Original Article

Trend analysis of caesarean sections using modified Robson's classification in a teaching institution in Uttarakhand

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Abstract

Background: Globally, the rising caesarean section (CS) rate is of great concern as it is associated with increased maternal morbidity and mortality in subsequent pregnancies. It is essential to reanalyze the CS trend and curb the rising menace using a standardized uniform auditing system. This study aimed to analyze and evaluate the trend of CS using Modified Robson's Ten Group classification system (RTGCS) in a teaching institution in Uttarakhand. **Methodology:** This cross-sectional study from October 2022 to March 2023 included 260 women undergoing elective or emergency CS. Data on maternal demographics, obstetrics, labour, and fetal outcomes were recorded. Indications for CS were analyzed using modified RTGCS. **Results:** The overall CS rate for the study period at our hospital was 31.4%. The major contributors to CS were Group 2 (21.5%), Group 10 (21.5%), and Group 5 (20.7%), while Group 6 and Group 8 contributed 10% and 7.6%, respectively. Group 9 had the least share (1%) in the study population. The two main indications for which CS was performed were prior Lower Section Caesarean Section (LSCS) and fetal distress, contributing to 24.6% and 19.2%, respectively. CS for breech presentation was done in 16% of the total cases. **Conclusion:** Modified RTGCS is an easy and effective method for auditing CS, preventing unnecessary procedures, and improving maternal care. Its implementation is crucial in addressing the increasing prevalence of CS and ensuring better maternal and fetal outcomes.

Keywords: Audit, caesarean section, maternal morbidity, maternal mortality, Robson classification system

Introduction

Caesarean section (CS) is a commonly performed and safe operation carried out by obstetricians. However, there has been a global increase in the rate of CS in recent years.[1,2] Unfortunately, not all CS is performed for obstetrical indications. There has been a rapid increase in CS for nonmedical indications including CS on maternal request.[3]

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This rise in CS rates can be attributed to various factors. Some mothers request CS due to anxiety or fear of vaginal delivery (VD) or a desire to schedule the birth on a specific day (religious sentiments).[1] Furthermore, certain doctors may tend to favour CS due to personal preferences.[3,4] Sociocultural and religious factors also play a role in influencing or discouraging mothers from requesting CS in certain societies.[5] Furthermore, the fear of legal consequences and lawsuits related to complications during VD is a significant factor that influences doctors to choose CS as a safe measure, leading to more CS deliveries.[6] The practice of "once a caesarean, always a caesarean" is also prevalent in some centres.[7] Women belonging to higher socioeconomic strata, living in urban areas, and having a higher level of education have a higher incidence of CS compared to their counterparts. On the

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other hand, there is a lack of adequate manpower, equipment, and appropriate healthcare facilities in rural areas, leading to increased maternal morbidity and mortality rates. Variations in the institutional rates of CS exist due to inherent differences in patient characteristics, types of institutions, obstetric practices, pregnancy and labour management protocols, and available resources.

This upward trend in CS rates raises concerns due to the associated short-term and long-term maternal morbidity and mortality risks.[8] These risks include a higher likelihood of postpartum haemorrhage, blood transfusion, longer hospital stays, and postpartum infections. Furthermore, there are potential long-term complications such as obstetrical fistulas and placenta accreta spectrum (PAS) in subsequent pregnancies. The most dreaded complication of CS is the development of PAS in a subsequent pregnancy, which can lead to severe maternal haemorrhage with maternal mortality rates ranging from 20% to 50%.

In 1985, the World Health Organization (WHO) set a guideline stating that the CS rate should not exceed 10–15% in any region reflecting concerns over the rising CS rates.[9] However, even after the WHO guidelines were established, there is still no consensus on the optimal CS rate, and the appropriate interpretation of this indicator remains a topic of debate. In 2015, the WHO proposed the use of the Robson Ten-Group Classification System (RTGCS)[10] as a global standard for assessing, monitoring, and comparing CS rates within and between healthcare facilities.[11] It classifies all CS deliveries according to parity (nullipara, multiparity), previous CS, onset of labour, fetal presentation, number of fetuses, and gestational age. The WHO expects that this classification will assist healthcare facilities in several ways. It will allow them to compare their practices with more successful units, consider practice changes, assess the effectiveness of strategies or interventions for optimizing CS usage, and evaluate the quality of care and clinical management practices by analyzing outcomes among different groups of women. The present study aimed to analyze and evaluate the trend of CS using the RTGCS at a teaching institution in a sub-Himalayan city in Uttarakhand.

