

Classification of Cesarean Section Through Robson Criteria: An Emerging Concept to Audit the Increasing Cesarean Section Rate in a Tertiary Care Hospital

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Abstract

Background

Cesarean section rates have increased markedly worldwide, exceeding the World Health Organisation recommended optimal range of 10–15% in many settings. Unnecessary cesarean deliveries are associated with increased maternal morbidity and healthcare costs. The Robson Ten-Group Classification System provides a standardised and reproducible method to audit cesarean section rates and identify obstetric groups contributing most to the overall burden. This study aimed to audit cesarean section rates using the Robson classification in a tertiary care hospital.

Methods

A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care hospital from January 2024 to December 2025. All women who underwent cesarean section during the study period were included. Cesarean deliveries were classified according to the Robson Ten-Group Classification System. Data were analysed using descriptive statistics, and cesarean section rates and group-wise contributions were calculated.

Results

During the study period, 1,593 deliveries were recorded, of which 858 were cesarean sections, resulting in an overall cesarean section rate of 53.86%. The largest contributions to the overall cesarean section rate came from Robson Group 2, which contributed 36.71%, and Robson Group 5, which contributed 36.0%. Groups involving spontaneous labour without prior cesarean section (Groups 1 and 3) contributed relatively less to the total cesarean section rate.

Conclusion

The cesarean section rate in this tertiary care hospital was substantially higher than recommended levels, with Robson Groups 2 and 5 being the major contributors. The Robson Ten-Group Classification System proved to be an effective tool for auditing cesarean section practices and identifying priority obstetric groups. Routine use of this classification may support targeted, evidence-based interventions to optimise cesarean section use while ensuring maternal and perinatal safety.

Keywords

Cesarean section; Robson classification; Tertiary care hospital; Obstetric audit; Labour induction

INTRODUCTION

Over the years, global cesarean section (CS) rates have increased substantially, rising from approximately 7% in 1990 to nearly 21% in recent years, far exceeding the World Health Organisation (WHO) recommended optimal population-level rate of 10–15%. Projections suggest that this upward trend will continue, with global CS rates expected to reach nearly 29% by 2030, characterised by the coexistence of both unmet need and overuse of cesarean delivery across different regions. [1] While cesarean section is a life-saving intervention when medically indicated, its unnecessary use is associated with increased maternal morbidity, prolonged hospital stay, higher healthcare costs, and adverse outcomes in subsequent pregnancies. [2] Consequently, the rising rate of cesarean deliveries has emerged as a major public health concern, particularly in tertiary care hospitals worldwide, which often manage a higher proportion of referred and high-risk obstetric cases.

A key challenge in addressing the rising cesarean section rate is the absence of a universally accepted and standardised system for classifying cesarean deliveries based on clinically meaningful criteria. Traditional classifications based solely on indications such as Fetal distress, Failure to progress, Cephalopelvic disproportion, Malpresentation and Previous cesarean section are often inconsistent and limit comparison across institutions and over time, particularly for intrapartum and prelabor cesarean sections. [3] To overcome this limitation, Robson proposed the Ten-Group Classification System (TGCS) [4] in 2001, which categorises all women admitted for delivery into one of ten mutually exclusive and totally inclusive groups using five basic obstetric characteristics: parity, previous cesarean section, onset of labour, fetal presentation, number of fetuses, and gestational age. [5] The WHO in 2015 and the International Federation of Gynaecology and Obstetrics (FIGO) in 2016 proposed the use of the Robson Classification as a global standard for assessing, monitoring, and comparing CS rates both within healthcare facilities, over time, and between facilities. This system classifies all women into one of 10 categories that are mutually exclusive and, as a set, completely comprehensive. The categories are based on five basic obstetrical characteristics (parity, number of fetuses, previous CS, onset of labour, gestational age, and fetal presentation). [6]

