Research Article

Cuestiones de Fisioterapia

Medicine

Caesarean Section Audit Using Robson's Ten-Group Classification System And Identification Of High-Contribution Subgroups At A Tertiary Care Hospital: A Cross-Sectional Observational Study

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Abstract

Background: The use of caesarean section (CS) has increased worldwide, even in India, where the all-India CS rate is reported to be 21.5% by the National Family Health Survey (NFHS-5) and the CS rate varies significantly between states. The WHO has recommended using the Robson Ten-Group Classification System (TGCS) as a standard audit tool, which can be used to compare institutions and identify those high-contribution subgroups which can be targeted for quality improvement. In this study, CS rates were audited using the Robson TGCS, and factors that could be modified were identified at a tertiary care hospital.

Methods: This was a cross sectional observational study of all consecutive deliveries (2380 in 12 months) in a tertiary care hospital. Deliveries were grouped into the 10 Robson groups according to parity, gestational age, fetal presentation, onset of labour and the number of fetuses. Group-specific CS rates, absolute contributions to CS rates and relative contributions of each group to the CS rate were estimated. Multiple logistic regression analysis found independent factors associated with primary CS in Robson Group 1.

Results: Overall CS rate was 38.1% (n=907/2380). The biggest group was Robson Group 5 (previous CS, singleton cephalic, term) with 12.3% absolute contribution (92.1% of individuals within-group CS). Groups 1+2 together contributed 10.1%. Group 10 (preterm) contributed 4.0%. Risk factors for primary CS independent of the others were: non-progression of labour (aOR 4.8), fetal distress (aOR 3.6), nulliparous age ≥35 years (aOR 2.1) and BMI ≥30 (aOR 1.8). Elective repeat CS made up 58.3% of the total Group 5 CS.

Conclusions: Robson Groups 5 and 1 account for the majority of the above average CS rate at this institution. There is a need for targeted interventions, such as VBAC counselling, active labour management, and support for nulliparous women, to attain a clinically relevant CS rate

Keywords: Caesarean section; Robson classification; TGCS; obstetric audit; VBAC; primary caesarean; India.

Introduction

Caesarean section (CS) is the most widely performed major surgery in the world, and the proportion of births that are performed by cesarean section (CS) doubled from 12% to 21% between 2000 and 2015 [1].

The National Family Health Survey (NFHS-5, 2019-2021) shows that the CS rate in India has dramatically increased from 17.2% in 2015-16 (NFHS-4) to 21.5% across the country, while the rate in the private sector was 47.4% compared to 14.3% in the public sector. High risk pregnancies are not rare in tertiary care referral hospitals with rates of over 35-40% [2].

High rates of CS (above 10-15 % as recommended by WHO 2015) [1,2] do not provide any extra benefit in terms of survival benefit at the population level; CS is also linked to high rates of maternal morbidity from subsequent pregnancies, such as placenta accreta, uterine rupture, and anaesthetic complications. An increasing rate of CSs can lead to several long-term complications such as an increased incidence of a scarred uterus, which will also become a more common reason for repeat CS, forming a vicious circle hard to break without systematic changes [3].

A classification system developed by Michael Robson in 2001 [4] classifies all deliveries into one of ten mutually exclusive, totally inclusive groups depending on 5 obstetric parameters: parity, previous uterine scar, the gestational age, fetal presentation and onset of the labour. In 2015, WHO recommended the use of Robson TGCS as the global standard for CS monitoring [5] and subsequent multicountry studies have confirmed its utility for comparing CS rates across settings and for adjusting for the case-mix of the obstetric population [6].

Tertiary care hospitals in India receive a disproportionate share of complicated pregnancies — including previous CS, preeclampsia, multiple gestations, and malpresentations — which inflates institutional CS rates compared to community-level benchmarks. Robson TGCS allows decomposition of the overall CS rate into subgroup-specific contributions, enabling audit committees to distinguish case-mix effects from system-level or practice-pattern effects. By identifying Robson groups that contribute most to the overall CS rate and assessing within-group variation in CS rates for potentially modifiable indications, hospitals can design targeted quality-improvement programmes.

Despite the WHO endorsement of Robson TGCS, its systematic application in Indian tertiary care hospitals remains inconsistent [7]. This study aimed to apply the Robson TGCS prospectively over 12 months to all deliveries at a tertiary care hospital, identify the highest-contributing subgroups, describe primary CS indications, and determine independent predictors of primary CS in the key nulliparous group (Robson Group 1).

2. MATERIALS AND METHODS

2.1 Study Design and Setting

CS audit was done over 12 months in a tertiary care hospital, a cross sectional observational study. All

deliveries from the study period were included (consecutive deliveries). No information on stillbirths or fetal deaths at <20 weeks gestation was available. Approval received for IEC; data taken from EMRs and labour ward registers.

