



Original Article

Audit of Caesarean Section Rates Using the Robson Ten-Group Classification System in a Tertiary Care Referral Hospital: A Prospective Observational Study

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ABSTRACT

Background: The global rise in caesarean section (CS) rates has become a major public health concern due to its implications for maternal and neonatal outcomes. The Robson Ten-Group Classification System (TGCS), recommended by the World Health Organization, provides a standardized method for evaluating and comparing CS rates across healthcare settings and identifying groups contributing most to the overall CS burden.

Objective: To analyze caesarean section rates according to the Robson Ten-Group Classification System and identify the major indications for caesarean section within each Robson group in a tertiary care referral hospital.

Methods: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College and Dr. Sushila Tiwari Government Hospital, Haldwani, Uttarakhand, over a period of 18 months. All women delivering during the study period were classified according to the Robson Ten-Group Classification System. Caesarean section cases (n=1000) were further analysed to determine group-wise contribution and indications. The relative size of each group, contribution to overall caesarean section burden, and predominant indications were analyzed using descriptive statistics.

Results: Most women belonged to the 20–29-year age group, and 41.0% were primigravidae. Group 5 was the largest contributor to the overall caesarean section burden (32.4%), followed by Group 1 (24.7%), Group 10 (14.7%), and Group 2 (13.9%). Collectively, these four groups accounted for 85.7% of all caesarean sections. Non-progress of labour was the predominant indication in Group 1, while non-reassuring fetal heart rate was the leading indication in Group 2. Previous caesarean section was the dominant indication in Group 5, whereas abnormal Doppler findings/intrauterine growth restriction were the major indications in Group 10. Overall, previous caesarean section, non-reassuring fetal heart rate, non-progress of labour, and abnormal Doppler/IUGR were the most frequent indications for operative delivery.

Conclusion: The Robson TGCS effectively identified the obstetric groups contributing most to the institutional caesarean section burden. Group 5 remained the principal contributor, emphasizing the long-term impact of primary caesarean section. Strategies aimed at reducing unnecessary primary caesarean sections, promoting appropriately selected VBAC, and optimizing labour management may help achieve more rational use of caesarean delivery in tertiary care settings.

Keywords: Caesarean section; Robson classification; Ten-Group Classification System; Obstetric audit; Vaginal birth after caesarean; Tertiary care hospital; Maternal health.

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INTRODUCTION

Caesarean section (CS) is one of the most commonly performed surgical procedures worldwide and plays a crucial role in reducing maternal and neonatal morbidity and mortality when medically indicated. Over the past few decades, the global rate of caesarean delivery has increased substantially, rising from approximately 12% in 2000 to more than 21% in recent years, with projections suggesting a further increase by 2030 [1]. While appropriate use of CS can be life-saving in conditions such as obstructed labour, fetal distress, malpresentation, and antepartum haemorrhage, its excessive use has raised concerns regarding unnecessary maternal and neonatal risks, increased healthcare costs, and future obstetric complications [2-4].

India has also witnessed a marked rise in caesarean section rates. According to the National Family Health Survey-5 (NFHS-5), the national CS rate increased to 21.5%, with substantial variation between public and private healthcare sectors [5]. Similar trends have been reported across South Asia, highlighting the need for systematic evaluation of factors contributing to the increasing use of caesarean delivery [6]. However, overall institutional CS rates provide limited insight into the specific obstetric populations responsible for this increase.

To address this limitation, Robson introduced the Ten-Group Classification System (TGCS), which categorizes all women admitted for delivery into ten mutually exclusive and totally inclusive groups based on five obstetric characteristics: parity, previous caesarean section, onset of labour, fetal presentation, number of fetuses, and gestational age [7]. The system enables standardized assessment of caesarean section practices and facilitates meaningful comparison across institutions and populations. Recognizing its utility, the World Health Organization recommended TGCS as the global standard for monitoring and comparing caesarean section rates [8].

The present study was undertaken in a tertiary care referral hospital of the Kumaon region to analyse caesarean section rates using the Robson Ten-Group Classification System, identify the relative size of each Robson group, determine group-wise caesarean section rates and contribution to the overall caesarean section burden, and identify the common indications for caesarean section within each group. Such information may help formulate targeted strategies for optimizing caesarean section practices and improving maternal healthcare quality.

METHODOLOGY

Study Design and Setting: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College and Dr. Sushila Tiwari Government Hospital, Haldwani, Uttarakhand, a tertiary-care referral center.

Study Duration: The study was carried out over a period of 18 months (Sept 2024 to Mar 2026)

Study Population: All women who delivered at the study hospital during the study period and fulfilled the eligibility criteria were included in the study. Women were first classified into the Robson Ten-Group Classification System based on obstetric characteristics. Caesarean section cases were subsequently analysed for indication-wise distribution.

Inclusion Criteria

- All women with gestational age ≥ 28 weeks who delivered in the study hospital during the study period.

Exclusion Criteria

- Women with intrauterine fetal death (IUFD).
- Women with incomplete or missing clinical records.

