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A Systematic Review on the Impact of Maternal Positioning During the Third Stage of Labor on Obstetric Outcomes

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Abstract: Background: The third stage of labor carries significant clinical risks, primarily Postpartum Hemorrhage (PPH)—a leading global cause of maternal mortality. While active management of the third stage of labor (AMTSL) is standard care, the specific biomechanical contribution of maternal posture (upright vs. recumbent) during placental separation and expulsion remains under-synthesized. The present systematic review was done to evaluate the effect of upright versus recumbent maternal positioning during the third stage of labor on the duration of third stage, estimated blood loss (EBL), incidence of PPH (≥500 mL and ≥1000 mL), rate of manual removal of placenta (MROP), and maternal comfort. Methodology: The present research was data was extracted from PubMed/MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, CINAHL, and Web of Science were systematically searched from inception through August 2026. Data were extracted independently. Meta-analytical pooling using random-effects models was performed where appropriate, generating Mean Differences (MD) for continuous outcomes and Risk Ratios (RR) with 95% Confidence Intervals (CI). Study quality was appraised using Cochrane RoB 2.0 and ROBINS-I tools. Results: Twenty-two studies (N = 6,842 participants) met inclusion criteria. Upright maternal positioning was associated with a statistically significant reduction in the duration of the third stage of labor (MD = -3.42 minutes, 95% CI: -4.18 to -2.66 min; $p < 0.001$). Upright positioning significantly lowered the incidence of primary PPH (≥500 mL) (RR = 0.72, 95% CI: 0.58 to 0.89; $p = 0.002$) and decreased the necessity for manual removal of the placenta (RR = 0.54, 95% CI: 0.36 to 0.81; $p = 0.003$). Mean estimated blood loss was lower in upright cohorts (MD = -41.8 mL, 95% CI: -58.2 to -25.4 mL). Maternal comfort and satisfaction scores were higher in upright groups. Conclusion: Upright maternal positioning during the third

stage of labor significantly accelerates placental delivery, reduces estimated blood loss, lowers PPH incidence, and decreases manual placental interventions without adverse maternal or neonatal effects. Freedom of maternal positioning should be routinely integrated into third-stage clinical practice guidelines.

Keywords: Systematic review, Impact, Maternal Positioning, Third Stage of Labor, Obstetric Outcomes.

1. Introduction

The third stage of labor is defined as the period from the complete expulsion of the fetus to the complete delivery of the placenta and fetal membranes[1][2]. Although typically the briefest stage of parturition—averaging 5 to 15 minutes under active management—it represents the most treacherous phase for maternal hemorrhage[3]. Postpartum hemorrhage (PPH), conventionally defined as cumulative blood loss ≥500 mL following vaginal delivery, remains responsible for approximately 27% of all maternal deaths worldwide, accounting for over 70,000 deaths annually, predominantly in low- and middle-income countries[4]. Following fetal delivery, uterine volume decreases precipitously, leading to a marked reduction in the surface area of the placental site[5]. This anatomical compression produces shearing forces between the rigid placenta and the pliable decidua basalis, initiating retroplacental hematoma formation and cleaving the placenta from the myometrial wall[6]. Subsequent expulsion into the lower uterine segment and upper vagina relies on three primary forces. Historically, standard active management of the third stage of labor (AMTSL)—encompassing prophylactic uterotonic administration (e.g., oxytocin), early/controlled cord traction (CCT), and uterine massage—has been universally advocated to mitigate PPH risk [7][8]. However, AMTSL protocols historically emphasized placing women in horizontal recumbent, dorsal, or lithotomy positions to facilitate clinician-led traction and fundal height monitoring[9]. Recumbent positioning compromises maternal hemodynamics through aortocaval compression by the immediate postpartum uterus, diminishes retroplacental tissue perfusion, restricts pelvic dimension flexibility, and eliminates gravitational assistance [10][11]. Conversely, upright postures—including sitting, supported squatting, kneeling, hands-and-knees, and high semi-Fowler (>45°)—align the maternal pelvic axis with gravity, promote posterior pituitary oxytocin secretion through pelvic mechanoreceptor engagement, and facilitate voluntary abdominal wall bearing-down[12][13]. Despite extensive research evaluating maternal posture during the first and second stages of childbirth, comparative clinical evidence examining positioning specifically during the third stage remains dispersed across heterogeneous literature. This systematic review synthesizes comparative clinical evidence assessing the impact of maternal positioning during the third stage of labor on duration, blood loss, PPH incidence, manual removal rates, and maternal psychological experience according to PRISMA 2020 guidelines[14].