In tertiary care hospitals, where a high proportion of deliveries involve referred and high-risk pregnancies, overall CS rates alone offer limited insight into the underlying obstetric practices contributing to the rising trend. The Robson Ten-Group Classification System provides a standardised, reproducible, and clinically relevant framework to systematically audit cesarean deliveries, identify specific obstetric groups contributing most to the overall CS rate, and enable meaningful comparison within and across healthcare facilities. Applying this classification in a tertiary care setting is essential to understand local patterns of cesarean delivery, evaluate current clinical decision-making, and guide targeted, evidence-based interventions aimed at optimising cesarean section use. Therefore, the present study was undertaken to audit the cesarean section rate in a tertiary care hospital in Chengalpattu district using the Robson Ten-Group Classification System, to classify cesarean deliveries accordingly, and to identify the major contributing obstetric groups responsible for the increasing cesarean section rate.

METHODS

Study Design and Setting

This was a retrospective, hospital-based observational study conducted in the Department of Obstetrics and Gynaecology, Chettinad Hospital and Research Institute, a tertiary care hospital in Chengalpattu, Tamil Nadu, India. The study period extended from January 2024 to December 2025.

Sample Size and Sampling

A total enumeration method was used to collect details of all women who delivered by cesarean section during the study period.

Inclusion and Exclusion Criteria

All women who underwent cesarean section delivery during the study period from **January 2024 to December 2025** were included in the study. Women who had term **normal vaginal deliveries, instrumental vaginal deliveries, and preterm vaginal deliveries were excluded from this study.**

Study variables

Cesarean deliveries were classified according to the Robson Ten-Group Classification System based on the following obstetric variables:

1. Parity (nulliparous / multiparous)
2. Previous cesarean section (present / absent)
3. Onset of labour (spontaneous / induced / pre-labour cesarean section)
4. Gestational age (≥ 37 weeks or < 37 weeks)
5. Fetal presentation (cephalic / breech / transverse or oblique lie)
6. Number of fetuses (singleton/multiple)

Each woman was assigned to one mutually exclusive and totally inclusive Robson group.

Data Collection Tools

Data were retrieved retrospectively from the Medical Record Department after obtaining prior permission. Information was entered into a pre-designed structured proforma capturing demographic details, obstetric characteristics, mode of delivery, and Robson classification variables. The data were cross-checked with labour room registers and operation theatre records for completeness and accuracy before analysis.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using Statistical Package for Social Sciences version 26. Descriptive statistics were used. Categorical variables were summarised using frequencies and percentages. The CS rate, relative size of each Robson group, group-specific cesarean section rate, and contribution of each group to the overall cesarean section rate were calculated.

Ethical Approval

The study was conducted after obtaining approval from the Institutional Human Ethics Committee for Student Research, Chettinad Academy of Research and Education (IHEC-I/082/11/2025). As this was a retrospective record-based study, informed consent was waived.

RESULTS

During the study period from January 2024 to December 2025, a total of 1,593 deliveries were recorded at the tertiary care hospital, of which 858 were cesarean sections, resulting in an overall cesarean section rate of 53.86%.

Table 1 summarises the Robson Ten-Group Classification System used in the present study to categorise all deliveries into standardised obstetric groups. This classification provided a uniform framework for stratifying the study population based on key obstetric characteristics and enabled systematic assessment of cesarean section distribution across mutually exclusive groups.

Table 1. Clinical characteristics of each Robson Ten-Group Classification

Robson Group	Clinical Characteristics
1	Nulliparous, singleton, cephalic, ≥ 37 weeks, spontaneous labor
2	Nulliparous, singleton, cephalic, ≥ 37 weeks, induced labor or pre-labor cesarean section
3	Multiparous, no previous cesarean section, singleton, cephalic, ≥ 37 weeks, spontaneous labor
4	Multiparous, no previous cesarean section, singleton, cephalic, ≥ 37 weeks, induced labor or pre-labor cesarean section
5	Multiparous, previous cesarean section, singleton, cephalic, ≥ 37 weeks
6	All nulliparous women with singleton breech pregnancies

7	All multiparous women with singleton breech pregnancies (including previous cesarean section)
8	All multiple pregnancies (including previous cesarean section)
9	All women with singleton pregnancies in transverse or oblique lie (including previous cesarean section)
10	Singleton, cephalic, ≤36 weeks (including previous cesarean section)

