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Original Research Article

IDENTIFYING KEY CONTRIBUTORS TO CAESAREAN DELIVERIES: A RETROSPECTIVE CROSS-SECTIONAL EVALUATION FROM A TERTIARY CARE CENTRE VIA THE ROBSON TEN-GROUP SYSTEM

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Abstract

Background: Caesarean section (CS) is a vital intervention for reducing maternal and neonatal morbidity and mortality. However, rising CS rates worldwide, often exceeding WHO recommendations, underscore the need for systematic evaluation. The Robson Ten-Group Classification System (RTGCS) provides a structured framework to identify which obstetric subgroups contribute most to elevated CS rates. **Materials and Methods:** A retrospective, cross-sectional analysis was conducted at Sharda Hospital Greater Noida, Uttar Pradesh over 15 months (January 2023–May 2024). Data on 880 deliveries were extracted from hospital records. All deliveries were classified according to the RTGCS. **Result:** Of the 880 deliveries, 55.1% were by CS. Group 5 (multiparous women with previous CS) formed 18.8%, was the highest contributor to overall CS rates. Nulliparous women at term (Group 1) accounted for 51.59% of CS within that group, making it the second-largest contributor to the primary CS rate. Breech presentation groups (6 and 7) and multiple pregnancies (Group 8) had high CS rates (≥80%), reflecting the complexity of these cases. Preterm deliveries (Group 10) contributed 35.1% to the overall CS rate, often due to associated obstetric complications. **Conclusion:** The RTGCS proved instrumental in pinpointing areas warranting intervention, thereby offering a roadmap for evidence-based strategies to optimize delivery practices while maintaining maternal and neonatal safety. Groups 5 and 1 were the predominant contributors to the elevated CS rate. Targeted measures—including promoting vaginal birth after caesarean (VBAC), optimizing labor induction protocols, and improving fetal heart rate monitoring—could help reduce unnecessary CS.

INTRODUCTION

Caesarean section (CS) is one of the most commonly performed obstetric procedures worldwide. It is defined as surgical intervention that involves delivering the foetus through a uterine wall incision (hysterotomy) after period of fetal viability. CS is important life-saving intervention in obstetric practice performed when vaginal delivery poses risks to the mother or foetus.[1]

Unnecessary CS procedures have become a major public health concern, particularly in regions where rates exceed recommended thresholds. The World Health Organization (WHO) suggests that CS rates above 10–15% may not provide additional maternal or perinatal benefits and instead may lead to higher maternal morbidity and increased healthcare costs. Despite this, global CS rates continue to rise, with an average CS rate of 18.6% across 150 countries, ranging from 6% in the least developed nations to 27.2% in highly developed regions.[2] Over the last three decades, the global rate of CS has risen significantly, leading to growing concerns about its increasing frequency and long-term health implications.[3] The increasing caesarean rate has now become a growing concern at the national and international levels. The current CS rate in India is 17.2%, which varies in different states, being higher in southern states.[4] This increase can be attributed to multiple factors, including changing maternal demographics, a rise in high-risk pregnancies, greater use of electronic fetal monitoring, medico-legal concerns, and evolving obstetric practice styles.

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Although CS can reduce maternal and perinatal morbidity in complex or high-risk pregnancies, risks associated with CS include postpartum haemorrhage, infections, increased need for blood transfusions, thromboembolic events, and longer hospital stays, neonatal respiratory complications. In subsequent pregnancies, women with a history of CS face an elevated risk of placenta previa, placenta accreta spectrum disorders, uterine rupture, and the need for peripartum hysterectomy.

To systematically assess and regulate CS rates, the World Health Organization (WHO) has endorsed the Robson Ten-Group Classification System (RTGCS) as a universal standard for evaluating CS trends across different healthcare settings.[5] Developed by Michael Robson in 2001, this classification system categorizes all pregnant women undergoing delivery into ten well-defined groups based on five key obstetric parameters.[6] Parity – whether the mother is a first-time mother (nulliparous) or has had previous births (multiparous, with or without prior CS). Onset of labor – whether labor begins spontaneously, is medically induced, or if CS is performed before labor begins (elective CS). Gestational age – whether the pregnancy is full-term or preterm. Fetal presentation – whether the foetus is in a cephalic, breech, or transverse position. Number of foetuses – whether the pregnancy involves a single baby or multiple foetuses.