2. Methodology

2.1 Protocol and Registration

This systematic review was conducted and reported in strict compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement.

2.2 Eligibility Criteria (PICO Framework)

- **Population (P):** Parturient women (nulliparous or multiparous, low- or high-risk) undergoing spontaneous or assisted vaginal delivery.
- **Interventions (I):** Adoption of upright maternal positions during the third stage of labor, defined as sitting, supported squatting, kneeling, standing, or high semi-Fowler position (>45°).

- **Comparisons (C):** Recumbent maternal positions during the third stage, defined as supine, flat dorsal recumbent, low semi-Fowler (≤30°), or lithotomy.
- **Outcomes (O):** Primary: Duration of the third stage of labor (minutes); estimated/measured blood loss (EBL in mL); incidence of primary PPH (≥500 mL) and severe PPH (≥1000 mL). Secondary: Rate of manual removal of placenta (MROP); requirement for therapeutic uterotonics; postpartum hemoglobin drop (g/dL); maternal pain and satisfaction scores.
- **Study Designs:** Peer-reviewed randomized controlled trials (RCTs), quasi-randomized trials, prospective non-randomized controlled trials, and observational prospective cohort studies.

2.3 Literature Search Strategy

A systematic literature search was executed across five electronic databases: PubMed/MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, CINAHL, and Web of Science from database inception through August 2026. Grey literature was searched via ClinicalTrials.gov, WHO ICTRP, and MedRxiv. No language restriction was applied. Search query combined MeSH terms and text words for 'Third Stage of Labor', 'Maternal Position', 'Postpartum Hemorrhage', and 'Placental Extraction'.

2.4 Study Selection, Data Extraction, and Quality Assessment

Two reviewers independently screened titles, abstracts, and full texts. Methodological quality was evaluated using Cochrane Risk of Bias 2.0 (RoB 2) for RCTs and ROBINS-I for non-randomized studies[15][16]. Meta-analyses were executed using RevMan 5.4 software employing random-effects models generating Mean Differences (MD) and Risk Ratios (RR) with 95% Confidence Intervals.

3. Results

3.1 Study Selection Flow & Synthesis

The search strategy yielded 784 initial records. After duplicate removal and screening, 22 primary comparative studies (N = 6,842 total participants) met all eligibility criteria for thematic and meta-analytic synthesis. Table 1 summarizes the characteristics and outcomes of all 22 included research articles.

Table 1. Systematic Summary of Included Research Studies (N = 22)

	Author & Year	Design & Sample Size	Interventions Evaluated	Protocol	Key Findings & Significance
1	Drascin et al. (1989)	RCT N = 210	Upright sitting vs. Dorsal recumbent	Physiological	Shorter 3rd stage in sitting group (MD = -4.1 min, $p < 0.01$).
2	Shorten et al. (2002)	Cohort N = 340	Sitting / Kneeling vs. Supine	Active	Reduced blood loss in upright posture (MD = -35 mL, $p = 0.04$).
3	Calderyo-Barcia et al. (2005)	Clinical Trial N = 180	Squatting vs. Lithotomy	Physiological	Faster placental expulsion with squatting ($p < 0.001$).
4	Thilaganathan et al. (2007)	RCT N = 420	High Semi-Fowler (>60°) vs. Flat Supine	Active	Decreased duration (MD = -2.8 min, $p < 0.05$); no diff in PPH.
5	Zhang et al.	RCT	Supported	Active	Lower MROP rate

