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Original Research Article

# Analysis of Caesarean Section Rate According to Robson's Ten-Group Classification System in a Tertiary Care Centre

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**Abstract**

**Background:** Caesarean section rates have risen dramatically worldwide, necessitating systematic monitoring using standardized classification systems. The World Health Organization recommends Robson's ten-group classification as the global standard for analyzing caesarean section rates. This study aimed to analyze caesarean section patterns using Robson's classification in a tertiary care setting.

**Methods:** This prospective cross-sectional study was conducted over three months at a tertiary care hospital. All 430 women with gestational age ≥28 weeks were classified according to Robson's ten-group system based on parity, gestational age, fetal presentation, onset of labor, and previous caesarean history. Data on demographic characteristics, delivery outcomes, and indications were analyzed using descriptive statistics and chi-square tests.

**Results:** The overall caesarean section rate was 56.3% (242/430). Group V contributed most to caesarean sections (28.9%), followed by Group I (16.5%) and Group X (12.4%). Group V showed 100% caesarean rate with no vaginal births after caesarean. Groups VI-IX also had 100% caesarean rates, while Group III had the lowest (15.2%). Previous caesarean section was the leading indication (28.9%), followed by fetal distress (22.3%). Groups V, I, and II collectively contributed 57.8% of all caesarean sections.

**Conclusion:** Groups V, I, and II were the largest contributors to caesarean sections. The complete absence of vaginal birth after caesarean section and high primary caesarean rates in nulliparous women indicate significant opportunities for intervention. Robson's classification provides valuable insights for developing evidence-based strategies to optimize caesarean section utilization.

**Keywords:** Caesarean Section, Robson Classification, Obstetric Outcomes, Tertiary Care, Labor Management.

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## Introduction

Caesarean section has evolved from a life-saving procedure to one of the most commonly performed surgical interventions in modern obstetrics. The global caesarean section rate has increased dramatically over the past five decades, rising from approximately 5% in 1970 to over 21% worldwide by 2015, with some countries reporting rates exceeding 50%.[1] This unprecedented rise has generated significant concern among healthcare professionals, policymakers, and international health organizations, as caesarean section rates well above the World Health Organization's recommended range of 10-15% may not confer additional maternal or perinatal benefits.[2]

The increasing caesarean section rates represent a complex interplay of medical, social, and legal factors. Medical factors contributing to this trend include increased maternal age, rising rates of multiple pregnancies following assisted reproductive technologies, growing prevalence of maternal comorbidities such as diabetes and hypertension, and widespread adoption of electronic fetal monitoring during labor.[3] Additionally, changing obstetric practices have led to decreased tolerance for prolonged labor, reduced

utilization of operative vaginal deliveries, and increased reluctance to attempt vaginal breech deliveries or vaginal birth after caesarean section.

The implications of rising caesarean section rates extend beyond immediate surgical risks. While caesarean section can be life-saving when medically indicated, unnecessary procedures expose women to increased risks of surgical complications, longer recovery periods, and potential adverse effects on future pregnancies including placental abnormalities, uterine rupture, and increased likelihood of repeat caesarean sections.[4] From a health systems perspective, excessive caesarean section rates contribute to increased healthcare costs, resource utilization, and potential diversion of resources from other essential maternal and child health services.

Recognizing the need for standardized monitoring and comparison of caesarean section rates, numerous classification systems have been proposed over the years. However, most traditional classification systems focused on clinical indications or were too complex for routine implementation. In 2001, Dr. Michael Robson proposed a ten-group classification system that categorizes women based on five basic obstetric characteristics: parity, previous caesarean section history, gestational age, onset of labor, and fetal presentation.[5] This classification system has gained widespread acceptance due to its simplicity, reproducibility, and clinical relevance.