Figure 1 illustrates the percentage contribution of each Robson group to the overall cesarean section rate. The largest contributions were observed in **Robson Group 5 (40.10%)** and **Robson Group 2 (35.30%)**, which together accounted for the majority of cesarean sections. **Robson Group 10** contributed **9.32%** to the overall cesarean section rate, while **Group 1** contributed **5.13%**. The remaining Robson groups individually contributed less than 3% each to the overall cesarean section rate, reflecting smaller group sizes or lower relative impact despite high group-specific cesarean section rates in some categories.

Figure 1: Contribution of Each Robson Group to the Overall Cesarean Section Rate

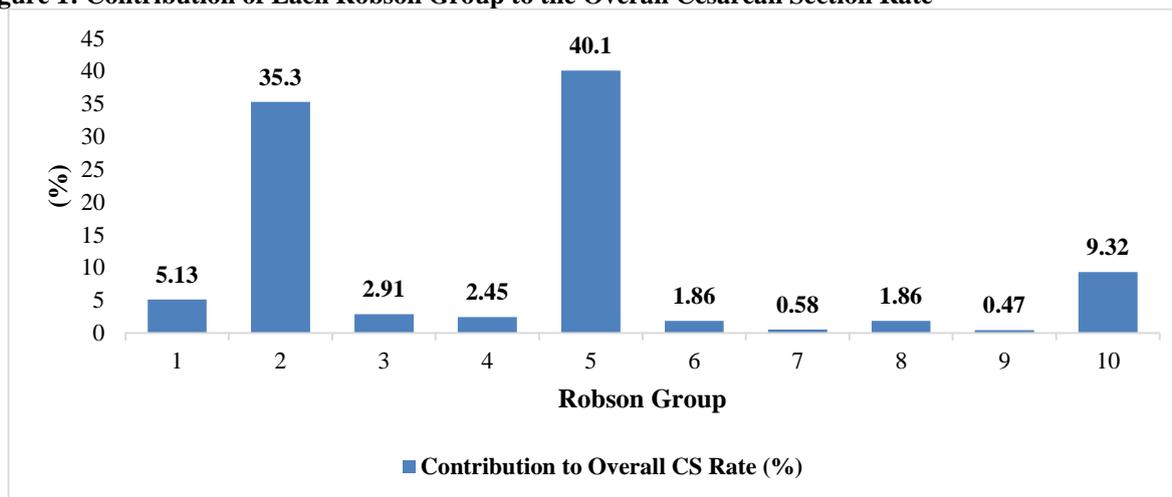


Table 2: Robson Group-wise Distribution of Cesarean Sections

Robson Group	Total Deliveries (n)	Cesarean Sections (n)	Relative Size of Group (%)	Group-specific CS Rate (%)	Contribution to Overall CS Rate (%)
1	302	44	18.96	14.57	5.13
2	447	303	28.06	67.79	35.30
3	156	25	9.79	16.02	2.91
4	97	21	6.09	21.65	2.45
5	344	344	21.59	100.00	40.10
6	16	16	1.00	100.00	1.86
7	5	5	0.31	100.00	0.58
8	16	16	1.00	100.00	1.86
9	4	4	0.25	100.00	0.47
10	157	80	9.86	50.96	9.32
Total	1593	858	100.00	-	100.00

Table 2 presents the distribution of deliveries and cesarean sections according to the Robson Ten-Group Classification System. Around 28.06% of the study population were observed in Robson Group 2, which includes nulliparous, term, singleton, cephalic pregnancies undergoing induction or pre-labour cesarean section, making it the largest group in this study. Multiparous women with a previous cesarean section who belong to Group 5 comprises of 21.59%, making it the second largest group. Group-specific cesarean section rates were highest in Groups 5, 6, 7, 8, and 9, all of which demonstrated a 100% cesarean section rate, reflecting groups with previous cesarean section, breech presentation, multiple pregnancies, or abnormal lie. Group 10, comprising preterm singleton cephalic pregnancies, showed a cesarean section rate of 50.96%.