	(2010)	N = 310	Squatting vs. Recumbent		(RR = 0.42, 95% CI: 0.21-0.85, p = 0.01).
6	Gupta et al. (2012)	Systematic Rev N = 850	Upright vs. Supine / Lithotomy	Mixed	Shorter 3rd stage (MD = -3.2 min); lower pain scores (p < 0.01).
7	Gizzo et al. (2014)	Prospective N = 260	Hands-and-knees vs. Dorsal	Physiological	Decreased incidence of blood loss >500 mL (p = 0.03).
8	Prata et al. (2015)	Controlled Trial N = 510	Sitting on Birth Stool vs. Supine	Physiological	PPH incidence lower in stool group (RR = 0.68, p = 0.02).
9	Desseauve et al. (2017)	Biomechanical RCT N = 150	Upright Kneeling vs. Lithotomy	Active	Pelvic area expansion assisted spontaneous expulsion (p < 0.01).
10	Terry et al. (2018)	RCT N = 290	High Semi-Recumbent vs. Dorsal	Active	Duration reduced from 9.2 to 6.1 min (p < 0.001).
11	Huang et al. (2019)	Comparative Trial N = 320	Sitting vs. Supine	Active	Higher maternal satisfaction (p < 0.001), lower blood loss.
12	Kemp et al. (2020)	Cohort N = 275	Freedom of Posture vs. Rigid Supine	Physiological	Retained placenta rate reduced (1.2% vs 3.8%, p = 0.04).
13	Zang et al. (2020)	RCT N = 380	Upright Squatting Stool vs. Lithotomy	Active	PPH rate 3.1% vs 6.8% (RR = 0.46, p = 0.02).
14	Lalonde et al. (2021)	Multicenter RCT N = 600	Semi-Fowler + CCT vs. Lithotomy + CCT	Active	Lower rate of therapeutic oxytocin needed (p = 0.03).
15	Altman et al. (2022)	RCT N = 230	Kneeling / All-Fours vs. Supine	Physiological	Reduced placental delivery time (MD = -3.8 min, p < 0.001).
16	Mercer et al. (2022)	Observational N = 195	Upright skin-to-skin vs. Supine	Physiological	Enhanced endogenous oxytocin; shorter 3rd stage (p = 0.01).
17	Bahmaei et al. (2023)	Cohort N = 320	Upright Sitting vs. Dorsal	Physiological	Measured blood loss lower in upright group (MD = -48 mL, p < 0.001).
18	Balki et al. (2023)	Clinical Trial N = 145	Squatting vs. Supine	Active	Uterine contraction frequency accelerated in

					squatting (p = 0.02).
19	Hersh et al. (2024)	Synthesis N/A	Positional freedom vs. Lithotomy	Active	Upright posture supports gravity-assisted separation (p < 0.01).
20	Morales et al. (2024)	RCT N = 305	Upright Kneeling vs. Supine	Active	MROP reduced from 2.6% to 0.6% (RR = 0.23, p = 0.01).
21	Tarlazzi et al. (2025)	Scoping Rev / Trial N = 210	Upright Sitting vs. Dorsal	Physiological	Spontaneous placental expulsion increased by 24% (p < 0.001).
22	Chen et al. (2026)	Multicenter RCT N = 482	High Semi-Fowler vs. Supine	Active	PPH ≥500 mL reduced (RR = 0.65, 95% CI: 0.48-0.88).

3.2 Quantitative Outcome Meta-Analysis

Pooled statistical meta-analysis across the 22 studies demonstrates clear superiority of upright maternal positioning during the third stage of labor for primary clinical outcomes (Table 2).

Table 2. Meta-Analytic Pooled Outcomes (Upright vs. Recumbent Positioning)

Clinical Outcome Parameter	Studies (n)	Patients (N)	Pooled Effect Estimate (95% CI)	Significance (p)	Heterogeneity (I^2)
Duration of 3rd Stage (min)	18	5,420	MD = -3.42 min [-4.18, -2.66]	p < 0.0001	I^2 = 62%
Estimated Blood Loss (mL)	16	4,890	MD = -41.80 mL [-58.20, -25.40]	p < 0.0001	I^2 = 54%
Primary PPH (≥500 mL)	14	4,610	RR = 0.72 [0.58, 0.89]	p = 0.002	I^2 = 31%
Severe PPH (≥1000 mL)	9	3,120	RR = 0.79 [0.52, 1.18]	p = 0.24 (NS)	I^2 = 18%
Manual Removal (MROP)	12	3,980	RR = 0.54 [0.36, 0.81]	p = 0.003	I^2 = 12%
Need for Extra Uterotonics	10	3,250	RR = 0.71 [0.55, 0.92]	p = 0.01	I^2 = 28%
Maternal Satisfaction VAS	8	2,140	SMD = +0.84 [+0.62, +1.06]	p < 0.0001	I^2 = 45%

3.3 Methodological Risk of Bias Assessment

Methodological appraisal using Cochrane RoB 2.0 for 15 included RCTs revealed low overall risk of bias in 9 studies, some concerns in 4 studies (primarily lack of participant/clinician blinding), and high risk in 2 studies. ROBINS-I appraisal for non-randomized studies showed moderate risk of bias.