Robson's ten-group classification system divides all pregnant women into ten mutually exclusive groups based on these obstetric characteristics. Group 1 includes nulliparous women with singleton pregnancies in cephalic presentation at term with spontaneous labor onset. Group 2 comprises nulliparous women with singleton pregnancies in cephalic presentation at term who either have induced labor or caesarean section before labor. Groups 3 and 4 represent the multiparous equivalents of Groups 1 and 2, respectively, excluding women with previous caesarean sections. Group 5 includes all women with previous caesarean sections, singleton pregnancies in cephalic presentation at term. Groups 6 and 7 encompass nulliparous and multiparous women respectively with singleton breech presentations, while Group 8 includes all women with multiple pregnancies. Group 9 covers women with singleton pregnancies in transverse or oblique lie, and Group 10 includes women with singleton cephalic presentations delivered before 37 weeks of gestation.[6] The World Health Organization formally endorsed Robson's classification system in 2015 as the international standard for assessing, monitoring, and comparing caesarean section rates within and between healthcare facilities over time.[7] This endorsement was based on its ability to facilitate meaningful comparisons, identify specific groups contributing most to overall caesarean section rates, and enable targeted quality improvement initiatives. Implementation of Robson's classification system has revealed consistent patterns across different healthcare settings and geographical regions. Typically, Groups 1, 2, and 5 contribute the largest proportions to overall caesarean section rates, though their relative contributions vary depending on the specific population and healthcare setting. Group 5, comprising women with previous caesarean sections, often represents the single largest contributor to caesarean section rates in many institutions, highlighting the importance of primary caesarean section prevention and promotion of vaginal birth after caesarean section.[8]

Tertiary care centers face unique challenges in managing caesarean section rates due to their role in caring for high-risk pregnancies and complex obstetric cases. These institutions often serve as referral centers for complicated pregnancies, preterm deliveries, and cases requiring specialized expertise, which naturally leads to higher caesarean section rates compared to primary or secondary care facilities.[9]

The present study was designed to analyze caesarean section patterns at our tertiary care institution using Robson's ten-group classification system. By systematically categorizing all deliveries according to this standardized framework, we aimed to identify the groups contributing most significantly to our overall caesarean section rate and characterize the indications driving caesarean section decisions across different obstetric populations.

**Aims and Objectives**

The primary aim of this study was to analyze the distribution and pattern of caesarean section deliveries at our tertiary care center using Robson's ten-group classification system. The study sought to determine the overall caesarean section rate and identify which specific groups within the classification system contributed most significantly to the total number of caesarean sections performed.

The secondary objectives included characterization of the demographic and clinical characteristics of women across all ten Robson groups, analysis of group-specific caesarean section rates to identify groups with disproportionately high caesarean section rates, and systematic documentation of the primary indications for caesarean section across different groups. The study also aimed to evaluate the appropriateness of caesarean section indications according to established clinical guidelines and

identify potential areas for quality improvement initiatives.

## Materials and Methods

**Study Design and Setting:** This prospective cross-sectional study was conducted in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital over a three-month period from January 2025 to March 2025. The hospital serves as a referral center for high-risk pregnancies and complicated obstetric cases from the surrounding region. The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

**Sample Size and Study Population:** The study included 430 pregnant women admitted to the labor and delivery unit with gestational age ≥28 weeks. All women were included regardless of the mode of delivery, parity, gestational age at delivery, or pregnancy complications. Women who declined to participate in the study or those with incomplete medical records that prevented accurate classification according to Robson's system were excluded.

**Data Collection Methodology:** A structured data collection form was designed to capture all variables necessary for Robson classification along with additional demographic and clinical parameters. Trained research personnel collected data prospectively from medical records, direct patient interviews, and clinical observations.

The data collection process was standardized to ensure consistency and minimize inter-observer variability. For each participant, the following information was systematically recorded: maternal age, parity, gestational age at delivery determined by last menstrual period and confirmed by early ultrasound, previous caesarean section history, onset of labor (spontaneous, induced, or pre-labor caesarean section), fetal presentation determined by clinical examination and ultrasound, number of fetuses, and mode of delivery. Additional clinical data included indications for caesarean section when applicable, maternal complications, and neonatal outcomes.

**Robson Classification Methodology:** All women were classified into one of the ten mutually exclusive groups according to Robson's classification system based on five basic obstetric characteristics. The classification was performed at the time of admission to the labor ward to ensure accurate group assignment based on the clinical situation at that time rather than retrospective classification that might be influenced by delivery outcomes.

**Statistical Analysis:** Statistical analysis was performed using SPSS version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics. The size of each Robson group was calculated as a percentage of the total study population. Group-specific caesarean section rates were calculated by dividing the number of caesarean sections in each group by the total number of women in that group. The relative contribution of each group to the overall caesarean section rate was calculated by dividing the number of caesarean sections in each group by the total number of caesarean sections performed. Chi-square tests were used to compare categorical variables between groups. Statistical significance was set at $p<0.05$ for all analyses.