The Robson classification system is widely recognized for its clarity, reproducibility, and adaptability in monitoring CS rates across individual institutions, regions, and national healthcare systems.[7] It is particularly useful in helping healthcare institutions and policymakers track which patient groups contribute most to increasing CS rates and design targeted interventions to promote safe and appropriate delivery practices.[8] Studies conducted across multiple regions, including America, Europe have demonstrated that this classification system is simple to implement and effective in standardizing CS rate evaluations.[9,10] A systematic review from 2014, which included over 33 million births across 31 countries, further reinforced its value in analysing caesarean deliveries and formulating appropriate obstetric policies.[11]

Aim

This study aims to analyse caesarean section (CS) rates at a tertiary care centre using the Robson Ten-Group Classification System. Additionally, the study focuses on identifying trends, key contributing factors, and areas for potential intervention. It further seeks to evaluate labor management strategies and propose evidence-based interventions to optimize CS practices.

Objectives

- To classify and analyse CS rates based on the Robson Ten-Group Classification System.
- To determine the major contributors to overall and primary CS rates within the obstetric population.
- To assess rates of vaginal birth after caesarean (VBAC) and examine factors influencing the trial of labor after caesarean (TOLAC).
- To propose evidence-based modifications aimed at reducing unnecessary CS while ensuring maternal and neonatal safety.

MATERIALS AND METHODS

This study is a cross-sectional, retrospective, observational analysis conducted at Sharda Hospital, a tertiary care centre in Greater Noida, Uttar Pradesh, India, over a 15-month period from January 2023 to May 2024.

Study Population- the study encompassed all women who delivered in the labor ward during this timeframe, excluding those who presented with uterine rupture prior to delivery. Total of 880 women were included.

Data Collection- Obstetric and demographic data were extracted from hospital medical records, capturing variables such as mode of delivery, parity, history of previous caesarean sections, onset of labor (spontaneous, induced, or elective caesarean).

Data Analysis- Utilizing the Robson Ten-Group Classification System, each delivery was categorized based on predefined obstetric parameters, facilitating a comprehensive analysis of caesarean section rates across different patient subgroups.

Ethical Considerations- Ethical approval was duly obtained from the hospital's ethics and research committee, ensuring adherence to ethical standards and maintenance of patient confidentiality throughout the study.

RESULTS

Table 1: Robson's ten group classification system.

Robsons Classification	Group Name
Group 1	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
Group 2	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour
2a	Labour induced
2b	Pre-labour CS
Group 3	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
Group 4	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour

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4a	Labour induced
4b	Pre-labour CS
Group 5	All multiparous women with at least one previous CS, with a single cephalic pregnancy, ≥37 weeks gestation
5a	With one previous CS
5b	With two or more previous CSs
Group 6	All nulliparous women with a single breech pregnancy
Group 7	All multiparous women with a single breech pregnancy including women with previous CS(s)
Group8	All women with multiple pregnancies including women with previous CS(s)
Group 9	All women with a single pregnancy with a transverse or oblique lie, including women with previous CS(s)
Group 10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous CS(s)

Table 2: Rate of caesarean section a/c to Robson classification in the study population.

Robson group	No. of Deliveries (C)	Total no. vaginal deliveries (A)	Total no LSCS (B)	Group CS Rate (B/C)	Relative Group CS rate %	Absolute CS Rate %	Group Size %
Group 1	157	76	81	51.59%	16.7%	9.2%	17.8%
Group 2a	79	51	28	31.6%	5.7%	3.18%	8.9%
2b	28	0	28	100%	5.7%	3.1%	3.1%
Group 3	152	119	33	21.7%	6.8%	3.7%	17.22%
Group 4a	63	58	5	7.94%	1.03%	0.56%	7.1%
4b	12	0	12	100	2.4%	01.3%	1.3%
Group 5a	126	9	117	95.2%	24.1%	13.2%	14.3%
5b	50	0	50	82.0%	10.3%	5.6%	5.6%
Group 6	38	5	33	86.6%	6.8%	03.7%	4.3%
Group 7	35	5	30	85.7%	6.1%	3.4%	3.9%
Group8	20	0	20	100%	4.1%	2.2%	2.2%
Group 9	9	0	9	100%	1.8%	1.02%	1.02%
Group 10	111	72	39	35.1%	8.02%	4.4%	12.6%
Total		395	485				

Group size (%) = no of women in the group / total N women delivered in the hospital × 100 Group CS rate (%) = n of CS in the group/ total N of women in the group × 100
Absolute CS Rate (%) = n of CS in the group / total N of women delivered in the hospital × 100
Relative CS rate (%) = n of CS in the group / total N of CS in the hospital × 100

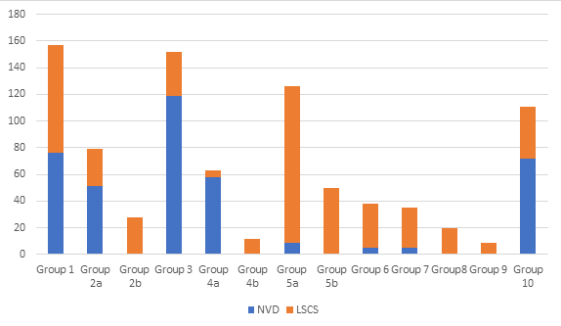

Figure 1: No. of caesarean sections in each group in the study population.

