0% to 40%	Not serious	Not assessable	Not serious	Serious[3]	Not strongly suspected[6]	⊕⊕⊕◯ Moderate
Bradycardia, nausea, and vomiting	1 RCT/100	No significant differences across dose groups	Not serious	Not assessable	Not serious	Very serious[5]	Not strongly suspected[6]	⊕⊕◯◯ Low
Neonatal outcomes	1 RCT/100	Apgar scores and umbilical arterial pH were comparable	Not serious	Not assessable	Not serious	Very serious[5]	Not strongly suspected[6]	⊕⊕◯◯ Low

Legend: ⊕⊕⊕⊕ High, ⊕⊕⊕◯ Moderate, ⊕⊕◯◯ Low, ⊕◯◯◯ Very low

1. Downgraded for indirectness because George et al. predominantly included women with BMI >35–55 kg/m²; therefore, applicability to the broader BMI ≥30 kg/m² population is uncertain.
2. Downgraded because Hassan et al. excluded 6 of 74 participants after randomisation, with limited explanation regarding the missing data and group distribution.
3. Downgraded because the evidence came from one relatively small trial and did not provide a sufficiently precise pooled estimate.
4. Downgraded because the confidence interval remained compatible with effects ranging from a large to a relatively small benefit.
5. Downgraded by two levels because events were infrequent or absent and the study was not powered to exclude clinically important differences
6. Formal assessment of publication bias was not possible with only three included studies. No downgrade was applied because no specific evidence of publication bias was identified

Publication bias: not formally tested, as funnel-plot asymmetry testing requires a minimum of approximately 10 studies; reported as undetected given the small number of included trials (n=3).

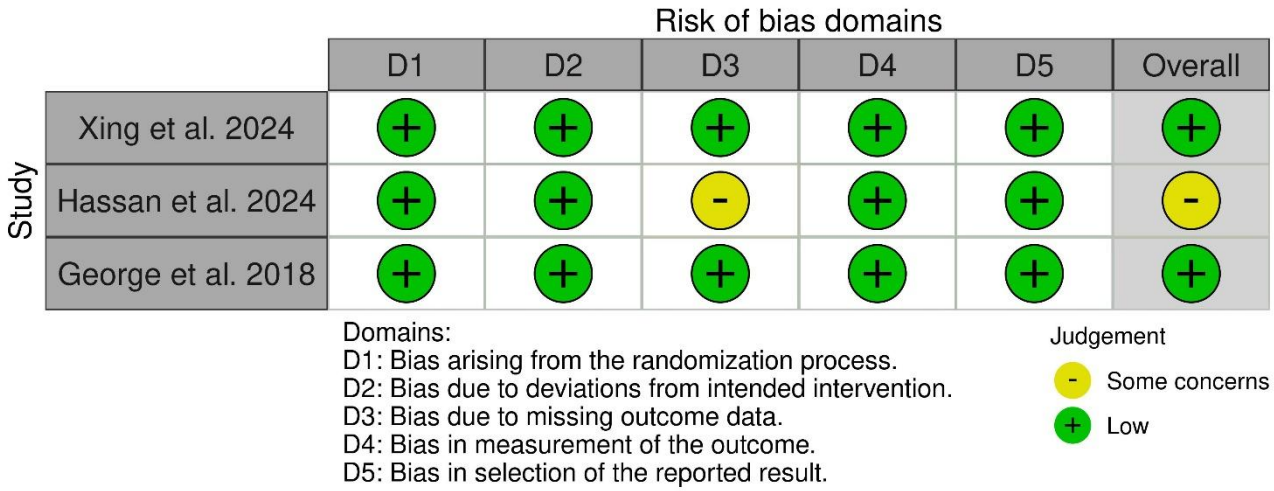

Figure 2. Quality assessment of the risk of bias assessment of 3 controlled trials

Effects of phenylephrine infusion

Xing et al. evaluated four phenylephrine infusion doses. Hypotension occurred in 52% of the 0.375 µg/kg/min group, 40% of the 0.5 µg/kg/min group, 20% of the 0.625 µg/kg/min group, and 0% of the 0.75 µg/kg/min group ($p<0.001$). The estimated ED_{50} and ED_{90} were 0.42 and 0.68 µg/kg/min, respectively.[4] These single-trial estimates should be regarded as preliminary pharmacological benchmarks rather than general dosing recommendations. Reactive hypertension increased with dose, reaching 40% in the 0.75 µg/kg/min group, whereas other adverse events did not differ significantly across groups.