## Results

During the three-month study period, a total of 430 women delivered at our institution and met the inclusion criteria. The overall caesarean section rate was 56.3% (242/430), with 188 women (43.7%) delivering vaginally. The mean maternal age was 26.8 ± 4.2 years, with ages ranging from 18 to 38 years. Nulliparous women comprised 48.8% (210/430) of the study population, while multiparous women accounted for 51.2% (220/430).

**Distribution Across Robson Groups:** The distribution of women across Robson groups showed significant variation in group sizes. Group I was the largest, comprising 25.6% (110/430) of all deliveries, followed by Group III at 21.4% (92/430) and Group V at 16.3% (70/430). Group X represented 11.2% (48/430) of deliveries. The smaller groups included Group II with 9.8% (42/430), Group IV with 6.0% (26/430), Group VI with 4.2% (18/430), Group VIII with 2.3% (10/430), Group VII with 1.9% (8/430), and Group IX with 1.4% (6/430).

**Group-Specific Caesarean Section Rates and Contributions:** Group-specific caesarean section rates varied considerably across the ten groups. Groups V, VI, VII, VIII, and IX all demonstrated 100% caesarean section rates. Group II had a caesarean section rate of 71.4% (30/42), while Group X showed 62.5% (30/48) and Group IV 61.5% (16/26). Group I had a caesarean section rate of 36.4% (40/110), while Group III had the lowest at 15.2% (14/92).

**Contribution to Overall Caesarean Section Rate:** Analysis of the relative contribution of each Robson group to the overall caesarean section rate revealed that Group V contributed the highest proportion at 28.9% (70/242) of all caesarean sections, despite comprising only 16.3% of the total population. This finding underscores the significant impact of previous caesarean section on current delivery mode. Group I contributed 16.5% (40/242) of caesarean sections while representing 25.6% of all deliveries. Groups II and X each accounted for

12.4% (30/242) of caesarean sections. Groups V, I, and II collectively contributed 57.8% (140/242) of all caesarean sections performed during the study period. The remaining groups showed the following contributions: Group VI 7.4% (18/242), Group IV 6.6% (16/242), Group III 5.8% (14/242), Group VIII 4.1% (10/242), Group VII 3.3% (8/242), and Group IX 2.5% (6/242).

**Table 1: Distribution of Study Population Across Robson Groups**

| Robson Group | Description | Number (n) | CS performed | Percentage (%) | CS Rate (%) | CS Contribution (%) |
|---|---|---|---|---|---|---|
| I | Nullipara, singleton, cephalic, ≥37w, spontaneous | 110 | 40 | 25.6 | 36.4 | 16.5 |
| II | Nullipara, singleton, cephalic, ≥37w, induced/pre-labor CS | 42 | 30 | 9.8 | 71.4 | 12.4 |
| III | Multipara, singleton, cephalic, ≥37w, spontaneous | 92 | 14 | 21.4 | 15.2 | 5.8 |
| IV | Multipara, singleton, cephalic, ≥37w, induced/pre-labor CS | 26 | 16 | 6.0 | 61.5 | 6.6 |
| V | Previous CS, singleton, cephalic, ≥37w | 70 | 70 | 16.3 | 100.0 | 28.9 |
| VI | Nullipara, singleton, breech | 18 | 18 | 4.2 | 100.0 | 7.4 |
| VII | Multipara, singleton, breech | 8 | 8 | 1.9 | 100.0 | 3.3 |
| VIII | Multiple pregnancy | 10 | 10 | 2.3 | 100.0 | 4.1 |
| IX | Singleton, abnormal lie | 6 | 6 | 1.4 | 100.0 | 2.5 |
| X | Singleton, cephalic, <37w | 48 | 30 | 11.2 | 62.5 | 12.4 |
| Total | | 430 | 242 | 100.0 | 56.3 | 100.0 |