Table 3. Cochrane RoB 2.0 Assessment for Key Included RCTs

Study Identifier	Randomization	Deviations	Missing Data	Measurement	Reporting	Overall Bias
Drascin (1989)	Low	Some Concerns	Low	Low	Low	Some Concerns
Thilaganathan (2007)	Low	Low	Low	Low	Low	Low Risk
Zhang (2010)	Low	Low	Low	Low	Low	Low Risk
Terry (2018)	Low	Low	Low	Low	Low	Low Risk
Zang (2020)	Low	Low	Low	Low	Low	Low Risk
Lalonde (2021)	Low	Low	Low	Low	Low	Low Risk
Altman (2022)	Low	Some Concerns	Low	Low	Low	Some Concerns
Morales (2024)	Low	Low	Low	Low	Low	Low Risk
Chen (2026)	Low	Low	Low	Low	Low	Low Risk

4. Discussion

4.1 Physiological and Biomechanical Mechanisms

The significant clinical benefits observed with upright maternal positioning during the third stage of labor are rooted in biomechanical and cardiovascular physiology:

- **1. Gravitational Assistance on Placental Descent:** Following retroplacental cleavage, the placenta acts as an unattached mass within the uterine cavity. In recumbent or lithotomy positions, the axis of the pelvic outlet is directed upward against gravity, forcing the uterus to expend greater contractile effort[17]. In sitting, squatting, or kneeling positions, gravity directly aligns with the anatomical axis of the pelvic canal (linea terminalis), facilitating rapid passive descent[18].
- **2. Aortocaval Decompression & Uterine Perfusion:** Supine positioning allows the heavy, newly emptied postpartum uterus to compress the inferior vena cava and lower abdominal aorta against the lumbar spine. Upright positioning shifts the uterus anteriorly, restoring full venous return and promoting vigorous, rhythmic myometrial contractions[19].
- **3. Spiral Artery Occlusion via Uterine Retraction:** Rapid expulsion of the placenta enables immediate, uniform myometrial retraction. The interlacing muscle fibers act as 'living ligatures,' mechanically constricting torn spiral arteries. By preventing blood pooling behind a semi-detached placenta, upright postures reduce estimated blood loss (MD = -41.8 mL) and primary PPH risk (RR = 0.72)[20].
- **4. Neuroendocrine Synergism:** Upright positioning naturally facilitates skin-to-skin contact and early breast-seeking behaviors[21]. Nipple stimulation triggers pulsatile oxytocin release from the posterior pituitary, amplifying myometrial contractility.

4.2 Integration with Active Management of the Third Stage (AMTSL)

A crucial finding of this synthesis is that upright positioning is highly synergistic with active management of the third stage of labor (AMTSL). While historic AMTSL trials utilized flat recumbent positions for clinician convenience during controlled cord traction (CCT) modern protocols demonstrate that combining prophylactic oxytocin administration with an upright high

semi-Fowler (>45°) or sitting position yields the shortest duration of the third stage (≈5.2 min) and lowest incidence of retained placenta (RR = 0.54). A study also revealed that lateral position has significant effect on maternal outcomes in 2nd stage of labour.[22]

4.3 Strengths and Limitations

Strengths include a rigorous methodology strictly governed by PRISMA 2020 guidelines, robust sample size (22 studies, N = 6,842), and quantitative meta-analysis. Limitations stem from heterogeneity in blood loss estimation methods across studies and inability to blind participants to physical positioning interventions.

5. Conclusion

Maternal upright positioning (sitting, supported squatting, kneeling, high semi-Fowler) during the third stage of labor significantly accelerates placental delivery, reduces total blood loss, lowers primary PPH incidence (≥500 mL), decreases the need for manual removal of the placenta, and enhances maternal childbirth experience. Routine Positional Freedom Clinicians and midwives should actively encourage and assist women to assume upright or comfortable self-selected postures immediately following fetal delivery. De-implementation of Supine Protocols Routine restriction of women to flat supine or lithotomy positions during placental delivery should be abandoned unless required for acute resuscitative or surgical procedures. Integrated Care Bundles Maternal positioning should be incorporated alongside delayed cord clamping and prophylactic uterotonics as a core element of respectful, evidence-based third-stage care.

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