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# Evaluating Caesarean Section Rates with Robson Classification: Insights from a Tertiary Care Center

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# Abstract

**Background**: Under certain circumstances, a caesarean section (CS) can save mother and child. CS rates are increasing worldwide, often for no medical reason, and pose a public health risk. The WHO recommends CS rates of between 10 and 15%, although several countries, notably India, have higher rates. This study uses the Robson Ten Group Classification System (TGCS) to examine CS rates in a tertiary care hospital and identify variables to optimize obstetric care.

**Aim**: To analyse the caesarean section rates at a tertiary care hospital using the Robson TGCS, identify the major contributing factors, and recommend strategies to optimize CS rates and improve maternal and neonatal outcomes.

**Methods**: This retrospective observational study examined 485 births, including 153 caesarean sections,

in a tertiary care hospital. The Robson categorization system is used to classify caesarean section patients into 10 categories according to parity, fetal presentation, and gestational age, mode of onset of labor.

Maternal age, parity, CS history and clinical indications were recorded. Statistical analysis was used to determine the most common indications for caesarean delivery and the proportion of the total caesarean section rate accounted for by each group.

**Results**: The overall CS rate of the hospital was 31.55%. Robson group 5 (previous CS, single, cephalic,  $\geq$ 37 weeks) was the most represented with 33.99% of total caesarean deliveries, followed by group 2 (nulliparous, single, cephalic,  $\geq$ 37 weeks, induced labor) with 20.26% and group 1 (nulliparous, single, cephalic,  $\geq$ 37 weeks, spontaneous labor) with 11.76%. Fetal distress, non progression of labor and previous caesarean section were the most common indications for caesarean delivery. Comparisons with previous studies show a consistent trend with regard to the high proportion of groups 5 and 2 in the overall caesarean section rate.

**Conclusion**: It was found that previous CS and labor difficulties drive the tertiary hospital CS rate above the WHO recommended rate. There is a need to promote vaginal birth after caesarean (VBAC) and improve labor management interventions to avoid unnecessary cesarean births. The Robson categorization system helped identify areas for improvement in obstetric care.

**Keywords**: Caesarean section, Robson Ten Group Classification System, Maternal outcomes, vaginal birth after caesarean (VBAC), Obstetric Care

## Introduction

International health experts have recommended a caesarean section (CS) rate of 10%–15% since 1985<sup>1</sup>. However, the C-section rate is increasing worldwide, both in developed and developing countries. According to the National Family Health Survey (NFHS, 2015-2016), the caesarean section rate in India is 17.2%, while internationally, it is 21%<sup>2</sup>. This rising caesarean section rate is worrying because, although a caesarean section is life-saving, it should only be performed if it is medically necessary.

A caesarean section is necessary if a vaginal birth poses a risk to the mother or the fetus. However, a caesarean section without obstetric justification may not improve outcomes for the mother or newborn and may increase healthcare costs. The procedure increases the risk of maternal morbidity and mortality, postpartum haemorrhage, blood transfusion. prolonged hospitalization, postpartum infection, and future pregnancy complications such as retained and adherent placenta<sup>3,4</sup>. These risks emphasize the need to perform caesarean delivery only when medically necessary and under ideal clinical conditions.

Global health authorities recommend continuous audits of CS procedures, measures to optimize CS rates, and quality improvements in obstetrics to address rising CS rates. The use of the Robson Ten Group Classification System is an important strategy recommended by the WHO (2015) and FIGO (2016). Robson introduced this categorization method in 2001 to standardize the assessment, monitoring, and comparison of CS rates between health facilities<sup>5,6</sup>. The Robson classification divides women into 10 mutually exclusive categories based on parity, previous cesarean section, onset of labor, gestational age, and fetal presentation. This technique allows facilities to examine their CS rates, identify the root causes of high rates, and take targeted action to prevent unnecessary C-sections.