Hassan et al. compared a prophylactic phenylephrine infusion starting at 50 µg/min with 100-µg rescue boluses. Systolic, diastolic, and mean arterial pressures were significantly higher in the infusion group ($p<0.05$). No adverse events were reported, and neonatal Apgar scores were comparable between groups.[7]

Across the included studies, phenylephrine infusion tended to reduce hypotensive episodes compared with bolus or control strategies, although certainty in the estimated benefit was limited. George et al. reported less intraoperative hypotension and fewer associated symptoms with phenylephrine infusion than with bolus administration. Intraoperative nausea and vomiting occurred in 46% versus 75% of participants, respectively ($p<0.001$). Post-delivery hypotension (7% vs 43%), intraoperative antiemetic use (26% vs 42%), and vomiting 0-2 h after delivery (11% vs 25%) were also less frequent with infusion. The infusion group had more pre-delivery reactive hypertension and higher pruritus scores, whereas post-delivery hypertension and bradycardia did not differ significantly.[9]

Discussion

International consensus guidance recommends prophylactic vasopressor administration for preventing spinal anaesthesia-induced hypotension during caesarean delivery, with phenylephrine remaining a widely used first-line agent.6 Across the included studies, haemodynamic outcomes generally favoured infusion over rescue bolus administration, although the magnitude and nature of benefit varied according to the dosing strategy.[7,9]

Safety comparisons were limited because Hassan et al. did not report reactive hypertension. In the dose-response trial,

hypotension decreased as the infusion dose increased (ED_{50} 0.42 μg/kg/min; ED_{90} 0.68 μg/kg/min), but reactive hypertension became more frequent at higher doses.[4]

Obesity-related cardiovascular and pharmacokinetic differences may contribute to variation in vasopressor response. Fixed-rate regimens are straightforward to administer but may not account for differences in body size, whereas weight-based regimens may provide more individualised dosing. Nevertheless, the ED_{50} and ED_{90} values reported by Xing et al. were derived from a single dose-response trial in parturients with a mean BMI of approximately 32 kg/m².[4] They should therefore not be interpreted as broadly applicable dosing recommendations. No included trial directly compared fixed-rate with weight-based infusion, so the relative advantages of these approaches remain uncertain.

Obesity may increase susceptibility to spinal anaesthesia-induced hypotension through several mechanisms. Greater abdominal mass and the gravid uterus increase intra-abdominal pressure and may aggravate inferior vena cava compression. Engorgement of the epidural venous plexus can reduce cerebrospinal fluid volume and intrathecal space, potentially promoting cephalad spread of spinal anaesthesia.[10]

Higher BMI is also associated with changes in cardiac output and vascular function that may increase variability in vasopressor response across obesity classes.[11] In addition, obesity increases the risk of chronic hypertension, preeclampsia, and gestational diabetes mellitus.[12,13]

George et al. similarly reported more pre-delivery reactive hypertension with a fixed-rate infusion of 50 μg/min.9 Hassan et al. found smaller reductions in diastolic and mean arterial pressures with infusion than with rescue boluses.[7]

An observational study found no difference in vasopressor requirements between participants with BMI <30 kg/m² and those with BMI 30-45 kg/m², but reported differences in hypotensive episodes, fluid administration, and phenylephrine requirements among participants with BMI >45 kg/m².14 The present review did not include sufficient data to determine whether phenylephrine requirements differ across obesity classes.

Maternal hypotension is an important contributor to intraoperative nausea and vomiting. George et al. reported less intraoperative nausea and vomiting and lower rescue antiemetic use with prophylactic infusion.[9] By contrast, Hassan et al. reported no adverse events with its infusion protocol, although adverse events were not the primary focus of that trial.[7] Bradycardia did not differ significantly between infusion and comparator groups in the trials that reported this outcome.[4,9]

Prolonged maternal hypotension may compromise uteroplacental perfusion and contribute to fetal acidosis. However, neonatal outcomes were reported in only two of the three included studies, and neither trial was adequately powered to establish neonatal equivalence.[4,7]

Fluid administration may also modify vasopressor requirements. Although this question was not directly evaluated by the included trials, a separate study found that crystalloid co-loading rates of 10 and 20 mL/kg/h produced different phenylephrine ED_{50} estimates, suggesting that fluid strategy should be considered when comparing dose requirements.[15]

Certainty of Evidence

The certainty of evidence was assessed separately for the comparison of prophylactic phenylephrine infusion versus rescue bolus administration and for comparisons among fixed weight-based infusion doses. These comparisons were not combined because they addressed different intervention questions. For infusion versus rescue bolus administration, the certainty was moderate for maternal hypotension and intraoperative nausea and vomiting, low for maternal blood-pressure control, early postoperative vomiting, and reactive hypertension, and very low for bradycardia and neonatal outcomes. For the dose-response comparison, moderate-certainty evidence supported a dose-dependent reduction in maternal hypotension accompanied by an increase in reactive hypertension. Evidence regarding bradycardia, nausea and vomiting, and neonatal outcomes was of low certainty because these outcomes were infrequent and the trial was not adequately powered to exclude clinically important differences. Publication bias could not be formally assessed because only three trials were included; however, no downgrade was applied in the absence of specific evidence suggesting publication bias.

