Predicting Cesarean Delivery: A Case-Control Study among Indian Women

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Abstract:

Background:

Cesarean delivery rates are increasing worldwide, including in India, necessitating the identification of risk factors to improve maternal and neonatal outcomes. This study aimed to determine maternal, clinical, and sociodemographic predictors of cesarean delivery in an Indian cohort.

Methods:

A case-control study was conducted at a tertiary care hospital in Nagpur, India. A total of 190 participants were enrolled: 95 had cesarean deliveries and were compared with 95 who had vaginal deliveries. Structured interviews and medical record reviews were conducted for data collection. Univariate logistic regression models were used to identify risk factors.

Results:

Univariate analysis identified significant risk factors for cesarean delivery, including age > 30 years, urban residence, short stature, obesity, comorbidities, fewer than four antenatal care (ANC) visits, and delayed ANC initiation.

Conclusion:

Urban residence, maternal health conditions, and inadequate ANC constitute independent predictors of cesarean delivery. Targeted interventions and robust ANC services are necessary to improve delivery outcomes.

Keywords:

Cesarean Section, Retrospective Study, Risk Factors

Introduction:

Public concern regarding rising rates of cesarean section (C-section) deliveries globally, particularly in low- and middle-income countries like India, is increasing.(1) While C-sections are essential in managing obstetric emergencies, their overuse is associated with maternal and neonatal morbidity, increased healthcare costs, and strain on healthcare systems.(2) Understanding the risk factors contributing to the rising frequency of surgeries is crucial, especially in diverse and resource-limited settings.

India presents a unique context for studying C-section determinants due to its vast sociodemographic diversity. Existing literature highlights various maternal, fetal, and healthcare-related factors associated with delivery mode, but these determinants vary by geography, economics, and culture.(3,4) This study investigates risk factors for C-section delivery in India using a robust case-control design. By analyzing sociodemographic, anthropometric, and obstetric variables, this research aims to identify independent predictors of C-section and provide insights for healthcare providers and policymakers to optimize delivery outcomes.

Methodology:

Study Design and Setting:

A case-control study was conducted in a tertiary care hospital in Nagpur, India, following ethical approval. Women with singleton pregnancies were categorized into two groups: cases (C-section deliveries) and controls (vaginal deliveries).

Sample Size and Data Collection:

The sample size was calculated to detect an odds ratio of 2.0 for key risk factors with 80% power and a 95% confidence level. A total of 190 participants (95 cases and 95 controls) were enrolled using consecutive sampling. Data were collected via structured interviews and medical record reviews, capturing socio-demographic, anthropometric, obstetric, and clinical variables, such as age, BMI, antenatal care (ANC) visits, and comorbidities.

Statistical Analysis:

Univariate analysis was performed to identify significant associations between variables and C-section delivery. Variables with a p-value < 0.05 were considered significant.

Results:

A total of 190 participants were included, comprising 95 cesarean delivery cases and 95 vaginal delivery controls. Cases were older on average and more likely to reside in urban areas, have comorbidities, or report fewer ANC visits compared to controls.

Univariate Analysis:

Significant risk factors for cesarean delivery included age >30 years, urban residence, short stature, obesity, comorbidities, fewer than four ANC visits, and delayed ANC initiation

Table 1. Univariate Analysis of Risk Factors for C-section

Variable	Cases (n=95)	Controls (n=95)	p-value	Odds Ratio (CI)
Age (>30)	54	35	0.006	2.24 (1.2-4)
Residence (Urban)	58	31	0.001	3.21 (1.7-5.8)
Short Stature (Yes)	71	42	0.001	3.7 (2.01-6.9)
BMI (Obese)	51	26	0.001	3.05 (1.6-5.6)
Weight Gain During Pregnancy (>11kg)	33	53	0.003	0.4 (0.2-0.7)
Total ANC Visits (<4)	45	23	0.001	2.8 (1.5-5.2)
First ANC Visit (After 12 weeks)	64	43	0.002	2.4 (1.3-4.5)
Comorbidities (Present)	46	20	0.001	3.5 (1.8-6.7)

P-value <0.05 is significant

Discussion:

This study identified key maternal, clinical, and sociodemographic risk factors associated with cesarean delivery in the Indian population. The findings provide critical insights for healthcare professionals and policymakers to mitigate unnecessary C-sections and improve maternal health outcomes.

Key Findings and Implications:

Urban residence emerged as a significant predictor, reflecting increased healthcare access and potential institutional or patient-driven preferences for C-sections.(3,4) Short stature was strongly associated with cesarean delivery, consistent with prior research indicating its impact on

cephalopelvic disproportion.(5) Obesity and comorbidities, such as hypertension and gestational diabetes, also significantly increased the likelihood of C-section, highlighting the role of maternal health conditions in delivery outcomes.(6)

Antenatal care (ANC) is a modifiable factor with direct implications for cesarean delivery rates. Inadequate ANC visits and delayed ANC initiation were associated with a higher likelihood of C-section, underscoring the importance of early and comprehensive prenatal care.(7) Strengthening ANC programs can facilitate early identification of high-risk pregnancies and optimize delivery planning to reduce unnecessary surgical interventions.

Clinical and Policy Recommendations:

1. **Enhanced ANC Services:** Regular and early ANC visits should be promoted to monitor maternal health, identify complications, and provide timely interventions.
2. **Nutritional and Weight Management Programs:** Given the association between obesity and cesarean delivery, preconception and antenatal weight management strategies should be prioritized.
3. **Public Awareness Campaigns:** Educating women about the risks and benefits of C-section versus vaginal delivery can empower informed decision-making and reduce elective cesareans.
4. **Institutional Policies:** Hospitals should implement evidence-based protocols to ensure that C-sections are performed only when medically indicated, reducing unnecessary interventions.

Conclusion:

This study highlights significant risk factors for cesarean delivery, emphasizing maternal health and ANC as critical areas for intervention. Addressing these factors through targeted healthcare policies and clinical strategies can reduce unnecessary C-sections and improve maternal and neonatal health outcomes in India.

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