Methods

This cross-sectional study was conducted at a teaching institution that handles approximately 1,500 annual deliveries and serves as a referral center for high-risk cases. The study was conducted after obtaining approval from the institutional ethical committee clearance, spanning over six months from October 2022 to March 2023. The study included 260 participants who underwent a CS in the hospital during the specified study period. Written informed consent was obtained from all study participants. Exclusion criteria for the study included participants who had laparotomy for a ruptured uterus, deliveries before the period of viability, or those with missing records.

Data were collected using a prestructured case performance form from the medical case records of study participants. Information about maternal demographic characteristics, obstetrical history (gravidity, parity, number of previous CS), labour characteristics (gestational age at delivery, type of labour, fetal presentation, number of fetuses), caesarean characteristics (elective or emergency, indication for CS), and fetal outcomes (APGAR score at five minutes, birth weight) were recorded.

RTGCS, based on four obstetric parameters (category of pregnancy, previous obstetric history, course of labour, gestational age), was used to audit the CS. We used the modification[12] of RTGCS as per the Society of Obstetricians and Gynaecologists of Canada for our study [Table 1].

Each study participant was assigned a specific group based on these parameters. Data obtained from the study were subsequently entered into the Statistical Package for the Social Sciences software, version 23. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to present the results of the analysis.

Table 1: Modified Robson's Ten Group classification system[12]

Group	Characteristics
1	Nullipara, singleton cephalic, ≥7 weeks, spontaneous labour
2	Nullipara, singleton cephalic, ≥37 weeks A: Induced B: Caesarean section before labour
3	Multipara, singleton cephalic, ≥37 weeks, spontaneous labour
4	Multipara, singleton cephalic, ≥37 weeks A: Induced B: Caesarean section before labour
5	Previous Caesarean section, singleton cephalic, ≥37 weeks A: Spontaneous labour B: Induced labour C: Caesarean section before labour
6	All nulliparous breeches A: Spontaneous labour B: Induced labour C: Caesarean section before labour
7	All multiparous breeches (including previous Caesarean section) A: Spontaneous labour B: Induced labour C: Caesarean section before labour
8	All multiple pregnancies (including previous Caesarean section) A: Spontaneous labour B: Induced labour C: Caesarean section before labour
9	All abnormal lies (including previous Caesarean section but excluding breech) A: Spontaneous labour B: Induced labour C: Caesarean section before labour
10	All singleton cephalic, ≤36 weeks (including previous Caesarean section) A: Spontaneous labour B: Induced labour C: Caesarean section before labour

Results

During the study period, a total of 827 deliveries occurred at our institution, out of which 260 were CS, resulting in a CS rate of 31.4%. Table 2 presents the demographic and obstetrical characteristics of the study participants. The mean age of the participants was 29.3 ± 4.7 years, with the majority of women (231, 88.8%) falling within the 20–35 years age group. The majority of women who delivered at our institution were booked patients ($n = 176$, 67.7%). Among the study participants, 125 women (48%) were primigravida, while 135 women (51.9%) were multigravida. The majority of women (179, 68.8%) delivered between 37 and 42 weeks of gestation, while preterm CS (<37 weeks) was performed in one-third of cases (81, 31.1%).

A notable finding was that about two-thirds, 169 cases (65%), were of primary CS, while one-third of the cases had a history of prior CS, with 74 women (28.4%) having a history of one prior CS, and 17 women (6.5%) having multiple prior CS. Approximately one-fourth of the total cases (59, 22.7%) were elective CS, while the majority were emergency CS. Pre-labour CS was performed in 115 women (44.2%), while labour induction was carried out in one-fourth of 67 women (25.6%).

Table 3 displays the distribution of CS deliveries according to the modified RTGCS. The most common groups to which the majority of CS were assigned were Group 2 (56, 21.5%), Group 10 (56, 21.5%), and Group 5 (54, 20.7%). Combining Group 1 and Group 2, which includes nulliparous women with a gestational age over 37 weeks, accounted for approximately one-third of all CS (74, 28.4%). Subgroup analysis of this group revealed that Group 2A (induced labour) contributed to 15% (41) of all cases. The second most common group was Group 10, which included singleton pregnancies less than 37 weeks of gestation (56, 21.5%). Within this group, prelabour CS (Group 10C) accounted for 14.2% of all CS cases. The third most common category of CS was Group 5, which included singleton pregnancies with a prior CS (54, 20.7%), where the majority 31 (11.9%) of the total were prelabour CS (Group 5C). Group 6, representing nulliparous term breech deliveries, accounted for 10% of all CS ($n = 27$), while Group 8, comprising multiple pregnancies, contributed to 7.6% ($n = 20$) of the total CS.

Table 4 provides an overview of the indications for CS deliveries. The most common indication for CS was a prior CS, contributing to one-fourth (24.6%) of all cases ($n = 64$), followed by fetal distress, which accounted for 19.2% ($n = 50$). The breech presentation was the indication for CS in 16.1% of all cases ($n = 42$).