2.2 Robson Classification and Data Collection

All deliveries were allocated to one of the ten Robson groups on the day of the delivery by trained research staff, using a standardised proforma. The principal investigator verified the classification by checking the case records. Robson group assignment: Group 1—nulliparous, singleton, cephalic, ≥37 weeks, spontaneous labour; Group 2—nulliparous, singleton, cephalic, ≥37 weeks, induced or pre-labour CS; Group 3—multiparous (no previous CS), singleton, cephalic, ≥37 weeks, spontaneous labour; Group 4—multiparous (no previous CS), singleton, cephalic, ≥37 weeks, induced or pre-labour CS; Group 5—previous CS, singleton, cephalic, ≥37 weeks; Group 6—all nulliparous breeches; Group 7—all multiparous breeches (including previous CS); Group 8—all multiple pregnancies; and Group 9—all abnormal lies (transverse/oblique); and Group 10—all singleton cephalic <37 weeks.

Additional data: maternal age, BMI at booking, haemoglobin, gestational diabetes (GDM, DIPSI criteria), pregnancy-induced hypertension (PIH), anaemia (<11 g/dL), antenatal visits, indication for CS (categorised as: previous CS/elective repeat, non-progressive labour, fetal distress, malpresentation, antepartum haemorrhage, pre-eclampsia/eclampsia, other), neonatal outcomes (Apgar score at 1 and 5 minutes, birth weight, NICU admission), intraoperative complications, length of stay.

2.3 Statistical Analysis

The group size (n and % of total deliveries), CS rate within group and the absolute and relative contribution to the total CS rate (group CS n / total deliveries × 100%) and (group CS n / total CS n × 100%) were computed for each Robson group. Categorical comparisons were made using chi-square test. Independent predictors of primary CS in Robson Group 1 nulliparous women (SPL or induced labour) were analysed using multivariable binary logistic regression. The data was analysed using SPSS v26 and were found to be statistically significant at the level of $p<0.05$.

3. RESULTS

3.1 Delivery Characteristics and Overall CS Rate

During the 12-month study period, 2380 deliveries occurred. The overall CS rate was 38.1% (n=907). Vaginal deliveries totalled 1473 (61.9%); instrumental deliveries (vacuum/forceps) comprised 3.2% of all deliveries. Mean maternal age was 26.4 ± 4.1 years; 38.7% were nulliparous; GDM was present in 14.3%, PIH/pre-eclampsia in 9.1%. The Robson group distribution and CS contributions are summarised in Table

1.

Table 1: Robson Ten-Group Classification: Group Size, CS Rates, and Contributions to Overall CS Rate (n=2380 deliveries)

Robson Group	Group Description	Group Size (n)	% Total Deliveries	Group CS Rate	Absolute Contribution	Relative Contribution
1	Nullip, singleton cephalic ≥37wk, spontaneous labour	487	20.5%	17.2%	3.5%	9.2%
2	Nullip, singleton cephalic ≥37wk, induced/pre-labour CS	184	7.7%	48.4%	3.7%	9.8%
3	Multip (no prev CS), singleton cephalic ≥37wk, spontaneous	518	21.8%	6.4%	1.4%	3.7%
4	Multip (no prev CS), singleton cephalic ≥37wk, induced/CS	148	6.2%	27.0%	1.7%	4.4%
5	Prev CS, singleton cephalic ≥37wk	386	16.2%	92.1%	15.0%	39.4%
6	Nulliparous breech	47	2.0%	95.7%	1.9%	5.0%
7	Multiparous breech (incl prev CS)	62	2.6%	98.4%	2.5%	6.7%
8	Multiple pregnancies	48	2.0%	81.3%	1.6%	4.2%
9	Transverse/oblique lie	19	0.8%	100%	0.8%	2.1%
10	Singleton cephalic <37wk (preterm)	241	10.1%	38.6%	3.9%	10.3%
TOTAL	All deliveries	2380	100%	38.1%	38.1%	100%