Limitations

This review included only three randomised controlled trials, and substantial clinical and methodological heterogeneity precluded meta-analysis. Definitions of hypotension, infusion strategies, fluid protocols, spinal anaesthetic regimens, and outcome reporting differed across studies. The small evidence base also prevented formal assessment of publication bias.

Applicability is limited to obese parturients without major comorbidities. Evidence was insufficient for parturients with severe obesity (BMI ≥45 kg/m^2), chronic hypertension, preeclampsia, or gestational diabetes mellitus. Studies in preeclampsia suggest different vasopressor dose requirements from those in normotensive parturients[16,17], while non-obstetric diabetes studies cannot provide direct dosing guidance for pregnancy.[18,19] Fluid management was also not standardised and may have influenced phenylephrine requirements.[15]

Finally, restricting eligibility to English-language publications may have introduced language bias. These limitations require cautious interpretation of any proposed dosing range, particularly for high-risk subgroups.

Recommendations for Future Research

Future trials should determine prophylactic infusion requirements in parturients with severe obesity and directly compare fixed-rate with weight-adjusted regimens. Maternal outcomes should include hypotension, reactive hypertension, bradycardia, cardiac output, rescue vasopressor use, and nausea and vomiting; neonatal outcomes should include Apgar scores, umbilical arterial pH, and base excess.[4,7,9] Studies should also evaluate common comorbidities, particularly gestational diabetes and chronic hypertension. Standardised blood pressure targets, dosing units, fluid protocols, and core outcomes would improve comparability across trials.[6]

Conclusion

Current evidence is insufficient to define the optimal phenylephrine infusion

strategy for preventing hypotension in obese parturients because the certainty was low for most outcomes. Infusion generally improved haemodynamic control compared with rescue bolus administration, but reactive hypertension increased at higher doses. Bradycardia did not differ significantly, although estimates were imprecise. These findings apply only to obese parturients without major comorbidities. Larger, standardised randomised controlled trials are required before definitive dosing recommendations can be made.

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Conflict of Interest

The author(s) report no conflict of interest.

Data Availability Statement

All data analyzed in this study were extracted from previously published articles. The extracted dataset used for the meta-analysis is available from the corresponding author upon reasonable request.

Author's Contributions

Conceptualization: AA, SD. Methodology: AA, SD. Literature search: AA, FK, GH. Data curation: AA, FK, GH. Formal Analysis: AA, FK, GH. Writing – original draft: AA. Writing – review & editing: AA, FK, GH. Supervision: SD. All authors have read and approved the final version of the manuscript.

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Supplementary Table 1. Databases Search Strategies

Database	Keywords	Last Search
Pubmed	((((((obesity) OR (obese)) OR (bmi)) OR (body mass index)) AND (((phenylephrine[Title/Abstract]) OR (phenylephrine infusion[Title/Abstract])) OR (vasopressor[Title/Abstract]))) AND (((((((hypotension[Title/Abstract]) OR (blood pressure[Title/Abstract])) OR ("bradycardia"[Title/Abstract])) OR ("hypertension"[Title/Abstract])) OR ("hemodynamic stability"[Title/Abstract])) OR (nausea[Title/Abstract])) OR (vomiting[Title/Abstract]))) AND (((((((((cesarean section[Title/Abstract]) OR (caesarean section[Title/Abstract])) OR (cesarean delivery[Title/Abstract])) OR (spinal anesthesia[Title/Abstract])) OR (neuraxial block[Title/Abstract]))) OR ("pregnant"[Title/Abstract])) OR ("pregnancy"[Title/Abstract])) OR (c-section[Title/Abstract])) Filters**:** from 2010 - 2025	14th July 2025
Cochrane	“obesity” OR “obese” OR “BMI” OR “body mass index” and “phenylephrine” OR “phenylephrine infusion” OR “vasopressor” and hypotension OR blood pressure OR bradycardia OR hypertension OR hemodynamic stability OR nausea OR vomiting and “cesarean section” OR “caesarean section” OR “cesarean delivery” OR “spinal anesthesia” OR “neuraxial block” OR “pregnant” OR “pregnancy” OR “c-section” Filter applied: - Publication year: 2010–2025	14th July 2025
Scopus	(TITLE-ABS-KEY (obesity OR obese OR bmi OR "body mass index") AND TITLE-ABS-KEY (phenylephrine OR "phenylephrine infusion" OR vasopressor) AND TITLE-ABS-KEY (hypotension OR "blood pressure" OR bradycardia OR hypertension OR "hemodynamic stability" OR nausea OR vomiting) AND TITLE-ABS-KEY ("cesarean section" OR "caesarean section" OR "cesarean delivery" OR "spinal anesthesia" OR "neuraxial block" OR pregnant OR pregnancy OR "c-section"))	02nd September 2025