In our study utilizing the Robson Ten-Group Classification System to analyse 880 deliveries at a tertiary care hospital, the overall caesarean section (CS) rate was 55.1%. Group 5, comprising 2 women with one or more previous CS, accounted for 18.8% of total deliveries, making it the largest contributor to the overall CS rate. Group 1 had 157 deliveries, with 81 resulting in CS, yielding a CS rate of 51.59%. This group had the second-highest contribution to primary CS. Group 2 was further divided into Group 2a (induced labor) with 79 deliveries and a CS rate of 31.6%, and Group 2b (pre-labor CS) with 28 deliveries, all of which were via CS, resulting in a 100% CS rate. Group 3 included 152 deliveries, with 33 CS procedures, resulting in a CS rate of 21.7%. Group 4 was divided into Group 4a (induced labor) with 63 deliveries and a CS rate of 7.94%, and Group 4b (pre-labor CS) with 12 deliveries, all of which were via CS, resulting in a 100% CS rate. Group 5 was split into Group 5a (one previous CS) with 126 deliveries and a CS rate of 95.2%, and Group 5b (two or more previous CS) with 50 deliveries, all via CS, resulting in a 100% CS rate. The low vaginal birth after caesarean (VBAC) rate of 5.11% in this group. Group 6 had 38 deliveries, with 33 resulting in CS, yielding a CS rate of 86.6%. Group 7 included 35 deliveries, with 30 via CS, resulting in a CS rate of 85.7%. Group 8 had 20 deliveries, with 16 resulting in CS, yielding a CS rate of 80%. Group 9 consisted of 9 deliveries, all via CS, resulting in a 100% CS rate, as vaginal delivery is not feasible in these presentations. Group 10 (preterm, cephalic presentation) included 111 deliveries, with 39 via CS, resulting in a CS rate of 35.1%.
These findings underscore the significant impact of specific obstetric groups on the overall CS rate, highlighting areas where targeted interventions could optimize delivery practices.

DISCUSSION

Caesarean section (CS) is essential for reducing maternal and neonatal morbidity and mortality and is a key indicator of the quality of maternal healthcare services. The Robson Ten-Group Classification System has been widely utilized in different healthcare settings to assess CS trends and inform

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clinical decision-making. Several studies show that the Robson classification can be effective in reducing unnecessary CS rates. For example, Aguiar et al. implemented an audit and feedback system, leading to a reduction in CS rates in Robson Groups 1 and 2 from 34.6% to 13.5%.[12] Similarly, Blomberg et al. in Sweden introduced organizational and cultural changes, reducing CS rates in Group 1 from 10.1% to 3.1% over nine years.[13] These studies highlight the positive impact of structured monitoring, clinical audits, and policy-driven interventions in effectively managing CS rates while maintaining maternal and neonatal safety.

Our retrospective study aimed to analyse caesarean section (CS) rates using the Robson Ten-Group Classification System (RTGCS) at a tertiary care hospital. A total of 880 deliveries were categorized according to the RTGCS, and the distribution of deliveries across the groups was examined.

In our study, the combined sizes of Groups 3 and 4 were smaller than those of Groups 1 and 2, suggesting a slightly larger nulliparous population. In the study, Groups 1 and 3 were the predominant categories among women presenting for labor and delivery. This observation aligns with findings from a study in India, where Groups 1 and 3 accounted for 24.2% and 19.4% of all deliveries, respectively.[14] Similarly, research conducted in Brazil and Italy identified Groups 1 and 3 as the most represented obstetric groups.[15,16]