Data Collection: Data were collected prospectively using a predesigned proforma from labour room records, operation theatre registers, antenatal records, and postnatal case sheets. Information regarding maternal age, parity, previous caesarean section, gestational age, onset of labour, fetal presentation, number of fetuses, mode of delivery, and indication for caesarean section was recorded.

Robson Ten-Group Classification: All eligible women were classified according to the Robson Ten-Group Classification System (TGCS), based on five obstetric characteristics: parity, previous caesarean section, onset of labour, fetal presentation, number of fetuses, and gestational age. Each woman was assigned to one mutually exclusive and totally inclusive Robson group.

Outcome Measures: The primary outcome was the caesarean section rate in each Robson group. Secondary outcomes included determination of the relative size of each Robson group, group-specific contribution to the overall caesarean section rate, and identification of the common indications for caesarean section within each group.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages. Relative group size, group-specific caesarean section rate, absolute contribution, and relative contribution were calculated according to WHO Robson TGCS guidelines.

Ethical Considerations: The study was approved by the Institutional Ethics Committee of Government Medical College and Dr. Sushila Tiwari Government Hospital, Haldwani. As the study was observational and based on routinely collected hospital data, no intervention was performed. Confidentiality and anonymity of participant information were maintained throughout the study.

RESULTS

During the study period, all eligible deliveries were classified according to the Robson Ten-Group Classification System. A total of 1000 caesarean sections were analysed. Most women belonged to the 20–29-year age group, and primigravidae constituted a substantial proportion of the study population. The majority of deliveries were singleton cephalic pregnancies, with a considerable proportion having a history of previous caesarean section (Table 1).

Table 1. Baseline maternal and obstetric characteristics of women undergoing caesarean section (n = 1000)

Characteristic	n (%)
Age 20–29 years	784 (78.4)
Primigravida	410 (41.0)
Gravida 2	334 (33.4)
Gravida ≥ 3	256 (25.6)
Previous caesarean section	377 (37.7)
Term pregnancy	848 (84.8)
Preterm pregnancy	152 (15.2)
Singleton pregnancy	988 (98.8)
Multiple pregnancy	12 (1.2)

The distribution of caesarean sections according to the Robson Ten-Group Classification System is presented in Table 2. Groups 5, 1, 10, and 2 accounted for the majority of caesarean deliveries.

Table 2. Distribution of caesarean sections according to Robson Ten-Group Classification System (n = 1000)

Robson Group	n (%)
Group 1	247 (24.7)
Group 2	139 (13.9)
Group 3	55 (5.5)
Group 4	20 (2.0)
Group 5	324 (32.4)
Group 6	27 (2.7)
Group 7	25 (2.5)
Group 8	12 (1.2)
Group 9	4 (0.4)
Group 10	147 (14.7)
Total	1000 (100.0)

As shown in Table 3, Group 5 was the largest contributor to the overall caesarean section burden, followed by Groups 1, 10, and 2. Together, these four groups accounted for more than four-fifths of all caesarean deliveries.

Table 3. Contribution of each Robson group to the overall caesarean section burden (n = 1000)

Rank	Robson Group	Contribution (%)
1	Group 5	32.4
2	Group 1	24.7
3	Group 10	14.7
4	Group 2	13.9
5	Group 3	5.5
6	Group 6	2.7
7	Group 7	2.5
8	Group 4	2.0
9	Group 8	1.2
10	Group 9	0.4

The pattern of indications varied considerably across Robson groups (Table 4). Labour abnormalities predominated in low-risk nulliparous groups, whereas repeat caesarean section was the major indication among women with previous uterine scar. Preterm caesarean sections were primarily associated with fetal compromise and abnormal Doppler findings.

Table 4. Major indications for caesarean section in high-contributing Robson groups

Robson Group	Predominant indications
Group 1	Non-progress of labour, non-reassuring fetal heart rate
Group 2	Non-reassuring fetal heart rate, non-progress of labour
Group 5	Previous caesarean section
Group 10	Abnormal Doppler/IUGR, non-reassuring fetal heart rate

The contribution of individual indications to the overall caesarean section burden is summarized in Table 5. Previous caesarean section represented the largest individual indication, although several obstetric indications contributed substantially to the overall caesarean section burden.

Table 5. Contribution of major indications to overall caesarean section burden (n = 1000)

Indication	n (%)
Previous caesarean section	185 (18.5)
Non-reassuring fetal heart rate	167 (16.7)
Non-progress of labour	157 (15.7)
Abnormal Doppler/IUGR	147 (14.7)
Severe oligohydramnios/anhydramnios	132 (13.2)
Cephalopelvic disproportion	112 (11.2)
Breech presentation	58 (5.8)
Placenta previa/abruption	38 (3.8)
Transverse/oblique lie	4 (0.4)

Previous caesarean section accounted for the largest proportion of indications, followed by non-progress of labour, non-reassuring fetal heart rate, and abnormal Doppler/IUGR.

A summary of the dominant indication within each major Robson group is shown in Table 6. Distinct indication profiles were observed across groups, reflecting differing obstetric risk characteristics.