Lower cesarean section rates were observed in Group 1 and Group 3, which represent term singleton cephalic pregnancies with spontaneous labour in nulliparous and multiparous women without previous cesarean section, respectively. In terms of contribution to the overall cesarean section rate, Group 5 (40.10%) and Group 2 (35.30%) were the predominant contributors, together accounting for the majority of cesarean sections. Overall, the Robson classification identified nulliparous women undergoing induction or pre-labour cesarean section (Group 2) and multiparous women with a previous cesarean section (Group 5) as the major contributors to the high cesarean section rate observed in the study population.

DISCUSSION

The present study applied the Robson Ten-Group Classification System to audit CS rates in a tertiary care hospital and demonstrated a markedly high overall cesarean section rate of **53.86%**. This rate is substantially higher than the WHO-recommended optimal range of 10 - 15% [7] and exceeds both the national cesarean section rate of 21.5% reported in NFHS-5 [8] and the higher cesarean section proportion observed in Tamil Nadu (44.3%) in the same

survey, which is expected given the referral and high-risk case mix typical of tertiary centres. [9] These findings are reinforced by Guner's study on the importance of institutional audits to understand the underlying contributors to elevated cesarean section rates, rather than relying solely on overall percentages. Globally, the Robson classification has been increasingly used to monitor and compare cesarean delivery practices, which is crucial for quality improvement and tailored interventions in obstetric care. [10]

Our study identified Robson Groups 2 and 5 as the principal contributors to the overall cesarean section burden, a pattern that has been consistently reported in recent multicenter and tertiary-care audits. Large retrospective analyses have similarly shown that women with a previous cesarean section (Group 5) represent the dominant source of cesarean deliveries, while induced or pre-labour cesarean sections among nulliparous women (Group 2) contribute substantially to rising cesarean section rates. [11] A tertiary-care audit by Arshad et al. further confirmed Group 5 as the single largest contributor to overall cesarean sections, underscoring the reproducibility and robustness of the Robson classification across diverse healthcare settings. [12] The predominance of Group 5 reflects the cumulative impact of primary cesarean sections on subsequent pregnancies. Persistently high repeat cesarean section rates have been attributed to limited implementation of vaginal birth after cesarean (VBAC), heightened clinical risk perception, and medico-legal concerns in tertiary care environments. Supporting this observation, a recent retrospective study from Serbia by Jankovic et al. demonstrated that suboptimal adoption of VBAC protocols was a key determinant of sustained high cesarean section rates in referral hospitals. [13] These findings highlight that long-term reduction in cesarean section rates is unlikely without focused efforts to safely reduce primary cesarean deliveries.

At a regional level, the present findings closely parallel those reported by Arunadevi et al. from another tertiary-care centre within the Chengalpattu district, where Group 5 was the leading contributor, followed by notable contributions from nulliparous term singleton cephalic pregnancies (Groups 1 and 2). [14] The concordance of results across institutions within the same district suggests a shared obstetric practice context, characterised by similar referral patterns, case complexity, and decision-making frameworks. The consistently high contribution of Group 2 in both studies further emphasises the growing influence of labour induction and pre-labour cesarean practices among first-time mothers. Together, these district-level observations indicate that coordinated, context-specific interventions targeting primary cesarean sections could yield meaningful reductions in overall cesarean section rates.

