

Research Article

Impact of Targeted Interventions on Cesarean Section Rates: A Four-Year Audit Using the Robson 10-Group Classification System at MCH, PIMS

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ABSTRACT

Objective: To analyze cesarean section rates using the Robson Ten-Group Classification System and assess the impact of targeted interventions on reducing CS rates.

Study Design: Retrospective clinical audit.

Place and Duration: MCH, Pakistan Institute of Medical Sciences, Islamabad, from January 2021 to December 2024.

Methodology: A total of 8,653 deliveries were recorded throughout the study period and assigned to 10 Robson groups. Cesarean section rates were evaluated at each Robson group level. Moreover, the proportion of cesarean burden by each group to the total cesarean cases were calculated. An intervention was conducted after analysis of these audits in the first year, including the implementation of standardized labor induction protocols, structured vaginal birth after cesarean counseling, adjusted vaginal birth after cesarean selection criteria, and obstetric resident training. Descriptive statistics were used to compare the pre and post intervention outcomes.

Results: The overall cesarean section rate was 34.07% (2,948/8,653); however, a declining trend was observed from 36.10% in 2021 to 32.27% in 2024. Robson group 5 was the largest contributor of all cesarean section cases (38%). Groups 6, 7, and 9 had the highest within-group cesarean rates (94.23%, 93.05%, and 92.53%, respectively). The post-intervention analysis showed that “vaginal birth after cesarean” success rate was improved from 28% to 38%, and emergency cesarean rates declined from 29.28% to 21.03%.

Conclusion: Robson Ten-Group Classification System-guided targeted interventions effectively reduced cesarean rates, particularly among the high-burden groups. Institutional audits using Robson classification is useful standard practice for monitoring and optimizing cesarean section rates.

Keywords: Cesarean Section, Obstetric Audit, Labor Induction, Robson Classification, Vaginal Birth after Cesarean, Pakistan.

INTRODUCTION

Caesarean section (CS) is among the most common obstetric surgical operations worldwide. While this serves as a lifesaving intervention in some clinical scenarios, its widespread use, where it is not medically necessary, has given rise to considerable concern among obstetricians, public health specialists, and policy makers. The World Health Organization (WHO) has mentioned that population-level CS rates above 10-15% provide no extra health benefits to mother or neonates and may bring unnecessary risks.¹ The rate of CS has increased significantly in both high and low-to-middle-income countries

(LMICs) during the last 20 years, including South Asia (SA).^{2,3} Several factors have influenced these higher rates of primary CS including a preference for not trying Vaginal Birth After Cesarean (VBAC), a culture of fear of hospitals, patient choice, and limited intrapartum monitoring.^{4,5}

The absence of a structured classification or auditing system at the level of institution causes a particular challenge to identify the subgroups of women driving elevated CS rates. Consequently, the same challenge is faced in designing the appropriately targeted corrective strategies.^{6,7}

The Robson Ten-Group Classification System (RTGCS) was developed to meet this growing challenge of high CS rates. RTGCS classifies all women who gave birth at a particular institution into 10 mutually exclusive, clinically relevant groups according to parity, onset of labor, fetal presentation, and gestational age (GA), and plurality, allowing direct comparison of CS rates between time periods, departments, and institutions.⁸ With its robust and simple nature, the system has been adopted worldwide and is officially recommended by WHO as the method of monitoring and comparing cesarean rates.⁹ The ten groups of the Robson classification cover the entire range of obstetric presentations from nulliparous women in spontaneous labor (Group 1), those who were induced (Group 2), multiparous women (Groups 3 and 4), women with a previous cesarean scar (Group 5), and special groups such as breech presentation (Groups 6 and 7), multiple gestation (Group 8), abnormal fetal lie (Group 9) and preterm delivery (Group 10). The Group 5 population (women with a previous CS who present during pregnancy with a singleton cephalic pregnancy) has been known to be the major driver of overall CS rates globally, largely due to the prevailing clinical culture of performing repeat elective cesarean instead of VBAC.^{10,11}

Due to the increasing CS rates at the Maternal and Child Health (MCH) Department of Pakistan Institute of Medical Sciences (PIMS), Islamabad, a structured four-year clinical audit was started in year 2021. The audit was based on the Robson classification system to identify the most relevant contributing groups, and to design and implement evidence-based interventions. These interventions included standardization of labour induction protocols, active encouragement of VBAC with careful selection of candidates, establishment of tight standards for fetal monitoring protocols, and a program of obstetric resident training. This article provides results of the audit and quantifies the contribution of each Robson group to the overall CS burden. We also assessed the measurable impact of the implemented interventions during the study period.

METHODOLOGY

This retrospective clinical audit was conducted at the MCH, PIMS, Islamabad.