Table 2: Obstetric characteristics of the study participants

Characteristics	Numbers (%)
Age	
<20 years	2 (0.76%)
20–35 years	231 (88.84%)
35 years	27 (10.38%)
Gravida	
Primigravida	125 (48.07%)
Multigravida	135 (51.92%)
Parity	
Nulliparous	139 (53.46%)
Multiparous	121 (46.53%)
Previous LSCS	
None	169 (65%)
1	74 (28.46%)
>1	17 (6.53%)
Gestational age at delivery	
<37 weeks (Preterm)	81 (31.15%)
37-42 weeks (term)	179 (68.85%)
>42 weeks (post-term)	0 (0%)
Onset of labour	
Spontaneous	78 (30%)
Induction	67 (25.67%)
Prelabour	115 (44.23%)
Fetal presentation	
Cephalic	205 (78.8%)
Breech	52 (20%)
Transverse	3 (1.2%)
Caesarean section	
Elective	59 (22.7%)
Emergency	201 (77.3)
APGAR score	
>7	242 (93.07%)
<7	18 (6.93%)
Birth weight	
<2500	89 (34.23%)
2500–3500	148 (56.92%)
>3500	23 (8.84%)

Discussion

The absence of a standardized classification system for CS hinders meaningful comparisons across healthcare facilities, regions, and

Table 3: Distribution of Caesarean section as per Robson classification system

Robson class	Number of LSCS	Percentages
1	18	6.92%
2A	41	15.77%
2B	15	5.77%
3	4	1.54%
4A	4	1.54%
4B	3	1.15%
5A	13	5.00%
5B	10	3.85%
5C	31	11.92%
6A	13	5.00%
6C	14	5.38%
7A	9	3.46%
7C	6	2.31%
8A	11	4.23%
8C	9	3.46%
9A	1	0.38%
9C	2	0.77%
10A	10	3.85%
10B	9	3.46%
10C	37	14.23%

Table 4: Indications of caesarean section

Indication of LSCS	Number (*n*)	Percentage
Previous LSCS	64	24.6%
Fetal distress	50	19.2%
Breech presentation	42	16.2%
Others	27	10.4%
Arrest of labour	26	10.0%
Multiple pregnancies	19	7.3%
MSL in early labour	14	5.4%
Placenta praevia	12	4.6%
CDMR	6	2.3%

countries. Following a systematic review conducted in 2011 to identify different CS classification systems, RTGCS was found to be the best option. The RTGCS categorizes women into ten groups based on key obstetric characteristics. WHO recognized the RTGCS as the most suitable system and recommended its development for international use.[13] It is simple, robust, and applicable prospectively to all women admitted for delivery. In 2014, the WHO conducted a comprehensive review of the user experience with the RTGCS. A panel of experts convened in Geneva to assess its adoption, implementation, and interpretation, as well as identify potential barriers and facilitators. The panel made key recommendations: Healthcare facilities should universally use the Robson classification system for women admitted for delivery, allowing for further analysis of variables based on local needs. Additionally, they emphasized the importance of publicly reporting classification results, where feasible, to enhance transparency and data utilization.[11] This review article presents the adoption, implementation, and interpretation of RTGCS for CS which is being increasingly used worldwide.

The WHO has endorsed an institutional CS rate of 10–15% to ensure a balance between the risks and benefits of CS. The CS rate serves as a significant indicator of obstetric practice and maternal health outcomes. In this study, the CS rate at our institution was found to be 31.4%, falling within the reported range of CS rates in similar settings. Recognizing that the ideal CS rate remains a subject of ongoing debate, it is essential to strike a careful balance between providing necessary interventions and minimizing potential risks associated with surgical delivery. Therefore, conducting a critical evaluation of the CS practices at our institution becomes paramount to identify possible areas of improvement and work towards reducing the overall CS rate.

The current study's results reveal intriguing trends in gravidity and gestational age. Nearly half of the participants were primigravida, underscoring the importance of providing suitable care and support for first-time mothers. Most deliveries took place within the expected full-term gestational age range of 37-42 weeks, which is consistent with normal childbirth timing. However, a noteworthy percentage of cases involved preterm CS, emphasizing the necessity for in-depth exploration into the underlying reasons and potential interventions to decrease the occurrence of preterm CS deliveries. A significant observation in this study is the prevalence of prior CS among the participants. Approximately one-third of the cases had a history of a previous CS, and a substantial proportion had experienced multiple previous CS. This underscores the significance of managing previous CS deliveries appropriately and understanding their potential influence on subsequent birth choices.