The relatively lower contribution of Robson Groups 1 and 3, which include women with spontaneous onset of labour and no previous cesarean section, is consistent with findings from international Robson classification audits. Spontaneous labour has been repeatedly associated with lower cesarean section rates when compared with induced labour or repeat cesarean sections. The Euro-Peristat analysis by Zeitlin et al. demonstrated this association across multiple European countries, reinforcing the protective role of spontaneous labour against unnecessary cesarean delivery. [5] Although groups characterised by breech presentation, multiple pregnancies, abnormal lie, and preterm gestation showed uniformly high group-specific cesarean section rates, their overall contribution remained limited due to their smaller representation in the obstetric population, a pattern similarly reported in Indian tertiary-care audits by Pravina et al. [6]

A distinct and potentially modifiable observation from the present study is the substantial contribution of nulliparous women undergoing labour induction or pre-labour cesarean section (Group 2). Recent work by Namutosi et al. highlighted that variability and lack of standardisation in induction practices significantly increase the likelihood of primary cesarean section among first-time mothers. [15] These findings align with evidence from a multicountry cohort study by Souza et al., which demonstrated that implementation of standardised labour management and induction protocols was associated with improved labour outcomes and reduced cesarean delivery rates. Collectively, these observations suggest that optimisation of induction practices represents a key opportunity for reducing primary cesarean sections in tertiary-care settings.

Beyond individual group-specific findings, the present study reaffirms the value of the Robson Ten-Group Classification System as a robust and reproducible framework for auditing cesarean section practices. Its utility in facilitating meaningful comparisons across institutions and time periods has been well documented. Vogel et al. demonstrated that systematic application of the Robson classification enables benchmarking and forms a critical component of effective audit-and-feedback mechanisms in obstetric care. [16] Furthermore, systematic reviews such as that by Mushonga et al. have shown that structured audit and feedback interventions are effective elements of multifaceted strategies aimed at optimising cesarean section use and improving maternal and perinatal outcomes. In line with these findings, the World Health Organization endorses the integration of such non-clinical interventions as part of comprehensive efforts to improve the quality of obstetric care.

CONCLUSION

The present study demonstrates a markedly high cesarean section rate in a tertiary care hospital, with **Robson Groups 2 and 5** emerging as the major contributors to the overall cesarean burden. The findings highlight the significant role of **labour induction and pre-labour cesarean sections among nulliparous women**, as well as the cumulative impact of **repeat cesarean sections following a primary cesarean delivery**. Application of the **Robson Ten-Group Classification System** provided a clear, standardised, and reproducible framework to identify priority obstetric groups contributing to the rising cesarean section rate. Routine use of this classification system can facilitate continuous audit, enable meaningful comparison across institutions, and guide targeted, evidence-based interventions aimed at optimising cesarean section practices. Strengthening standardised labour management protocols, promoting judicious use of induction, and encouraging appropriately selected vaginal birth after cesarean may help reduce unnecessary cesarean deliveries while ensuring maternal and perinatal safety.

LIMITATIONS

The study has certain limitations. Its **retrospective design** relies on the accuracy and completeness of medical records and limits the ability to assess causal relationships. As a **single-centre study**, the findings may not be generalizable to primary or secondary care settings or to institutions with different case-mix profiles. The analysis was primarily **descriptive**, and potential confounding factors such as socioeconomic status, detailed clinical indications, provider-level decision-making, and maternal preferences could not be evaluated. Despite these limitations, the study provides valuable insights into cesarean section practices and identifies key target groups for intervention in tertiary care settings.

RECOMMENDATIONS

The findings of this study underscore the need for **routine implementation of the Robson Ten-Group Classification System** as a standard audit tool in tertiary care hospitals to continuously monitor cesarean section rates and identify priority obstetric groups. Particular emphasis should be placed on **reducing primary cesarean sections**, especially among nulliparous women undergoing labour induction or pre-labour cesarean section, through **strict adherence to evidence-based induction protocols, standardised labour management practices, and regular review of indications for primary cesarean delivery**. Strengthening counselling and institutional support for **appropriately selected VBAC** may help reduce repeat cesarean sections among women with a previous cesarean delivery. Periodic multidisciplinary audits, clinician feedback, and protocol-driven decision-making can further optimise cesarean section practices. Adoption of these measures has the potential to improve the quality of obstetric care, reduce unnecessary cesarean deliveries, and enhance maternal and perinatal outcomes while maintaining patient safety in tertiary care settings.