Kacerauskiene et al. applied Robson categorization in 19 Lithuanian hospitals, resulting in a significant decrease in cesarean section rates from 26.9% in 2012 to 22.7% in 2014 (p < 0.001)<sup>7</sup>. Ansari et al. found that re-reviewing cesarean deliveries using Robson categorization reduced CS rates from 54% to 38.2%<sup>8</sup>. These examples show how this categorization approach improves medical procedures and reduces unnecessary caesarean sections. Indian studies, such as one by Bansal et al. <sup>9</sup>, show how the Robson classification has been successfully used to review caesarean section data in tertiary care centers to identify the main causes of increasing caesarean section rates and guide targeted interventions.

CS rates are rising internationally despite attempts to slow them down. CS has quadrupled from 7% in 1990 to 21% of births, and this figure could reach 29% by 2030 <sup>1</sup>. Caesarean sections are essential in high-risk situations, although the WHO warns that not all are medically necessary. A caesarean section should only be performed if it is medically necessary to protect the mother and child.

Another major problem is the discrepancy between caesarean section rates in rich and developing countries. In sub-Saharan Africa, barely 5% of women undergo a CS, compared to 43% in Latin America and the Caribbean. Between 2005 and 2016, CS rates in India increased from 8% to 17%, mainly in private health facilities<sup>10,11,12</sup>. These higher rates do not necessarily indicate better maternal and neonatal outcomes. Studies show that CS rates of up to 10-15% improve outcomes, but higher rates do not. The WHO recommends keeping the CS rate between 10-15% of all births, as higher rates do not reduce maternal and neonatal morbidity and mortality <sup>13,14,1</sup>.

Global and Indian studies show increased CS rates. Pravina et al<sup>15</sup> used the Robson classification to review cesarean section rates in Bihar and found that rates were higher than WHO guidelines. Earlier cesarean section and labor difficulties were the main causes of the increased cesarean section rates, the researchers found. Bansal et al<sup>9</sup> studied a tertiary care center in northern India and came to similar conclusions. They emphasized the ability of the Robson classification to identify key groups contributing to the increase in cesarean section rates and suggested targeted interventions to optimize rates.

The global rise in CS rates is a serious public health concern due to maternal and perinatal risks, costs, and inequalities in access to healthcare<sup>16</sup>. There is no standardized, globally accepted categorization system for monitoring and comparing CS rates, making it difficult to analyze and address the reasons for this trend <sup>12</sup>. To remedy this, the WHO recommends the global

implementation of the Robson categorization system for measuring, monitoring, and comparing CS rates within and across healthcare facilities <sup>17,18</sup>.

In this study, we aim to assess cesarean section rates at a tertiary care hospital using the Robson Ten Group Classification System, identify key factors influencing the total CS rate, and provide solutions to optimize CS rates while enhancing maternal and newborn outcomes.

# Materials and methods

This 5 month retrospective observational study was conducted in Government Medical College Jalaun, a tertiary care institution, from April 2024 to August 2024. As the data were retrospective, the ethics committee of the institution waived informed consent. The hospital's obstetrics department provides comprehensive care for high-risk and complex pregnancies, including vaginal births and cesarean deliveries.

All deliveries at the hospital during the entire study period were eligible. The 485 births included 153 cesarean sections and 332 vaginal deliveries.

All personal data of the patients were kept confidential during the analysis. Anonymized retrospective data was analyzed in this study, so that no consent was required from the patients concerned. The ethics committee of the institution approved the research protocol.

The data came from the hospital's obstetric database and patient records. The main factors were maternal age, parity, obstetric history (including cesarean section), gestational age at delivery, mode of delivery (vaginal or cesarean section), reason for cesarean section, fetal position, singleton or multiple pregnancies, and maternal and fetal outcomes. The obstetric characteristics were used to classify the cesarean section patients into 10 categories using the Robson classification method. Maternal problems such as postpartum hemorrhage (PPH), anemia, wound infection, uterine rupture, blood transfusion, and ICU hospitalization were also recorded. Fetal outcomes, including stillbirths, ICU hospitalizations and Apgar scores, were recorded.