The distribution of CS deliveries according to the RTGCS provides a comprehensive overview of the indications and categories of CS. The most common groups observed in our study were Group 2, Group 10, and Group 5, which encompassed various obstetric conditions and factors. Combining Group 1 and Group 2, which involve nulliparous women with a gestational age greater than 37 weeks, accounted for a substantial proportion of all CS. Subgroup analysis within this group revealed a significant proportion were induced labour, suggesting the need for further exploration of the factors contributing to the decision for induction and potential areas for intervention. These women are at higher risk of requiring repeat CS in subsequent pregnancies. Group 10, which contributed to the second most common category of CS (21.5%), consisted of preterm singleton pregnancies where the majority of cases involved prelabour CS. This is primarily due to our institution being a tertiary care center, which often receives referred cases with complications such as hypertensive disorders of pregnancy, severe fetal growth restriction, preterm premature rupture of membranes, preterm labour, oligohydramnios, or fetal distress. Prelabour CS performed in this group also predisposes women to future CS due to increased risks of scar dehiscence/rupture. Group 5, which included singleton pregnancies with a prior history of CS, accounted for a significant proportion (20.7%) of all CS and was the third most common category. Prelabour elective CS was performed in this group due to either refusal of a trial of labour after caesarean (TOLAC) or a lower threshold for CS in the group.

The study also identified common indications for CS deliveries [Table 3]. Prior CS emerged as the most frequent indication, followed by fetal distress and breech presentation. Other indications included the arrest of labour, multiple pregnancies, meconium-stained liquor in early labour, and placenta previa. These findings emphasize the importance of appropriate antenatal counseling for women with previous CS regarding the mode of delivery. Women and their relatives should be informed about the success of the TOLAC in carefully selected cases. Spontaneous labour is a significant predictor of the success of the TOLAC, and women in spontaneous labour should be encouraged to opt for VD. Patients should be informed about the advantages of normal deliveries and VBAC (vaginal birth after caesarean) and encouraged to do the same during the antenatal period. The importance of antenatal exercises should be emphasized.

These days, intrapartum monitoring of the fetal heart is done electronically using cardiotocographic (CTG) tracings. Training residents and staff in labour management and CTG interpretation is essential. Additionally, it should be emphasized that not all cases of meconium-stained liquor and nonreassuring fetal heart in labour necessarily require CS. The use of oxytocin infusion pumps can aid in the correct titration of oxytocin and avoid hyperstimulation.

Appropriate application of instrumental deliveries in carefully selected cases of second-stage arrest disorders can reduce second-stage CS and associated morbidity. Techniques such as assisted breech deliveries and external cephalic versions in the antenatal period can also help reduce CS for breech presentation.

The study exhibits several strengths. Firstly, it encompasses a substantial number of deliveries, providing a comprehensive understanding of CS practices. Secondly, the utilization of the RTGCS ensures standardized and meaningful analysis of CS patterns. Thirdly, the inclusion of various demographic and obstetric characteristics offers valuable insights into factors associated with CS. Lastly, the findings shed light on specific groups where interventions can be targeted to optimize CS usage and promote safe vaginal deliveries.

However, certain limitations should be acknowledged. Firstly, the study did not delve into the underlying factors influencing the decision-making process for CS, such as provider or patient preferences. Secondly, the present study is a retrospective analysis relying on a medical record review, which may introduce incomplete or inaccurate documentation. Additionally, the study did not explore long-term maternal or neonatal outcomes associated with different CS groups.

This study offers valuable insights to primary care physicians regarding local childbirth preferences, common CS indications, and high-risk groups. This knowledge will assist them in conducting targeted antenatal counseling and closer monitoring for specific groups, such as nulliparous women over 37 weeks and preterm singleton pregnancies. By encouraging discussions on VBAC and emphasizing informed decision-making, they can contribute to initiatives aimed at improving CS practices and promoting safe deliveries and quality maternal care.

Conclusion

The study identified a CS rate of 31.4% among the 827 deliveries at the institution. Indications for CS included prior CS, fetal distress, and breech presentation. Implementing a standardized classification system like RTGCS allows targeted interventions in specific groups, such as nulliparous women with a gestational age over 37 weeks and preterm singleton pregnancies. Education and training in labour management and alternative techniques can help reduce unnecessary CS. Dissemination of classification results and promoting transparency aid in benchmarking and enhancing the quality of maternal and perinatal care.

Data availability

The data that support the findings of this study are contained in the published article.

Authors contribution

All named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship for this manuscript, take responsibility for the integrity of the work, and have given final approval for the version to be published.

Ethics approval

The study was approved by the institutional ethics committee.

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Conflicts of interest

There are no conflicts of interest.

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