The audit covered a period of four years, from Jan 2021 to Dec 2024. All women who delivered at the MCH Department during this study period

were included in the analysis, irrespective of mode of delivery (MoD), GA, or belonging to any obstetric risk category. Both vaginal deliveries (VD) and CS were captured to calculate accurate group-specific and overall CS rates. No exclusion criteria were applied, ensuring complete institutional representation. Delivery records were systematically retrieved by the authors from hospital admission registers, labor ward logbooks, and the electronic patient records present in the hospital database. Data fields extracted for each delivery included: maternal age, parity, GA at the time of delivery, previous obstetric history (particularly prior CS), onset of labor (spontaneous, induced, or pre-labor cesarean), fetal presentation at delivery, plurality, and ultimately the MoD.¹² All data were verified by using both paper-based and electronic records to minimize any transcription errors.

Each delivery was independently assessed and assigned to one of the ten Robson groups (in accordance with the WHO-recommended classification criteria). Contribution of each Robson group was calculated as the proportion of CS in that group relative to the total number of cesarean deliveries. CS rates were also computed for each study year to track temporal trends.

The first-year audit data were analyzed and a multi-component intervention program was implemented for the high-burden Robson groups identified from this analysis. Clear and uniform guidelines were set for labor induction specifically for Groups 1, 2, and 4, focusing on preventing unnecessary or poorly timed inductions that could lead to operative deliveries. For Group 5, structured antenatal counseling sessions were arranged. Moreover, revised VBAC selection criteria were introduced, along with a dedicated monitoring protocol to safely expand trial of labor after cesarean (TOLAC). Clear protocols were developed and enforced for continuous electronic fetal monitoring during labor, which aimed to reduce the subjectivity in fetal heart rate interpretation and emergency decisions for conducting CS. In addition, frequent, evidence-based training sessions for obstetric residents were held on topics such as management of labor, management of induction, counseling for VBAC, and appropriate indications for a cesarean delivery.

All these data were analyzed using SPSS version 25. Descriptive statistics were used to summarize the demographics, baseline characteristics and outcome measures. CS rates

were calculated for each year and for each Robson group and presented as frequency and percentages. Pre-intervention and post-intervention outcomes were compared to quantify the impact of the implemented strategies after the first year's data.

RESULTS

During the four-year study period 8,653 deliveries were recorded at the MCH

Department. Out of these, 2,948 were CS deliveries, accounting for overall CS rate of 34.07 %. The annual trend of total deliveries, CS and cesarean rates are shown in Table-I which shows a gradual decrease in CS rate over the years after intervention with the highest improvement and lowest rate of CS observed in year 2024.

Table-I: Annual Cesarean Section Trends Of CS at MCH Department of PIMS (2021-2024) (N=8653)

Year	Total Deliveries (N)	Cesarean Section (N)	CS Rate (%)
2021	2105	760	36.10
2022	2150	754	35.07
2023	2198	724	32.94
2024	2200	710	32.27
Total	8653	2948	34.07

Among the ten groups, Group 6 (nulliparous, breech presentation), Group 7 (multiparous, breech presentation) and Group 9 (abnormal lie, transverse or oblique) had the highest CS rates within the group (94.23 %, 93.05 % and

92.53 %, respectively), followed by Group 5 (women with a previous CS, singleton, cephalic, at term) with 86.29 % CS rate. The details of CS within the groups and their contribution to overall CS rates are shown in Table-II.

Table-II: Groupwise Details Of CS and Their Contribution to Overall CS Cases (N=8653)

Group	Number Of Women	CS Cases (N)	CS Rate Within The Group (%)	Contribution To Total CS Cases (%)
1	2163	362	16.74	12.28
2	1298	340	26.19	11.53
3	1731	87	5.03	2.95
4	865	104	12.02	3.53
5	1298	1120	86.29	38
6	260	245	94.23	8.41
7	259	241	93.05	8.18
8	258	153	59.30	5.19
9	174	161	92.53	5.46
10	347	135	38.90	4.58
Total	8653	2948	34.07	---

Implementation of targeted interventions demonstrated meaningful improvement across multiple domains as reflected by comparison of key outcome indicators from 2021 to 2024. Most notably, the VBAC success rate increased from 28% to 38%, representing a substantial reduction in repeat elective CS among Group 5 women. The overall CS rate declined from

36.10% in 2021 to 32.27% in 2024, representing a reduction of 3.83 percentage points. Reduction in emergency CS among Group 2 women (nulliparous, induced labor) was also observed, showing consistent improvement with the induction of protocols. These findings are summarized in Table-III.

