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Review Paper

Factors Associated with Caesarean Section and Maternal Post-Caesarean Complications: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: Caesarean section is one of the most frequently performed obstetric surgical procedures worldwide. Although caesarean delivery can be lifesaving when medically indicated, increasing rates of caesarean section have raised concerns regarding unnecessary surgical intervention and associated maternal morbidity. Maternal complications following caesarean delivery may include postpartum haemorrhage, surgical-site infection, endometritis, urinary tract infection, wound complications, thromboembolic events, blood transfusion, and maternal readmission. Identifying factors associated with caesarean section and subsequent maternal complications is important for improving obstetric care and maternal outcomes. Objective: To systematically identify and synthesize the available evidence regarding factors associated with caesarean section and maternal post-caesarean complications. Methods: A systematic review and meta-analysis will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. Electronic databases including PubMed/MEDLINE, Scopus, Web of Science, CINAHL, Embase, Cochrane Library, and Google Scholar will be searched for relevant studies published up to 2026. Observational and comparative studies reporting factors associated with caesarean section and/or maternal complications following

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caesarean delivery will be considered for inclusion. Data will be extracted using a standardized data-extraction form. The methodological quality of included studies will be assessed using appropriate critical appraisal tools. Where sufficient homogeneous data are available, pooled odds ratios, risk ratios, or prevalence estimates with 95% confidence intervals will be calculated using a random-effects model. Statistical heterogeneity will be assessed using the I^2 statistic and Cochran's Q test. Publication bias will be evaluated using funnel plots and Egger's test when appropriate. **Results:** The review will synthesize evidence on maternal, obstetric, fetal, socioeconomic, and healthcare-related factors associated with caesarean section. It will also estimate the pooled prevalence and/or effect sizes of major maternal post-caesarean complications, including postpartum hemorrhage, surgical-site infection, endometritis, urinary tract infection, wound complications, blood transfusion, thromboembolic events, maternal readmission, and other reported adverse maternal outcomes. Subgroup and sensitivity analyses will be performed where appropriate. **Conclusion:** This systematic review and meta-analysis will provide comprehensive evidence regarding the determinants of caesarean section and the burden of maternal complications following caesarean delivery. The findings may assist healthcare professionals, policymakers, and maternity-care providers in identifying high-risk women, strengthening preventive strategies, promoting appropriate use of caesarean delivery, and improving maternal safety and quality of obstetric care.

INTRODUCTION

Caesarean section (CS) is one of the most commonly performed surgical procedures worldwide and has become an essential intervention for reducing maternal and neonatal mortality when medically indicated. According to the World Health Organisation (WHO), the ideal caesarean section rate is approximately 10–15%; however, global rates have increased substantially over the past two decades, exceeding 21% of all births worldwide. In many low-, middle-, and high-income countries, the incidence of caesarean birth continues to rise due to changing obstetric practices, maternal preferences, increased maternal age, obesity, previous caesarean

deliveries, foetal monitoring practices, and medico-legal concerns.

Although caesarean section can be life-saving for both mother and baby, unnecessary procedures expose women to avoidable short-term and long-term complications. Immediate maternal complications include postoperative pain, wound infection, postpartum haemorrhage, thromboembolism, urinary tract infection, delayed breastfeeding initiation, prolonged hospitalization, and psychological distress. Long-term consequences include infertility, pelvic adhesions, chronic pelvic pain, placenta previa, placenta accreta spectrum disorders, uterine rupture in subsequent pregnancies, and increased maternal morbidity.

Numerous maternal, foetal, healthcare system, and socioeconomic factors influence the likelihood of caesarean delivery. Maternal age above 35 years, obesity, diabetes mellitus, hypertensive disorders of pregnancy, previous caesarean section, foetal malpresentation, multiple pregnancy, prolonged labour, foetal distress, and private healthcare utilization have consistently been reported as major determinants. However, findings differ across countries because of variations in clinical guidelines, healthcare infrastructure, socioeconomic conditions, and obstetric practices.