Table 6. Dominant indication according to Robson group

Robson Group	Dominant indication
Group 1	Non-progress of labour
Group 2	Non-reassuring fetal heart rate
Group 3	Non-reassuring fetal heart rate
Group 4	Abnormal Doppler/IUGR
Group 5	Previous caesarean section
Group 10	Abnormal Doppler/IUGR

DISCUSSION

The present study utilized the Robson Ten-Group Classification System (TGCS) to evaluate caesarean section (CS) patterns in a tertiary care referral hospital. The Robson Ten-Group Classification System, recommended by the World Health Organization, has become the global standard for monitoring and comparing caesarean section rates because of its simplicity, reproducibility, and ability to identify the obstetric groups contributing most to institutional caesarean section rates [8].

In the present study, Group 5 emerged as the largest contributor to the overall CS burden. Similar findings have been reported by Shtainmetz et al. [9], El Radaf et al. [10], Thakur et al. [11], Hassan et al. [12], and Jadoon et al. [13], all of whom identified women with a previous caesarean section as the predominant contributors to institutional CS rates. The high contribution of Group 5 reflects the cumulative effect of rising primary caesarean sections and reduced uptake of vaginal birth after caesarean (VBAC). This observation emphasizes the importance of preventing unnecessary primary CS and promoting appropriately selected trial of labour after caesarean (TOLAC).

Group 1 constituted the second largest contributor to the overall CS burden. Since this group comprises low-risk nulliparous women with singleton cephalic term pregnancies in spontaneous labour, its contribution is particularly important. Similar observations have been reported by Nadella et al. [14], Hassan et al. [12], and Vogel et al. [15]. Elevated CS rates in this group may indicate opportunities for improving labour management, optimizing intrapartum monitoring, and reducing unnecessary operative interventions. As women in Group 1 are undergoing their first delivery, reducing CS in this category can substantially influence future institutional CS rates.

Group 2 also contributed significantly to the overall CS burden. Comparable findings have been reported by Perin et al. [16], Sukmanee et al. [17], and Thakur et al. [11]. This group is particularly sensitive to induction protocols and pre-labour caesarean section practices. The findings suggest the need for standardized induction policies and adherence to evidence-based labour management protocols.

Another notable finding was the substantial contribution of Group 10. Similar observations were reported by Abubeker et al. [18] and Parveen et al. [19], where preterm singleton cephalic pregnancies represented an important contributor to operative deliveries. The high proportion of Group 10 in the present study likely reflects the tertiary referral nature of the institution, which manages a large number of high-risk pregnancies requiring specialized maternal and fetal care.

Regarding indications, non-progress of labour was the leading indication in Group 1, while non-reassuring fetal heart rate predominated in Group 2. Similar findings were reported by Kore et al. [20], Sukmanee et al. [17], Nadella et al. [14], and Thakur et al. [11]. Previous caesarean section was the dominant indication in Group 5, whereas abnormal Doppler findings and intrauterine growth restriction were the major indications in Group 10. Comparable patterns have been described by Jadoon et al. [13] and Abubeker et al. [18].

Overall, previous caesarean section, non-reassuring fetal heart rate, non-progress of labour, and abnormal Doppler/IUGR were major contributors to operative delivery. Similar trends have been reported by Ramos et al. [21] and Hassan et al. [12]. The findings indicate that caesarean section rates are influenced by multiple maternal, fetal, and institutional factors rather than a single dominant indication.

The study demonstrates the usefulness of TGCS as an effective audit tool for identifying target groups for intervention. Strategies aimed at reducing unnecessary primary caesarean sections, strengthening labour management, promoting VBAC where appropriate, and optimizing fetal surveillance may contribute to rationalizing CS rates without compromising maternal and neonatal outcomes.

The findings reinforce that continuous Robson TGCS-based audit provides valuable information for quality improvement, facilitates benchmarking with other institutions, and supports evidence-based interventions aimed at optimizing caesarean section practices.

CONCLUSION

The present study demonstrated the usefulness of the Robson Ten-Group Classification System as a standardized tool for evaluating caesarean section practices in a tertiary care referral hospital. Group 5 was the largest contributor to the overall caesarean section burden, followed by Groups 1, 10, and 2, indicating that repeat caesarean section and primary operative deliveries among nulliparous women are major drivers of institutional CS rates. Previous caesarean section, non-reassuring fetal heart rate, non-progress of labour, and abnormal Doppler/IUGR emerged as the leading indications for operative delivery. The findings highlight the need for interventions focused on reducing unnecessary primary caesarean sections, strengthening labour management practices, improving fetal surveillance, and promoting appropriately selected vaginal birth after caesarean. Routine implementation of Robson TGCS across tertiary healthcare institutions may facilitate standardized obstetric audits and contribute to improving maternal and neonatal outcomes.

DECLARATIONS

Ethical Approval and Consent to Participate: The study was approved by the Institutional Ethics Committee of Government Medical College and Dr. Sushila Tiwari Government Hospital, Haldwani, Uttarakhand. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Availability of Data and Materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Authors' Contributions: All authors contributed substantially to the conception and design of the study, data collection, analysis and interpretation of data, drafting of the manuscript, and approval of the final version.

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