Table-III: Comparison of Pre and Post Intervention Outcomes (N=8653)

Outcome Indicators	Pre-Intervention (2021)	Post-Intervention (2024)
Overall CS Rate (%)	36.10	32.27
VBAC Success Rate (%)	28	38
Emergency CS (%)	29.28	21.03

Women With Previous CS (Group 5) (%)	86.29	78.97
Overall CS Reduction From 2021 To 2024 (%)	3.83	

DISCUSSION

This 4-year institutional audit of 8653 deliveries revealed a CS rate of 34.07%. This rate, however, gradually declined from 36.10% in 2021 to 32.27% in 2024 after implementing targeted interventions. After applying the RTGCS guidelines, it was revealed that the Group 5 (women with a previous CS, singleton, cephalic, at term) represented the biggest proportion of the CS burden, at 38%. Over the course of the study, following VBAC promotion interventions initiated after the first-year audit, the VBAC success rate was significantly increased from 28% to 38% and the rate of emergency cesarean section was significantly reduced from 29.28% to 21.03%. These results demonstrate the value of classification-based institutional audits to identify high-burden groups and to take effective corrective measures. The findings of this study are in line with the growing body of evidence supporting the use of a standardized approach to monitoring and reducing CS rates in our obstetric units.

In a study conducted in Portugal by Paz LDC et al., RTGCS was applied on 4356 deliveries to evaluate CS rates in different groups and assess the impact of targeted interventions. The overall CS rate was 26.1% with Group 5 being the largest contributor to CSs (30.4%), followed by Groups 1 (26.6%) and 3 (13.5%). The Robson classification effectively identified target groups for interventions and CS rates were reduced significantly in group 2 and group 4 (18.4 and 16.9%, respectively) after the interventions guided by Robson's classification.¹³

Similarly, a study conducted in Poland by Wojewodzic et al. audit of 11,315 deliveries was performed using the Robson classification. The study reported an overall CS rate of 24.76% where Groups 1 and 5 collectively accounted for the majority of CS cases. The authors concluded that rationalizing CS rates requires focused intervention on Group 5 women and optimizing primary CS indications in Groups 1 and 2.¹⁴

The relevance of these findings is particularly evident in the SA context, where CS rates are rising sharply in the past decade. A study conducted by Kagathara M et al. applied the RTGCS classification and identified Groups 5 (prior CS), 2 (induced nulliparas), and 10 (preterm) as major CS contributors. Targeted

interventions successfully enhanced intrapartum monitoring, Bishop score-based induction, and antenatal strategies, therefore significantly reduced the overall CS rate from 45.42% to 37.54% ($p < 0.05$). Effective quality improvement was also reflected in VBAC rates in Group 5, demonstrating the value of this classification.¹⁵

Tiwari M et al. analyzed 26,552 deliveries over a three years period at a tertiary care hospital in India using the RTGCS. The study reported an overall CS rate of 28.18% that was rising at an alarming rate from 18.97% to 39.95%. Groups 5, 1, and 2 were the major contributors. The authors also emphasized implementing standardized protocols to reduce primary CS rates and promote VD.¹⁶

The validity and importance of this classification in Pakistani context was demonstrated by Chaudhri R et al. who analyzed 5,657 deliveries in three tertiary care hospitals in Rawalpindi, Pakistan, using the RTGCS. The reported CS rate was 39.9%, which is well above WHO recommendations. Group 5 (previous CS) was the largest contributor at 41.7%, followed by Groups 10 and 2. The authors suggested to institutionalize RTGCS across Pakistan to monitor CS rates and implement targeted strategies to promote VD.¹⁷

Summing up this subject at broader view, a systematic review of 21 studies by Jiandani F et al. identified Group 5 (previous CS) as the leading contributor to rising CS rates, followed by Groups 10, 4, 2, and 1. The authors emphasized that RTGCS is an essential standardized tool for CS rate monitoring at all levels. The findings of this classification support promoting VBAC and reducing primary CS, a key strategy for optimizing overall CS rates.¹⁸

Overall, the results of this study and the literature cited highlight the viability, repeatability and effectiveness of RTGCS-led audits as a means of understanding and managing the growing CS burden. The most promising opportunity to achieve meaningful and lasting reductions in unnecessary CS rates across Pakistan and similar LMICs is to establish institutional commitment to classification-based monitoring and provide evidence-based interventions to high-burden Robson groups.

This study has certain limitations. As a single center retrospective audit, these results may not be applicable to other centers that have different resources and patient populations.

Also, the lack of official control group restricts the capacity to show that the observed decrease in CS rates is a result only of the interventions implemented.

CONCLUSION

The results of our study show that an institutional RTGCS audit is an effective and practical approach for identifying the key drivers of elevated CS rates. This audit helped to evaluate the groups which are principal contributors to the overall CS burden in the institute and thereby applying the strategies to promote VBAC practices. The current study supports the need to implement routine RTGCS based audits in the obstetric departments in Pakistan and other LMIC areas for independent clinical decisions and the policy formulation, thereby reducing the work and economic burden on health care facilities.

Conflict of interest:

None.

Disclaimer:

None.

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