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Determinants of Caesarean Section Delivery Among Mothers: Evidence from a Cross-Sectional Study in a Private Maternity Hospital in Medan, Indonesia

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ABSTRACT

Background: The increasing rate of Caesarean Section (CS) delivery has become a global concern, particularly in private healthcare settings where non-medical factors may influence decision-making. Understanding maternal determinants is essential to optimize delivery practices and reduce unnecessary procedures. **Objectives:** This study aimed to identify maternal factors associated with CS delivery among mothers in a private maternity hospital in Medan. **Methods:** A cross-sectional study was conducted using secondary data from medical records of 341 mothers who delivered at RSU Bunda Thamrin between January and December 2025. The dependent variable was CS, while independent variables included maternal age, gestational age, history of CS, preeclampsia, and premature rupture of membranes (PROM). Data were analyzed using Chi-square tests and multiple logistic regression to determine adjusted odds ratios (aORs) with 95% confidence intervals (CIs). **Results:** A history of previous CS was the strongest predictor of CS (aOR=19.689; 95% CI: 2.589–149.737; p=0.004). Preeclampsia (aOR=5.396; 95% CI: 2.276–12.790; p<0.001) and PROM (aOR=9.005; 95% CI: 3.506–23.128; p<0.001) were also significantly associated with increased CS likelihood. Maternal age and gestational age showed no significant association. **Conclusion:** Clinical maternal complications, particularly previous CS, preeclampsia, and PROM, are key determinants of CS delivery. Strengthening antenatal care and risk-based management is essential to reduce unnecessary CS and improve maternal outcomes.

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INTRODUCTION

The rising rate of Caesarean Section (CS) delivery has become a major global public health concern over the past decades. The World Health Organization recommends that the optimal rate of CS

should range between 10% and 15% of all births, as rates exceeding this threshold are not consistently associated with reductions in maternal and neonatal mortality (Ayres-de-Campos et al., 2024). However, many countries, including Indonesia, have experienced a substantial increase in CS deliveries, driven by both medical and non-medical factors (Belladiena et al., 2025). This trend raises concerns regarding potential clinical risks, increased healthcare costs, and long-term consequences for maternal and child health.

In Indonesia, the prevalence of CS delivery has steadily increased, particularly in private healthcare facilities (Zahroh et al., 2024). Private maternity hospitals tend to report higher CS rates compared to public institutions, which may be influenced by patient preferences, provider practices, and institutional or financial incentives. In addition, socio-demographic changes, such as higher maternal education levels, employment status, and improved access to healthcare services, have contributed to the growing demand for CS deliveries (Khadse, 2024).

From a clinical perspective, CS is a life-saving intervention when medically indicated, such as in cases of obstetric complications, fetal distress, or previous cesarean delivery (Mersha & Shibiru, 2024). Nevertheless, non-medical determinants also play a significant role in the decision-making process. These include fear of labor pain, perceived safety and convenience of surgical delivery, cultural beliefs, and social influences (Cipta Wardhani & Pudji Lestari, 2024) ; (Syed Qasim Shah, 2023). The interplay of these factors often shapes maternal and provider preferences, ultimately influencing the mode of delivery.

The city of Medan, as one of the major healthcare hubs in western Indonesia, is home to numerous private maternity hospitals offering advanced obstetric services. Despite this, empirical evidence specifically examining the determinants of CS delivery in private healthcare settings in Medan remains limited. A comprehensive understanding of these determinants is essential for developing effective strategies to optimize the use of CS and to prevent unnecessary procedures.

Therefore, this study aims to identify the determinants of Caesarean Section delivery among mothers in a private maternity hospital in Medan using a cross-sectional design. The findings of this study are expected to contribute to the existing body of knowledge on CS utilization and to inform policymakers and healthcare providers in improving maternal healthcare services and ensuring the appropriate use of Caesarean delivery in Indonesia.

RESEARCH METHOD

Study design

This study employed a cross-sectional design using secondary data derived from the medical records of mothers who delivered at RSU Bunda Thamrin between January 1 and December 31, 2025. Data processing and analysis were conducted from January 5 to January 20, 2026. The dependent variable in this study was Caesarean Section (CS), while the independent variables consisted of maternal factors, including maternal age, gestational age, history of CS, preeclampsia, and premature rupture of membranes (PROM).

Potential confounding variables—such as fetal malpresentation, fetal distress, shoulder dystocia, twin pregnancy, prolonged labor, and obstructed labor—were identified but excluded from the final analysis to ensure that the findings specifically reflected the influence of maternal factors.

This study offers practical implications for community health, particularly in optimizing antenatal care services. By identifying key maternal risk factors associated with CS—such as prior CS, preeclampsia, and PROM—the findings support the development of early screening strategies, personalized risk assessment, and targeted health education for pregnant women. These efforts may contribute to reducing unnecessary CS procedures, improving maternal and neonatal outcomes, and promoting safer, evidence-based delivery practices. Furthermore, the results may inform regional healthcare planning and policy development in maternal health services.