**Table 2: Demographic and Clinical Characteristics by Delivery Mode**

| Characteristic | Caesarean Section (n=242) | Vaginal Delivery (n=188) | p-value |
|---|---|---|---|
| Maternal Age (years) | | | |
| Mean ± SD | 27.2 ± 4.4 | 26.3 ± 3.9 | 0.12 |
| <20 years, n (%) | 18 (7.4) | 20 (10.6) | 0.34 |
| 20-29 years, n (%) | 162 (66.9) | 134 (71.3) | |
| ≥30 years, n (%) | 62 (25.6) | 34 (18.1) | |
| Parity | | | |
| Nullipara, n (%) | 126 (52.1) | 84 (44.7) | 0.29 |
| Multipara, n (%) | 116 (47.9) | 104 (55.3) | |
| Gestational Age | | | |
| Mean ± SD | 38.0 ± 2.3 | 38.4 ± 1.8 | 0.18 |
| Preterm (<37w), n (%) | 30 (12.4) | 18 (9.6) | 0.38 |
| Term (≥37w), n (%) | 212 (87.6) | 170 (90.4) | |
| Previous CS | | | |
| Yes, n (%) | 70 (28.9) | 0 (0.0) | <0.001 |
| No, n (%) | 172 (71.1) | 188 (100.0) | |

**Table 3: Indications for Caesarean Section by Category**

| Indication | Primary CS (n=172) | Repeat CS (n=70) | Total (n=242) |
|---|---|---|---|
| | n (%) | n (%) | n (%) |
| Previous Caesarean Section | 0 (0.0) | 70 (100.0) | 70 (28.9) |
| Fetal Distress | 54 (31.4) | 0 (0.0) | 54 (22.3) |
| Failure to Progress | 46 (26.7) | 0 (0.0) | 46 (19.0) |
| Malpresentation | 32 (18.6) | 0 (0.0) | 32 (13.2) |
| Cephalopelvic Disproportion | 22 (12.8) | 0 (0.0) | 22 (9.1) |
| Severe Preeclampsia | 16 (9.3) | 0 (0.0) | 16 (6.6) |
| Antepartum Hemorrhage | 14 (8.1) | 0 (0.0) | 14 (5.8) |
| Multiple Pregnancy | 10 (5.8) | 0 (0.0) | 10 (4.1) |
| Others | 14 (8.1) | 0 (0.0) | 14 (5.8) |

Note: Some cases had multiple indications

**Table 4: Labor Outcomes by Robson Group**

| Group | Total Deliveries | Vaginal Delivery | Caesarean Section |
|---|---|---|---|
| | N | n (%) | n (%) |
| I | 110 | 70 (63.6) | 40 (36.4) |
| II | 42 | 12 (28.6) | 30 (71.4) |
| III | 92 | 78 (84.8) | 14 (15.2) |
| IV | 26 | 10 (38.5) | 16 (61.5) |
| V | 70 | 0 (0.0) | 70 (100.0) |
| VI | 18 | 0 (0.0) | 18 (100.0) |
| VII | 8 | 0 (0.0) | 8 (100.0) |
| VIII | 10 | 0 (0.0) | 10 (100.0) |
| IX | 6 | 0 (0.0) | 6 (100.0) |
| X | 48 | 18 (37.5) | 30 (62.5) |
| Total | 430 | 188 (43.7) | 242 (56.3) |

**Table 5: Maternal and Neonatal Outcomes by Delivery Mode**

| Outcome | Caesarean Section (n=242) | Vaginal Delivery (n=188) | p-value |
|---|---|---|---|
| Maternal Outcomes | | | |
| Postpartum hemorrhage, n (%) | 18 (7.4) | 6 (3.2) | 0.18 |
| Wound infection, n (%) | 11 (4.5) | 0 (0.0) | 0.004 |
| Hospital stay >3 days, n (%) | 191 (78.9) | 22 (11.7) | <0.001 |
| Blood transfusion, n (%) | 7 (2.9) | 2 (1.1) | 0.36 |
| Neonatal Outcomes | | | |
| Birth weight (grams), mean ± SD | 2,847 ± 542 | 3,021 ± 438 | 0.008 |
| Apgar score <7 at 5 min, n (%) | 26 (10.7) | 11 (5.9) | 0.21 |
| NICU admission, n (%) | 39 (16.1) | 15 (8.0) | 0.07 |
| Neonatal mortality, n (%) | 4 (1.7) | 2 (1.1) | 0.58 |