	AND (PUBYEAR > 2009 AND PUBYEAR < 2026)	
ScienceDirect	(obesity OR obese OR bmi OR "body mass index") AND (phenylephrine OR "phenylephrine infusion" OR vasopressor) AND (hypotension OR "blood pressure" OR bradycardia OR hypertension OR "hemodynamic stability" OR nausea OR vomiting) AND ("cesarean section" OR "caesarean section" OR "cesarean delivery" OR "spinal anesthesia" OR "neuraxial block" OR pregnant OR pregnancy OR "c-section") Filter applied: from 2010 to 2025	14th July 2025

Suppelmentary Table 2. Studies Excluded After Full-Text Assessment and Reasons for Exclusion

No.	Author Name	Title	Reason for Exclusion
1	Benevides et al., 2024	Phenylephrine Infusion for the Prevention of Hypotension in Obese Patients During Cesarean Delivery Under Spinal Anesthesia: A Randomized, Placebo-Controlled, Double-Blind Study	Did not exclude patients with comorbidities
2	Singh et al., 2023	Comparing the Effect of Phenylephrine Bolus and Phenylephrine Infusion for Maintaining Arterial Blood Pressure During Cesarean Delivery Under Spinal Anesthesia: A Randomized Prospective Study.	Obese patients (BMI >30 kg/m²) were excluded
3	Nivatpumin et al., 2022	Comparison of perioperative outcomes and anesthetic-related complications of morbidly obese and super-obese parturients delivering by cesarean section	Did not exclude patients with comorbidities
4	Shafeinia et al., 2020	The Effect of Phenylephrine Infusion on Maternal Hemodynamic Changes During Spinal Anesthesia for Cesarean Delivery	Obese patients (BMI >30 kg/m²) were excluded
5	Odekon et al., 2015	The Effect of β2-Adrenoceptor Genotype on Phenylephrine Dose Administered During Spinal Anesthesia for Cesarean Delivery.	Did not exclude patients with BMI <30 kg/m²

6	Sakuma et al., 2010	Effects of intravenous vasopressor on spread of spinal anesthesia with 0.5% hyperbaric bupivacaine for caesarean delivery	Did not exclude patients with BMI <30 kg/m²
7	Guo et al., 2022	Prophylactic norepinephrine or phenylephrine infusion for bradycardia and post-spinal anaesthesia hypotension in patients with preeclampsia during Caesarean delivery: a randomised controlled trial	Did not report participant BMI
8	Yao et al., 2024	Effect of pneumatic leg compression on phenylephrine dose for hypotension prophylaxis via variable rate infusion at cesarean delivery: an unblinded randomized controlled trial	Did not report participant BMI
9	Park et al., 2022	Colloid coload versus crystalloid coload to prevent maternal hypotension in women receiving prophylactic phenylephrine infusion during caesarean delivery: a randomised controlled trial	Did not report participant BMI
10	Wang et al., 2020	Comparison of Continuous Infusion of Epinephrine and Phenylephrine on Hemodynamics During Spinal Anesthesia for Cesarean Delivery: A Randomized Controlled Trial	Did not exclude patients with BMI <30 kg/m²
11	Hasanin et al., 2019	Norepinephrine versus phenylephrine infusion for prophylaxis against post-spinal anaesthesia hypotension during elective caesarean delivery: A randomised controlled trial	Did not report participant BMI
12	Theodoraki et al., 2020	Prevention of hypotension during elective cesarean section with a fixed-rate norepinephrine infusion versus a fixed-rate phenylephrine infusion. A double-blinded randomized controlled trial	Did not exclude patients with BMI <30 kg/m²
13	Marni et al., 2024	Comparison Of The Effect Of Ephedrine And Phenylephrine In The Treatment Of Hypotension After Spinal Anesthesia During Caesarean Section And Their Effect On Fetal Outcome	Did not report participant BMI
14	Nani et al., 2011	Correlation between the Body Mass Index (BMI) of pregnant women and the development of hypotension after spinal anesthesia for cesarean section	Obese patients (BMI >30 kg/m²) were excluded

15	Fakhari et al., 2019	Comparing the effect of hypotension treatment due to spinal anesthesia with ephedrine or phenylephrine on arterial blood gases and neonatal Apgar score during cesarean delivery in obese mothers: Randomized clinical trial	Published in other language than English
16	Rana et al., 2020	Comparison of Variable Rate Phenylephrine Infusion with Rescue Phenylephrine Boluses Versus Rescue Boluses Alone for Prevention of Hypotension During Spinal Anesthesia for Elective Cesarean Delivery	Did not exclude patients with BMI <30 kg/m²