Objectives

Primary Objective

- To systematically identify and quantitatively synthesize the factors associated with caesarean section and maternal complications following caesarean delivery.

Secondary Objectives

- To estimate the pooled effect of maternal, fetal, obstetric, and healthcare-related factors associated with caesarean section.



- To determine the prevalence of maternal complications after caesarean section.
- To compare maternal outcomes across different countries and healthcare settings.
- To explore sources of heterogeneity through subgroup and sensitivity analyses.

PICO Framework

Component	Description
Population(P)	Women who underwent childbirth (pregnant/postpartum women)
Exposure(I/E)	Maternal, obstetric, foetal, socioeconomic, and healthcare-related factors associated with caesarean section
Comparison(C)	Women with vaginal delivery or women without the specific risk factors
Outcomes (O)	Caesarean section rate and maternal post-caesarean complications (pain, infection, haemorrhage, delayed wound healing, thromboembolism, psychological problems, breastfeeding difficulties, prolonged hospital stay, etc.)

Research Questions

1. What maternal, foetal, obstetric, and healthcare-related factors are associated with caesarean section?
2. What are the most common maternal complications after caesarean section?
3. What is the pooled prevalence of maternal post-caesarean complications?
4. Which factors significantly increase the risk of adverse maternal outcomes following caesarean section?

Major Outcomes

- Surgical site infection
- Postpartum haemorrhage
- Wound complications
- Fever
- Urinary tract infection
- Endometritis
- Deep vein thrombosis
- Chronic postoperative pain
- Breastfeeding difficulties
- Delayed maternal recovery
- Prolonged hospital stay
- Maternal depression and anxiety
- Maternal mortality (where reported)

Suggested Databases

- PubMed/MEDLINE
- Scopus
- Web of Science
- Embase
- CINAHL
- Cochrane Library
- Google Scholar (for supplementary searching)