Population and sample

The study population included all mothers who delivered at RSU Bunda Thamrin during the study period. A total of 341 mothers were included using a total sampling technique. Among them, 300 mothers underwent CS, while 41 had vaginal deliveries. The inclusion criteria comprised all mothers with complete medical records, whereas cases with incomplete or missing data were excluded. The sample size was considered adequate based on previous studies investigating risk factors associated with Caesarean Section.

Data collection

Data were collected retrospectively from hospital medical records, including variables such as maternal age, gestational age, history of CS, preeclampsia, and PROM. A standardized data extraction form was utilized to ensure consistency and accuracy in data collection. Clinical measurements such as weight, height, and blood pressure were recorded in metric units. Data verification procedures were implemented to ensure the validity and reliability of the recorded information. In particular, blood pressure measurements were carefully reviewed to confirm the diagnosis of preeclampsia, with both systolic and diastolic values cross-checked from the medical records.

Data analysis

Univariate analysis was conducted to describe the distribution of maternal characteristics. Bivariate analysis using the Chi-square test was performed to examine the association between maternal factors and CS, with a significance level set at $p < 0.05$. Cross-tabulation was used to present relationships between variables.

Crude Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were calculated to assess the strength of associations between maternal factors and CS. To account for the possibility that a single patient could present multiple maternal risk factors, each variable was analyzed independently. Patients with more than one condition—such as prior CS, preeclampsia, or PROM—were included in the analysis for each relevant variable. All 341 cases were classified based on the presence or absence of each maternal factor, allowing for a comprehensive assessment of their individual contributions to CS outcomes.

Multivariate analysis using Multiple Logistic Regression was conducted to identify the most influential factors associated with CS while controlling for other variables. All statistical analyses were performed using SPSS.

Ethical statement

This study adhered to the ethical principles for medical research involving human subjects. Informed consent was waived due to the retrospective nature of the study and the absence of direct patient interaction. All personal identifiers were removed prior to analysis, and access to the data was restricted to authorized researchers. Ethical approval was obtained from the Institutional Review Board in Medan.

RESULTS AND DISCUSSIONS

Table 1 summarizes the characteristics of the study participants, including maternal age, gestational age, previous Caesarean Section (CS), preeclampsia, and premature rupture of membranes (PROM). The majority of mothers were in the optimal reproductive age range of 20–35 years and experienced term pregnancies. Nevertheless, a considerable proportion of mothers presented with clinical risk factors such as prior CS, preeclampsia, and PROM which were predominantly associated with deliveries performed via Caesarean Section.

Table 1. Characteristics of subjects

Category	*Subcategory*	*Frequency (n)*	*Percent (%)*
Maternal Age	*<20 years or >35 years*	*101*	*29.6*
	20–35 years	*240*	*70.4*
Gestational Age	*<37 weeks or >42 weeks*	*58*	*17.0*
	37–42 weeks	*283*	*83.0*
CS History	*Yes*	*98*	*28.7*
	No	*243*	*71.3*
Preeclampsia	*Yes*	*154*	*45.2*
	No	*187*	*54.8*
PROM	*Yes*	*163*	*47.8*
	No	*178*	*52.2*
Caesarean Section	*Yes*	*300*	*88.0*
	No	*41*	*12.0*

. CS: Caesarean Section; PROM: Premature Rupture of Membrane

Bivariate analysis (Table 2) showed that a history of previous CS, preeclampsia, and PROM were significantly associated with a higher likelihood of CS delivery ($p < 0.001$ for all). Maternal age and gestational age were not significantly associated with CS ($p > 0.05$). These findings suggest that clinical complications during pregnancy have a stronger influence on the decision to perform caesarean delivery than general patient background characteristics.

Table 2. Bivariate analysis results

Variable	Category	CS Yes n (%)	CS No n (%)	Total n (%)	OR (95% CI)	p-value
Maternal Age	<20 or >35 years	88 (87.1)	13 (12.9)	101 (100)	0.894 (0.44–1.80)	0.751
	20–35 years	212 (88.3)	28 (11.7)	240 (100)	Reference	
Gestational Age	<37 or >42 weeks	48 (82.8)	10 (17.2)	58 (100)	0.59 (0.27–1.28)	0.183
	37–42 weeks	252 (89.0)	31 (11.0)	283 (100)	Reference	
CS History	Yes	97 (99.0)	1 (1.0)	98 (100)	19.11 (2.58–149.73)	0.004
	No	203 (83.5)	40 (16.5)	243 (100)	Reference	
Preeclampsia	Yes	146 (94.8)	8 (5.2)	154 (100)	5.396 (2.27–12.79)	0.000
	No	154 (82.3)	33 (17.7)	187 (100)	Reference	
PROM	Yes	157 (96.3)	6 (3.7)	163 (100)	6.40 (3.50–23.12)	0.000
	No	143 (80.3)	35 (19.7)	178 (100)	Reference	

CS: Caesarean Section; PROM: Premature Rupture of Membrane; CI: Confidence Interval

Table 3 Shows that after the authors get the result for all variables, a previous CS remained the strongest predictor for repeat caesarean delivery. Preeclampsia and PROM also significantly increased the odds ratio of CS, reinforcing the importance of managing high-risk conditions during pregnancy to reduce unnecessary surgical births.