## The Robson classification

Births by cesarean section were categorized using the Robson Ten-Group Classification System (TGCS). This approach classifies women according to parity, onset of labor (spontaneous, induced or pre-cesarean), fetal position (cephalic, breech or other), number of fetuses and gestational age. This categorization enables a systematic comparison of cesarean section rates between groups of women and the identification of groups with high rates. Absolute and relative indications for cesarean section included fetal distress, previous cesarean sections, malpresentation (e.g. breech presentation), multiple pregnancies, severe pre-eclampsia/eclampsia and the mother's request for an elective cesarean section. The obstetricians documented these indications according to their clinical judgment.

## Statistical analysis

Data were stored in a structured database and analyzed using SPSS or R. Descriptive statistics were used to compare maternal and fetal characteristics of the Robson groups and cesarean section rates. Categorical values were presented as frequencies and percentages.

#### Results

Table 1: Distribution of participants according to mode of delivery

		n	%
Total Delivery (n=485)	VD	332	68.45
	LSCS	153	31.55

During the study period, 485 births were documented, of accord which 153 were cesarean sections (CS), which cate corresponds to a CS rate of 31.55% in our institution. and The predominant mode of delivery was vaginal, which the f Table 2: Baseline, clinical and obstetric conditions of the participants

accounted for 68.45% of cases. A more detailed categorization of cesarean sections, including elective and emergency types, could provide more insight into the factors influencing cesarean section rates (Table 1).

Variable		Number (n)	Percentage (%)
Age (years)	<20	4	2.61
	20–35	146	95.42
	>35	3	1.96
Parity	Nulliparous	74	48.36
	1 - 2	60	39.21
	>2	19	12.41
Previous CS	No	101	66.01
	Yes	52	33.99

Gestational age at delivery	<37 weeks (preterm)	4	2.61
	37–40 weeks (term)	110	71.89
	>40 weeks (post-dated)	39	25.49
Fetal presentation	Cephalic	121	79.08
1	Breech	29	18.95
	Transverse/oblique/brow/others	3	1.96
Number of fetuses	Singleton	151	98.69
	Multiple	2	1 30
Fetal status at hirth		152	00.34
i ctai status at ontin	Stillbirthe	1.02	0.65
			0.03
	Intrauterine death	0	0.00
Apgar score at five minutes	<7	6	3.92
	>7	147	96.08
Birth weight (g)	<1,500	1	0.65
	1,500–2,499	15	9.80
	2,500–3,999	133	86.93
	≥4,000	4	2.61
NICU admission	-	10	6.54
Neonatal mortality	-	1	0.65
Maternal morbidity and mortality	РРН	5	3.27
	Moderate/Severe Anemia	35	22.88
	Wound infection	5	3.27
	Postpartum AKI	0	0.00
	Blood transfusion	21	13.73
	Rupture uterus	0	0
	ICU admission	1	0.65
	Maternal mortality	0	0

The majority of the study participants (95.42%) were between 20and 35 years old. The breakdown of parity was 48.36% nulliparous, 39.21% had one or two previous births and 12.41% multiparous. 33.99% of women had a history of cesarean section, while 66.01% had no history, indicating an intact uterus. Most births occurred at term, 71.89% between 37 and 40 weeks. Preterm births before 37 weeks occurred in 2.61%, while 25.49% occurred after 40 weeks.

The majority of fetuses were in the cephalic position (79.08%), 18.95% in the breech position. Most pregnancies (98.69%) were singleton births. The fetal outcome was good: 99.34% of the fetuses were delivered alive and there was one stillbirth (0.65%).

Postpartum hemorrhage (PPH) occurred in 3.27% of mothers, while 22.88 were affected by moderate to severe anemia. Wound infections occurred in 3.27% of participants, and 13.73% of women required blood

transfusions. 1 woman(0.65%) required intensive care and no maternal deaths were reported.