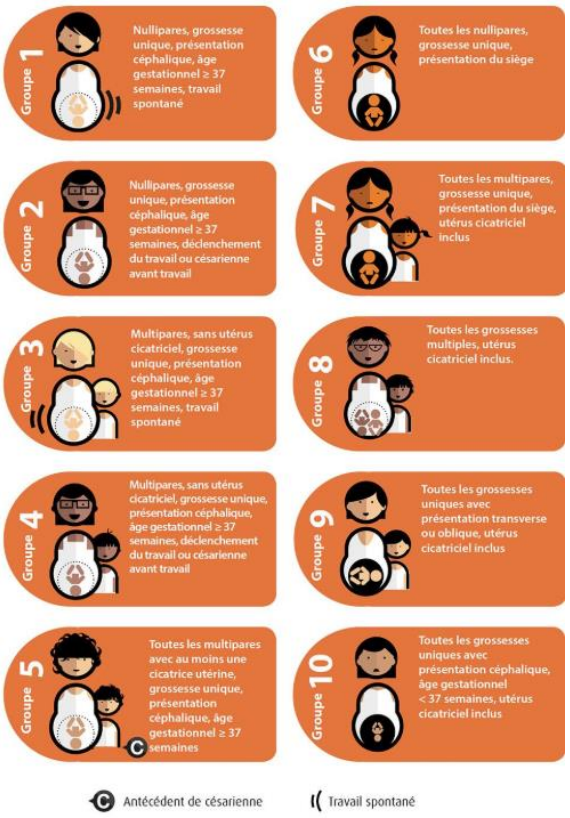


Figure 1: Robson Ten-Group Classification and Cesarean Section Contribution Analysis

3.2 Primary CS Indications and High-Contribution Group Analysis

Group 5 was the single largest contributor (15.0% absolute, 39.4% relative), with 92.1% CS rate. Of the 386 Group 5 deliveries, 58.3% underwent elective repeat CS; only 7.1% attempted trial of labour after caesarean (TOLAC), with VBAC success in 4 of 27 (14.8%) TOLAC attempts. Groups 1+2 together contributed 13.2% absolute (34.8% relative). In Group 1 (nulliparous spontaneous labour), the primary CS rate was 17.2%; leading indications were fetal distress (38.1%), non-progression of labour (29.2%), and cord prolapse (5.4%). In Group 2, elective CS (maternal request and clinician discretion) accounted for 21.4% of Group 2 CS.

Table 2: Primary Caesarean Section Indications by Robson Group (Expressed as % of CS within each Group)

CS Indication	Group 1 (n=84 CS)	Group 2 (n=89 CS)	Group 5 (n=356 CS)	Group 10 (n=93 CS)

Fetal distress / non-reassuring CTG	38.1%	14.6%	8.7%	27.9%
Non-progression of labour (1st/2nd stage)	29.2%	8.4%	4.5%	9.7%
Elective repeat (scar, no TOLAC)	—	—	58.3%	—
Failed induction	—	49.4%	—	—
Pre-eclampsia / eclampsia	4.8%	12.4%	5.3%	28.0%
Malpresentation / cord	5.4%	2.2%	1.7%	11.8%
APH / placenta praevia	6.0%	4.5%	8.7%	7.5%
Maternal request	4.8%	21.4%	11.5%	—
Other / combined indications	11.7%	7.1%	11.3%	15.1%

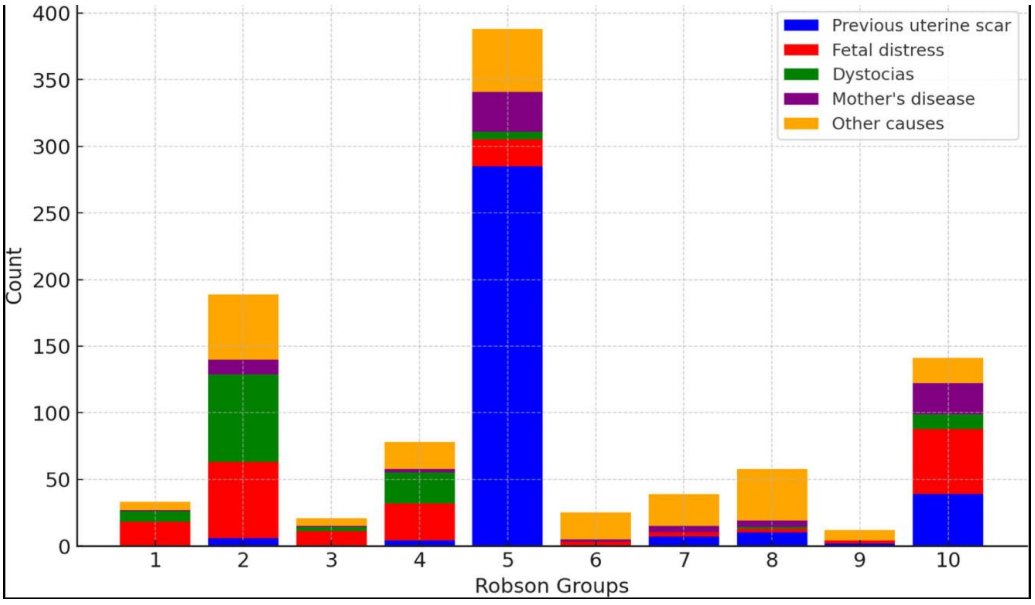


Figure 2: Distribution of Cesarean Section Indications Across Major Robson Groups