Our study identified that Group 5 (women with previous caesarean sections) was the primary contributor to the overall caesarean section (CS) rate, followed by Groups 1 and 2 (nulliparous women). These groups consistently exhibited elevated CS rates, primarily due to repeat CS and primary CS. In our study, the overall caesarean section (CS) rate was 51.9%, exceeding the World Health Organization's (WHO) recommended range of 10–15%. This elevated rate may reflect our institution's role as a referral centre for complex pregnancies, maternal requests and litigation concerns, may contribute to the overuse of CS in non-medically necessary cases.[17] The findings of our study align with those of Pravina et al,[18] and Pourshirazi et al,[19] who identified Group 5 as the leading contributor to CS rates. To reduce repeat caesareans, offering trial of labor after caesarean (TOLAC) is recommended. Evaluating VBAC success rates are essential for developing effective antenatal counselling and labor management strategies to reduce repeat caesarean sections. establishing dedicated VBAC clinics has proven effective in increasing VBAC rates by providing comprehensive counselling and support, enabling informed birth planning decisions.[20] Other major factor contributing to these high rates is the excessive use of cardiotocography (CTG) for fetal monitoring, which can sometimes lead to unnecessary caesarean sections due to misinterpretation of fetal heart rate patterns. Improving CTG interpretation skills through training programs has shown a reduction in emergency CS rates. Moreover, limiting unnecessary interventions during labor can also help lower CS rates.

Similar to us, the high CS rate for group 2 and group 4 have also been reported in other private facilities in Bangladesh (99%).[17] Although Groups 3 and 4 had minimal contributions to the overall CS rate, their high CS rates are concerning. As these groups consist of low-risk women, their CS rates should ideally remain below 3%. Conducting audits of these groups can serve as valuable tools to evaluate labor management practices within institutions,[21] prompting reviews of labor management protocols to ensure appropriate clinical practices. Aligning our institution's labor management protocols with WHO guidelines, which recommend labor induction only for clear medical indications, is essential. Over the past two decades, induction rates have doubled, with one in four women undergoing the procedure.[22] Inducing labor without valid medical reasons may contribute to increased caesarean delivery rates, especially if induction fails. Implementing evidence-based induction guidelines and closely monitoring labor progress can improve outcomes.

Following the Term Breech Trial, there has been a global shift toward caesarean sections (CS) for breech presentations.[23,24] In our study, however, over 80% of breech presentations in both nulliparous (Group 6) and multiparous women (Group 7) were delivered vaginally. This suggests that selected cases of breech presentation can be managed with external cephalic version (ECV) or vaginal breech delivery when conditions permit. Similarly, Group 8, representing multiple pregnancies, had nearly 80% CS rates, highlighting the necessity of surgical intervention likely due to complications, malpresentation, or maternal-fetal indications. Robson Group 9, encompassing pregnancies with transverse or oblique fetal lie, is typically the smallest subgroup in obstetric populations, it exhibits a 100% caesarean section (CS) rate, underscoring the necessity for surgical intervention. Preterm deliveries (Group 10) significantly contribute to elevated caesarean section (CS) rates at our tertiary care centre. This group experiences high morbidity and mortality, highlighting the need for enhanced antenatal care to reduce preterm births. Common complications include hypertensive disorders, fetal distress, intrauterine growth restriction, and preterm rupture of membranes. These findings align with studies from other tertiary care facilities, underscoring the importance of targeted interventions to address these challenges.[25]

CONCLUSION

In conclusion, the Robson Ten-Group Classification System (TGCS) has proven to be an invaluable tool in analysing and understanding caesarean section (CS) rates within our healthcare setting.[88] This stratification enables us to identify which patient groups contribute most significantly to our overall CS

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rate, thereby highlighting areas where targeted interventions may be most effective. Reducing unnecessary caesarean sections (CS) necessitates a multifaceted approach that addresses both clinical and non-clinical factors. Implementing evidence-based clinical practices, such as promoting vaginal birth after caesarean (VBAC) and providing continuous labor support, has been associated with lower CS rates and improved maternal outcomes. Non-clinical interventions, including the standardization of communication regarding fetal heart rate monitoring and the elimination of financial incentives favouring CS, also play a crucial role. Additionally, fostering a culture that respects individual labor processes and supports informed decision-making can empower women and reduce the demand for unnecessary CS. Collectively, these strategies contribute to a more balanced and evidence-based approach to childbirth, aligning medical practices with the best interests of mothers and infants.

Strengths of the Study

This study's primary strength lies in its application of the Robson Ten-Group Classification System (RTGCS), which facilitated a detailed and standardized analysis of caesarean section (CS) rates across various obstetric categories. Furthermore, the study's comprehensive data collection from medical charts ensured the inclusion of all deliveries within the specified timeframe, enhancing the representativeness of the findings.

Limitations of the Study

Being a retrospective analysis conducted at a single tertiary hospital, the findings may not be generalizable to other settings, especially primary or secondary healthcare facilities. The reliance on existing medical records also meant that some data, such as detailed indications for CS or certain maternal and neonatal outcomes, might have been inconsistently documented or unavailable. Additionally, the study did not account for potential confounding factors like socioeconomic status, cultural influences, or healthcare access, which could impact CS rates.

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