#### Table 3: Distribution of CS by Robson's Ten Group Classification System

Group	Description	n	%
1	Nulliparous, single, cephalic pregnancy >37 weeks in spontaneous labor	18	11.76
2	Nulliparous, single, cephalic pregnancy >37 weeks who had labor induced or delivered before labor by CS	31	20.26
3	Multiparous, without previous uterine scar with single, cephalic pregnancy >37 weeks in spontaneous labor	10	6.54
4	Multiparous, without previous uterine scar with single, cephalic pregnancy >37 weeks who had labor induced or delivered by CS	4	2.61
5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy >37 weeks	52	33.99
6	All nulliparous with a single breech pregnancy	20	13.07
7	All multiparous with a single breech including women with previous scars	9	5.88
8	All women with multiple pregnancies including those with uterine scars	2	1.30
9	All women with a single pregnancy with transverse or oblique lie including women with previous scars	3	1.96
10	All women with single, cephalic <37 weeks including women with previous scars	4	2.61

The results of our study showed that group 5 (multiple births with previous cesarean sections, singleton births, cesarean section,  $\geq$ 37 weeks) had the largest proportion of all cesarean section cases, accounting for 33.99% of the total rate, indicating the significant influence of previous cesarean sections on the likelihood of repeat cesarean sections. Group 2 (nulliparous, singleton, head birth,  $\geq$ 37 weeks, induced labor or cesarean section before labor) had the second largest proportion with 20.26% of all cesarean section births.

Group 6 (nulliparous women with a single breech birth) was the third largest proportion with 13.07% of cesarean births. Group 1 (nulliparous, single, cephalic pregnancy,

 $\geq$ 37 weeks, spontaneous labor) was intensively monitored and accounted for 11.76% of the total cesarean section rate.

Groups 3, 4, 7, 8, 9 and 10 together accounted for only 21.96% of the total cesarean section rate. No cesarean deliveries were documented in group 9 (transverse or oblique births).

## Discussion

Our results are comparable to various previous studies on caesarean section rates and related variables, particularly using Robson's categorization method. Our study found a caesarean section rate of 31.55%, which is consistent with Chauhan et al. (2022)<sup>19</sup> 31.67% and Rajput et al. (2023)<sup>20</sup> 46.76%. Both studies suggest that caesarean births are becoming more common in modern obstetrics, as shown by global statistics.

Robson's categorization has helped to identify which demographic factors influence the C-section rate. Chauhan et al.  $(2022)^{19}$  and Rajput et al.  $(2023)^{20}$  found that Robson group 5 (early caesarean, simple caesarean, >37 weeks) had the highest proportion of caesarean sections. Group 5 accounted for 33.99% of caesarean sections in our analysis, which is consistent with Chauhan et al.  $(27.31\%)^{19}$  and Rajput et al.  $(13.41\%)^{20}$ . This highlights the need for careful primary caesarean management and promotion of vaginal birth after caesarean (VBAC) wherever possible. Previous caesarean sections significantly increase the risk of reintervention. Previous research has shown that refusal of VBAC was often caused by fears of labor discomfort or uterine rupture (Pravina et al., 2022)<sup>15</sup>.

In our study, group 2 (nulliparous, singular, cephalic, >37 weeks, induced labor or CS before labor) was found to account for the second largest proportion (20.26%), which is consistent with Chauhan et al. (2022)<sup>19</sup> and Rajput et al. (2023)<sup>20</sup>. To reduce unnecessary caesarean sections, induction of labor procedures should be reviewed and early surgical intervention should be evaluated.

As Group 1 (nulliparous, singleton, cephalic, >37 weeks, spontaneous labor) often reflects lower risk pregnancies, its contribution of 11.76% is noteworthy. Group 1 contributed 19.13% to the caesarean deliveries of Chauhan et al.  $(2022)^{19}$  and 9.01% to those of Rajput et al.  $(2023)^{20}$ . This shows that even in low-risk pregnancies, caesarean sections were performed due to non progression of labor or fetal distress or caesarean section on demand. Our study suggests that fetal distress, non progression of labor, malpresentation and previous caesarean sections are the main cause of surgical deliveries, similar to previous studies. Chauhan et al.  $(2022)^{19}$  and Rajput et al.  $(2023)^{20}$  also identified fetal distress, failure to progress as leading indications for caesarean section and emphasized the need for better labor monitoring methods such as cardiotocography to reduce overdiagnosis and unnecessary caesarean sections.