REFERENCES

1. Angolile CM, Max BL, Mushemba J, Mashauri HL. Global increased cesarean section rates and public health implications: A call to action. *Health Sci Rep*. 2023 May 18;6(5):e1274.
2. Jaan F, Qureshi A, Reddy SSM. Beyond Medical Indications: Maternal Reasons for Elective Cesarean Sections. *Eur J Cardiovasc Med*. 2025 May 26;15:600–4.
3. Robson M, Corbett GA, Kessler J, Murphy M, Ryan K, Byrne F, et al. An Intrapartum Cesarean Delivery Classification System – a prospective eighteen year longitudinal cohort study. *Am J Obstet Gynecol* [Internet]. 2025 May 21 [cited 2026 Jan 2]; Available from: <https://www.sciencedirect.com/science/article/pii/S0002937825000663>
4. Robson Classification: Implementation Manual [Internet]. [cited 2026 Jan 2]. Available from: <https://www.who.int/publications/i/item/9789241513197>
5. Zeitlin J, Durox M, Macfarlane A, Alexander S, Heller G, Loghi M, et al. Using Robson’s Ten-Group Classification System for comparing caesarean section rates in Europe: an analysis of routine data from the Euro-Peristat study. *Bjog*. 2021 Aug;128(9):1444–53.
6. Pravina P, Ranjana R, Goel N. Cesarean Audit Using Robson Classification at a Tertiary Care Center in Bihar: A Retrospective Study. *Cureus*. 14(3):e23133.
7. WHO statement on caesarean section rates [Internet]. [cited 2026 Jan 10]. Available from: <https://www.who.int/publications/i/item/WHO-RHR-15.02>
8. Neethi Mohan V, Shirisha P, Vaidyanathan G, Muraleedharan VR. Variations in the prevalence of caesarean section deliveries in India between 2016 and 2021 – an analysis of Tamil Nadu and Chhattisgarh. *BMC Pregnancy Childbirth*. 2023 Aug 30;23(1):622.
9. NFHS-5_Phase-II_0.pdf [Internet]. [cited 2026 Jan 9]. Available from: https://mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf?utm_source=chatgpt.com
10. Guner G, Yeniocak AS. A cross-sectional analysis of caesarean sections according to Robson 10-group classification system: experience from a tertiary centre in Turkiye. *BMC Pregnancy Childbirth*. 2025 July 1;25(1):674.
11. Lavin T, Ocheke AN, Betran AP, Adeniran AS, Ezenkwele E, Nwachukwu DC, et al. Analyzing caesarean sections through the Robson classification in Nigeria: a prospective nationwide study in referral level facilities. *eClinicalMedicine*. 2025 Sept 1;87:103427.
12. Arshad H, Wadani ZH, Kamal Z, Masheer S. Investigating Cesarean Section Trends: A Study Using the Modified Robson Classification in a Tertiary Care Setting. *Cureus*. 16(11):e72827.
13. Jankovic S, Rovcanin M, Tomic A, Jokic A, Kostic K, Grujic T, et al. A Retrospective Analysis of the Robson Classification Implementation in a Tertiary Care Hospital in Serbia. *J Clin Med*. 2025 Jan;14(8):2700.
14. An K. Cesarean Section Audit Using Robson’s Ten Group Classification System at a Tertiary Care Centre in Tamil Nadu: A Cross Sectional Study. *Online J Health Allied Sci* [Internet]. 2023 Nov 15 [cited 2026 Jan 9];22(3). Available from: <https://www.ojhas.org/issue87/2023-3-4.html>
15. Namutosi E, Akankwasa P, Matokota JB, Ssempanyi DD, Katongole J, Kakooza J, et al. Induction of Labor: A Narrative Review for Clinical Use. *Cureus* [Internet]. 2025 Oct 9 [cited 2026 Jan 2];17. Available from: <https://cureus.com/articles/415795-induction-of-labor-a-narrative-review-for-clinical-use>
16. Manjit_Bual_Poster_2ZLIPbv.pdf [Internet]. [cited 2026 Jan 2]. Available from: https://www.bmus.org/media/resources/files/15_Manjit_Bual_Poster_2ZLIPbv.pdf