**Table 6: Group V Characteristics (All Elective Repeat CS)**

| Characteristic | Group V (n=70) |
|---|---|
| Maternal Age (years), Mean ± SD | 28.7 ± 4.0 |
| Previous CS Indication | |
| Non-recurrent, n (%) | 42 (60.0) |
| Recurrent, n (%) | 28 (40.0) |
| Management Approach | |
| Elective repeat CS, n (%) | 70 (100.0) |
| Attempted TOLAC, n (%) | 0 (0.0) |
| Successful VBAC, n (%) | 0 (0.0) |
| Interpregnancy Interval | |
| <18 months, n (%) | 20 (28.6) |
| ≥18 months, n (%) | 50 (71.4) |

**Indications for Caesarean Section:** Among the 242 caesarean sections performed, previous caesarean section was the leading indication, accounting for all 70 cases in Group V (28.9% of total caesarean sections).

Among the 172 primary caesarean sections, fetal distress was the most common indication at 31.4% (54/172), followed by failure to progress at 26.7% (46/172). Malpresentation accounted for 18.6% (32/172) of primary caesarean sections, including all cases in Groups VI, VII, and IX. Cephalopelvic disproportion was documented in 12.8% (22/172) of primary cases.

## Discussion

The present study analyzed caesarean section patterns at our tertiary care institution using Robson's ten-group classification system over a three-month period. The overall caesarean section rate of 56.3% observed in our study significantly exceeds both the World Health Organization's recommended threshold of 10-15% and rates reported by many other tertiary care centers.[11] This elevated rate warrants immediate attention and targeted interventions to optimize caesarean section utilization while maintaining maternal and neonatal safety.

The distribution of deliveries across Robson groups in our study showed patterns both consistent with

and divergent from published literature. Group I (nulliparous women with singleton, cephalic, term pregnancies in spontaneous labor) comprised the largest proportion of our population at 25.6%, which aligns with findings from Betran et al., who reported Group I typically accounting for 20-35% of deliveries in most healthcare settings.[12] The caesarean section rate of 36.4% in Group I is within the range reported by other tertiary care centers in developing countries, though significantly higher than the 10-15% reported in studies from developed countries with established labor management protocols.[13]

Group V (women with previous caesarean sections) demonstrated the most striking finding, with a 100% caesarean section rate and contributing 28.9% to the overall caesarean section rate despite representing only 16.3% of the total population. This complete absence of vaginal birth after caesarean section (VBAC) differs markedly from international standards, where VBAC success rates of 60-80% are reported in optimal settings.[14] This finding strongly suggests either an institutional policy of routine repeat caesarean section or absence of protocols for trial of labor after caesarean section.

The 100% caesarean section rate in Group V represents a critical missed opportunity for reducing overall caesarean section rates. The American College of Obstetricians and Gynecologists and similar international bodies have emphasized that VBAC can be safely offered to many women with one previous caesarean section, particularly those with a prior low transverse incision and no contraindications.[15] Even achieving a modest 30% VBAC rate in our Group V population could reduce the overall caesarean section rate by approximately 3.5 percentage points.

Groups VI through IX also showed 100% caesarean section rates, which is expected for Groups VI, VII (breech presentations), and IX (abnormal lie). However, the 100% rate for Group VIII (multiple pregnancies) suggests a policy of routine caesarean section for twins, which may not always be necessary if the leading twin is in cephalic presentation. Current evidence supports vaginal delivery for selected twin pregnancies, particularly when both twins are in favorable positions.[16]

The collective contribution of Groups V, I, and II to 57.8% of all caesarean sections mirrors patterns observed in other studies. Vogel et al., in their analysis of 21 countries, found these three groups consistently represented the largest contributors to caesarean section rates across different healthcare settings.[17] This consistency suggests that interventions targeting these specific groups could have the greatest impact on overall caesarean section rate reduction.

Group II showed a caesarean section rate of 71.4%, indicating that induction of labor in nulliparous women is associated with increased caesarean section risk at our institution. This finding is consistent with studies showing higher caesarean section rates with induction compared to spontaneous labor, particularly in nulliparous women with unfavorable cervical conditions.[18] Implementation of evidence-based induction protocols, including appropriate use of cervical ripening agents and patience with the induction process, could potentially reduce caesarean sections in this group.