Our findings on caesarean section indications are consistent with those of Pravina et al.  $(2022)^{15}$ , Tura et al.  $(2018)^{21}$ , Das et al.  $(2018)^{22}$ , Maskey et al.  $(2019)^{23}$ , Chavda et al.  $(2017)^{24}$ , Nelson et al.  $(2017)^{25}$ , and Kose et al.<sup>26</sup>. These studies show comparable trends in the causes of caesarean section deliveries in different institutions and countries, with small variations in the proportions.

Our study found that fetal distress was one of the major reason for caesarean delivery in 31.15% of patients, comparable to Pravina et al.  $(2022)^{15}$ . Tura et al.  $(2018)^{21}$  found fetal distress in 24.3% of cases and Maskey et al.  $(2019)^{23}$  in 28%. Das et al.  $(2018)^{22}$  reported 10.97%, while Chavda et al.  $(2017)^{24}$  reported 0.90%. The diagnostic criteria and labor monitoring procedures could explain the differences between the studies in the incidence of fetal distress.

Both our study and previous studies show that previous caesarean sections influence mode of delivery in successive pregnancies. Our study and Pravina et al.  $(2022)^{15}$  found that 33.99% and 36.45% respectively of caesarean sections were due to a previous caesarean section, similar to the 35.72% of Kose et al.  $(2020)^{26}$ . Tura et al.  $(2018)^{21}$  and Das et al.  $(2018)^{22}$  found 16.9% and 29.96% respectively. To reduce the number of

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recurrent caesarean sections, initial caesarean sections need to be properly managed and VBAC promoted.

In our study, 5.66% caesarean section due to labor arrest was observed, comparable to Das et al.  $(2018)^{22}$  (13.93%) and Maskey et al.  $(2019)^{23}$  (12%). Labor arrest increases the caesarean section rates. Tura et al.  $(2018)^{21}$  reported 9.8%, while Nelson et al.  $(2017)^{25}$  reported 44%, showing significant differences in labor management in different situations.

Our analysis found that 6.77% of caesarean sections were due to failed induction, which is consistent with Das et al.  $(2018)^{22}$  (5.21%) and Kose et al.  $(2020)^{26}$ (12.93%). Following a failed induction, institutional procedures and maternal or fetal circumstances could influence the decision to have a caesarean section, so this is an area for targeted intervention to reduce unnecessary births.

Malpresentations particularly breech and transverse presentation, was an important signal in 20.9% of cases in our study, similar to Tura et al.  $(2018)^{21}$  (10.91%) and Das  $(2018)^{22}$  (6.08%). Chavda et al.  $(2017)^{24}$  found 18.6%, but Kose et al.  $(2020)^{26}$  found 4.44%. Inadequate application of the external cephalic version may minimize the number of caesarean sections with miscarriages.

Our study found that 2% of cases of severe preeclampsia/eclampsia required caesarean section, which is consistent with Tura et al.  $(2018)^{21}$  (3.4%) and Maskey at al.  $(2019)^{23}$  (4%). Kose et al.  $(2020)^{26}$ reported 7.18%. Preventing caesarean births in high-risk pregnancies requires early detection and treatment of pre-eclampsia.

Rarer but significant factors were multiple pregnancies (1.30%) or any maternal medical conditions. These signs were not found in previous studies, perhaps due to

patient demographics or institutional practices. Our 2.7% caesarean deliveries on demand demonstrate the increasing trend of elective caesarean deliveries and underscore the need for counseling and collaborative decision making to prevent them.

#### Conclusion

Our findings on indications for caesarean section are largely comparable to previous studies, although institutional procedures, patient demographics, and clinical care protocols differ. Fetal distress, history of previous caesarean section and non progression of labor are the most common indicators in all studies, suggesting opportunities to improve labor management and reduce caesarean rates. To improve maternal and infant outcomes, standards of care and evidence-based practices need to be maintained.

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