Table 3. Multivariate analysis results

Variable	p-value	aOR	CI 95%	
			LL	UL
CS History	0.004	19.689	2.589	149.737
Preeclampsia	0.000	5.396	2.276	12.790
PROM	0.000	9.005	3.506	23.128

CI: Confidence interval; aOR; Adjusted Odds ratio

The multivariate analysis demonstrated that a previous Caesarean Section (CS) was the most significant independent predictor of CS in the current pregnancy, with an adjusted odds ratio (aOR) of 19.689, indicating that mothers with a prior CS were nearly 20 times more likely to undergo the procedure again compared to those without such history. Furthermore, preeclampsia and premature rupture of membranes (PROM) were also significantly associated with increased likelihood of CS, with aORs of 5.396 and 9.005, respectively, suggesting that these maternal complications substantially raise the probability of surgical delivery. In contrast, maternal age and gestational age were not significantly associated with CS after controlling for other variables in the model. In the multivariate logistic regression analysis, all categorical variables were coded in binary form with clearly defined reference categories: maternal age 20–35 years, gestational age 37–42 weeks, no prior CS, absence of preeclampsia, and absence of PROM. Accordingly, all reported adjusted odds ratios represent comparisons against these reference groups.

DISCUSSION

The present study identified a history of Caesarean Section (CS) as the most dominant predictor of repeat CS, consistent with findings reported by the World Health Organization and previous empirical studies. The very high adjusted odds ratio observed in this study underscores the strong clinical tendency to perform repeat CS among women with prior uterine surgery. This pattern is largely influenced by concerns over serious obstetric complications, including uterine rupture, abnormal placentation, and intrapartum emergencies associated with vaginal birth after caesarean (VBAC). Although VBAC is considered a safe and feasible option for selected cases, its utilization remains limited due to strict eligibility criteria and risk considerations. Consequently, many clinicians opt for repeat CS as a precautionary approach to minimize maternal and neonatal morbidity. These findings highlight the importance of careful evaluation of previous CS cases, including appropriate interpregnancy intervals and individualized delivery planning, to balance safety and the reduction of unnecessary surgical interventions.

In addition to previous CS, preeclampsia and premature rupture of membranes (PROM) were found to be significant determinants of CS delivery. Preeclampsia substantially increased the likelihood of CS, reflecting its well-established association with adverse maternal and fetal outcomes, such as placental insufficiency, fetal distress, and progression to severe hypertensive complications. Similarly, PROM was strongly associated with increased CS rates, likely due to the elevated risks of intrauterine infection, cord prolapse, and neonatal sepsis, particularly in prolonged cases. These findings are consistent with prior studies indicating that both conditions frequently necessitate timely obstetric intervention to prevent complications. From a clinical perspective, these results emphasize the critical role of early detection, close antenatal monitoring, and prompt management of high-risk pregnancies. Strengthening antenatal care services, particularly in urban healthcare settings such as Medan, may contribute to reducing emergency CS and improving overall maternal and neonatal outcomes.

Conversely, maternal age and gestational age were not significantly associated with CS after adjustment for other variables, suggesting that clinical decision-making is more strongly driven by obstetric complications and medical history rather than demographic characteristics alone. This finding may also reflect the relatively homogeneous distribution of maternal age within the study population, where most participants were in the optimal reproductive age group. Nevertheless, these variables may still exert indirect effects when interacting with other risk factors. From a broader perspective, the increasing rate of CS also raises important clinical, ethical, and socio-

cultural considerations. While CS is justified and recommended in cases with clear medical indications, unnecessary procedures may increase the risk of complications and healthcare burden. In line with this, principles emphasizing the protection of maternal and fetal health—such as those reflected in ethical and religious frameworks—support the use of CS only when medically indicated. Therefore, efforts to reduce unnecessary CS should focus on enhancing patient education, promoting evidence-based decision-making, improving counseling regarding VBAC, and strengthening health system policies. Future studies are encouraged to incorporate additional clinical variables and adopt more integrative analytical approaches to better capture the complex interplay of factors influencing CS decisions.

CONCLUSION

In conclusion, this study demonstrates that a history of Caesarean Section (CS), preeclampsia, and premature rupture of membranes (PROM) are significant determinants of CS delivery, whereas maternal age and gestational age are not independently associated with the mode of delivery, indicating that clinical complications play a more decisive role than demographic factors in influencing delivery decisions; these findings highlight the importance of strengthening antenatal screening, risk stratification, and timely clinical management to improve maternal and neonatal outcomes while minimizing unnecessary surgical interventions. However, as this study focused only on selected maternal variables and excluded fetal and intrapartum factors, future research should adopt a more comprehensive approach by integrating maternal, fetal, and health system–related determinants, as well as examining the combined effects of multiple concurrent indications, while also exploring non-medical influences such as maternal preferences and provider practices to better understand the rising trend of CS and support evidence-based maternal healthcare policies.

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