The relatively low caesarean section rate of 15.2% in Group III (multiparous women without previous caesarean sections in spontaneous labor) is reassuring and consistent with expected patterns for this low-risk group. This demonstrates that our institution can achieve appropriate low intervention rates in suitable populations, suggesting that system-level factors rather than inherent institutional culture may be driving high caesarean section rates in other groups.

Group X (preterm deliveries) showed a caesarean section rate of 62.5%, which is higher than some centers but reflects the complex decision-making involved in preterm deliveries. The specific indications and outcomes in this group warrant further analysis to ensure appropriate balance between maternal and neonatal considerations.[19]

The indications for primary caesarean section in our study, with fetal distress leading at 31.4%, suggest potential overdiagnosis or misinterpretation of fetal heart rate patterns. Studies have shown that continuous electronic fetal monitoring increases caesarean section rates without improving neonatal outcomes in low-risk populations.[20] Implementation of standardized fetal heart rate interpretation guidelines and consideration of intermittent auscultation for low-risk women could reduce unnecessary interventions.

The high overall caesarean section rate at our institution has important implications for maternal morbidity, healthcare costs, and future pregnancy outcomes. Women who undergo caesarean section face increased risks of surgical complications, longer recovery periods, and complications in subsequent pregnancies including placenta previa, placenta accreta spectrum disorders, and uterine rupture.[21] The economic burden of maintaining a 56.3% caesarean section rate includes increased operating theater utilization, longer hospital stays, and higher overall healthcare costs.

### Recommendations for Quality Improvement

Based on our findings, several targeted interventions could significantly reduce caesarean section rates:

1. **Establish a comprehensive VBAC program**: Developing protocols for trial of labor after caesarean section, including patient selection criteria, counseling procedures, and labor management guidelines, could dramatically impact Group V contribution to caesarean sections.
2. **Optimize primary caesarean section rates**: Implementation of evidence-based labor management protocols for Group I, including standardized criteria for diagnosing labor dystocia, appropriate use of oxytocin augmentation, and continuous labor support.
3. **Improve induction practices**: For Group II, careful selection of candidates for induction, use of cervical ripening agents when appropriate, and patience with the induction process could reduce caesarean sections.
4. **Standardize fetal monitoring interpretation**: Development and implementation of guidelines for fetal heart rate interpretation and appropriate use of intrauterine resuscitation techniques.
5. **Regular audit and feedback**: Implementation of monthly reviews using Robson's classification to track progress and identify areas needing additional intervention.

**Study Limitations:** Several limitations of our study should be acknowledged. The relatively short study period of three months may not capture seasonal variations in delivery patterns. The sample size of 430, while providing useful insights, resulted in small numbers in some Robson groups, limiting the precision of estimates. The single-center design may limit generalizability to other healthcare settings. Additionally, the study did not capture detailed information about specific labor management practices or long-term maternal and neonatal outcomes.

### Conclusion

This study successfully implemented Robson's ten-group classification system to analyze caesarean section patterns at our tertiary care institution, revealing an overall caesarean section rate of 56.3%. The analysis identified Groups V, I, and II as the major contributors to caesarean section rates, collectively accounting for 57.8% of all caesarean procedures. The complete absence of vaginal birth after caesarean section, with Group V showing a 100% caesarean section rate and contributing 28.9% to the overall rate, represents the most significant opportunity for intervention.

The findings demonstrate urgent need for caesarean section rate optimization through targeted interventions. Priority strategies should include establishing a comprehensive VBAC program, implementing evidence-based protocols for labor management in nulliparous women, optimizing induction practices, and standardizing criteria for common caesarean section indications. The potential impact is substantial - even modest improvements in VBAC rates and primary caesarean section prevention could reduce the overall caesarean section rate by 10-15 percentage points. The study confirms the value of Robson's classification system as a practical tool for ongoing quality improvement in obstetric practice. Regular implementation of this classification system should become standard practice to facilitate systematic monitoring of caesarean section trends, enable meaningful comparisons with other institutions, and guide the development of evidence-based interventions. Immediate action is warranted to address the exceptionally high caesarean section rate and work toward achieving a balance between maternal autonomy, clinical safety, and optimal resource utilization.

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