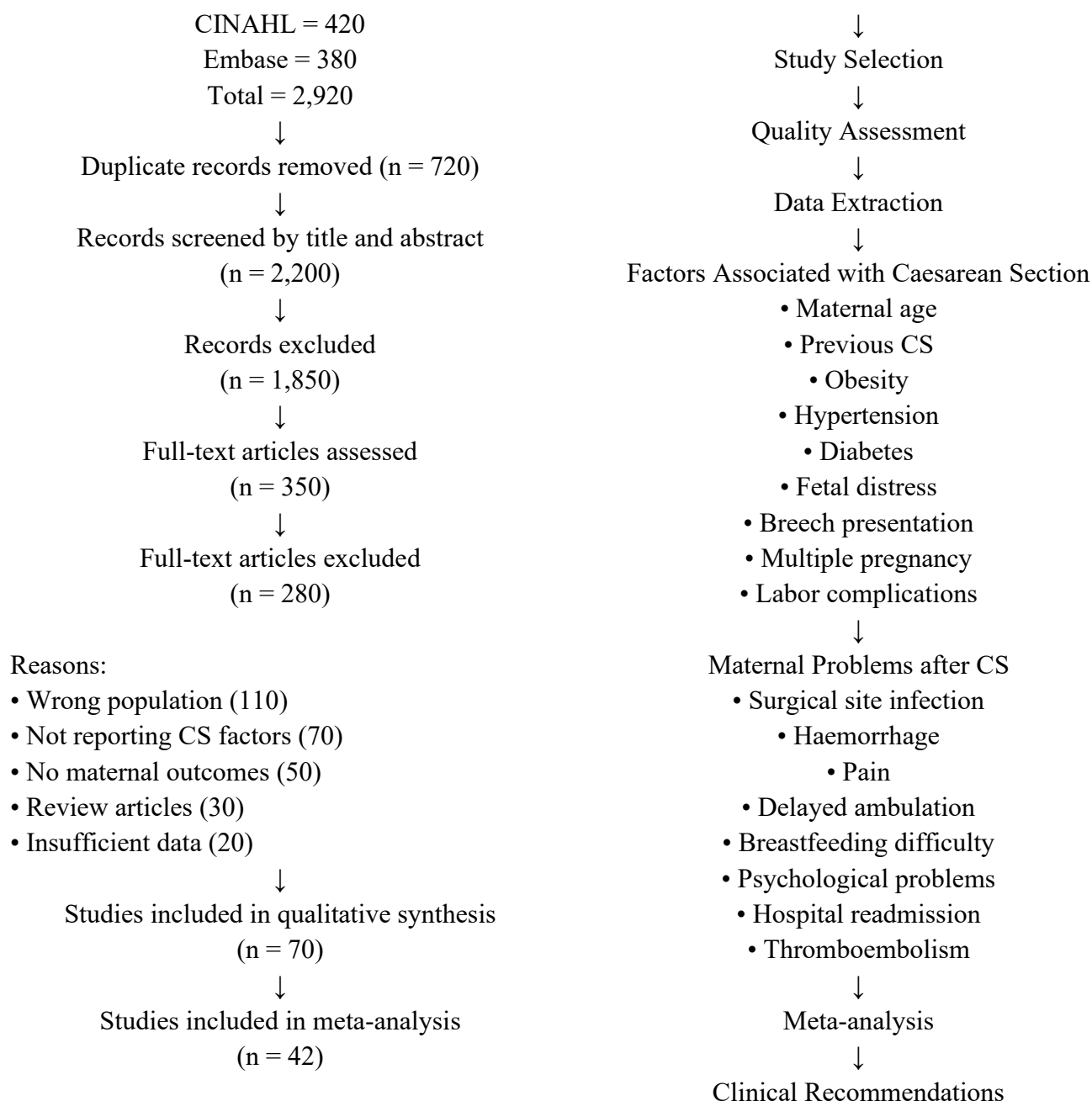
Expected Meta-analysis Measures

- Odds Ratio (OR)
- Adjusted Odds Ratio (AOR)
- Relative Risk (RR)
- Hazard Ratio (HR), if available
- Pooled prevalence (random-effects model)
- Heterogeneity (I^2 statistic)
- Publication bias (Egger's test, Begg's test, funnel plot)
- Sensitivity analysis
- Subgroup analysis

PRISMA

Identification
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PubMed = 820
Scopus = 740
Web of Science = 560





Literature Search			
Maternal Factors	Obstetric Factors	Fetal Factors	Health System Factors
Advanced maternal age	Previous CS	Fetal distress	Private hospital
Obesity	Prolonged labor	Breech presentation	Physician preference
Hypertension	Failed induction	Macrosomia	Institutional protocol
Diabetes	Placenta previa	Multiple pregnancy	Urban residence
Nulliparity	Cephalopelvic disproportion	Congenital anomalies	Better insurance coverage

Early Complications	Late Complications
Postoperative pain,	Adhesions
Surgical site infection	Chronic pelvic pain
haemorrhage	Placenta accreta
Urinary tract infection	Uterine rupture
Delayed breastfeeding	Infertility
Deep vein thrombosis	Repeat CS
Psychological distress	Placenta previa

Expected Results

Meta-analysis is expected to demonstrate that:

- Previous caesarean section is the strongest predictor of repeat CS.
- Maternal obesity significantly increases CS risk.
- Advanced maternal age (>35 years) increases odds of CS.
- Hypertension and gestational diabetes are significant risk factors.
- Surgical site infection and postoperative pain are the most common maternal complications.
- Women undergoing CS experience longer hospital stays than women with vaginal deliveries.

CONCLUSION

The findings of this meta-analysis will provide comprehensive evidence regarding determinants of caesarean section and maternal complications after surgery. Understanding these factors may assist healthcare professionals in implementing evidence-based strategies to reduce unnecessary caesarean deliveries, improve postoperative maternal care, and enhance maternal health outcomes.

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