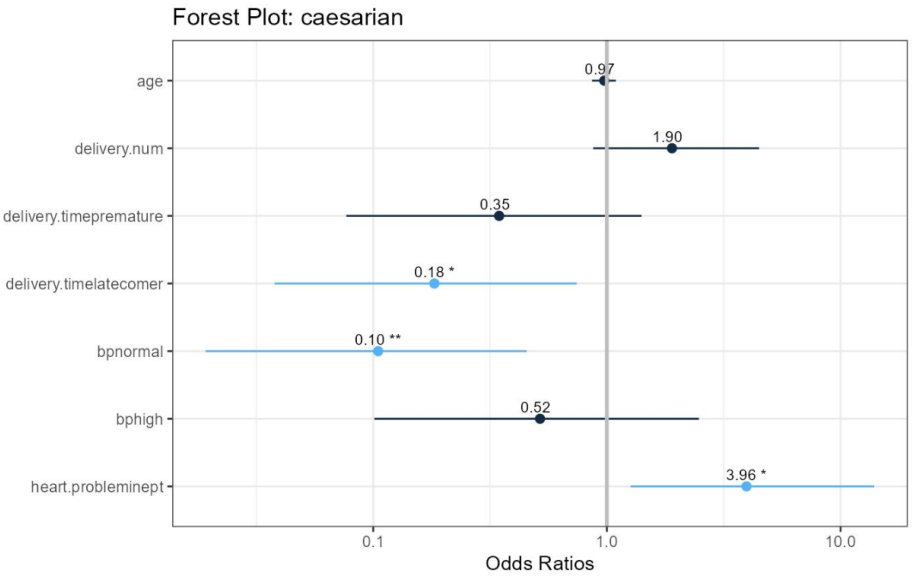
3.3 Multivariable Predictors of Primary CS in Robson Group 1

Among 487 Robson Group 1 deliveries, 84 (17.2%) underwent primary CS. Multivariable logistic regression (Table 3) identified four independent predictors of primary CS: fetal distress (CTG Category III or scalp-pH <7.20) (aOR 4.8; 95% CI 2.6–8.8; p<0.001), non-progression of labour (arrest disorder, Friedman criteria) (aOR 3.6; 95% CI 1.9–6.8; p<0.001), age ≥35 years (aOR 2.1; 95% CI 1.1–4.0; p=0.026),

and BMI ≥30 kg/m² at booking (aOR 1.8; 95% CI 1.0–3.4; p=0.049). GDM, anaemia, and presence of PIH did not independently predict primary CS after adjustment.

Table 3: Multivariable Logistic Regression: Predictors of Primary CS in Robson Group 1 Nulliparous Women (n=487)

Variable	Unadj OR (95% CI)	p-value	Adj OR (95% CI)	p-value
Fetal distress (Category III CTG)	5.4 (3.0–9.7)	<0.001	4.8 (2.6–8.8)	<0.001
Non-progression of labour	4.1 (2.2–7.6)	<0.001	3.6 (1.9–6.8)	<0.001
Age ≥35 years	2.4 (1.3–4.5)	0.007	2.1 (1.1–4.0)	0.026
BMI ≥30 kg/m² at booking	2.0 (1.1–3.7)	0.024	1.8 (1.0–3.4)	0.049
Gestational diabetes mellitus	1.6 (0.9–2.9)	0.12	1.3 (0.7–2.5)	0.39
Pregnancy-induced hypertension	1.4 (0.8–2.6)	0.25	1.2 (0.6–2.3)	0.58
Anaemia (Hb < 11 g/dL)	1.3 (0.7–2.4)	0.34	1.1 (0.6–2.1)	0.72



Discussion

The overall CS rate of 38.1% at this tertiary care referral hospital substantially exceeds the WHO recommended population-level target of 10-15% [1,2]. Robson TGCS analysis reveals that Group 5 (previous CS) is the dominant contributor, accounting for 39.4% of all CS — a finding consistent with reports from tertiary hospitals in India and globally [8], where a historical scar is increasingly becoming a self-fulfilling cycle of repeat CS in the absence of robust VBAC infrastructure.

The critically low VBAC attempt rate (7.1% of Group 5 eligible women) and the even lower VBAC success rate (14.8% of those attempting TOLAC) highlight a systemic failure to offer and support trial of labour after caesarean. Published meta-analyses report VBAC success rates of 60-80% in appropriately selected, well-monitored women with a single previous lower-segment CS, a single-layer closure, and no absolute contraindications [9]. The gap between published evidence and observed institutional practice suggests significant opportunity for structured VBAC counselling, consent documentation, and intrapartum monitoring pathways. FOGSI guidelines [10] and RCOG Green-top Guideline No. 45 [11] both support offering TOLAC in appropriate settings.

In Group 1 nulliparous women — who represent the initial entry point into the 'CS cascade' — the primary CS rate of 17.2% is higher than optimal. Fetal distress (38.1% of Group 1 CS) and non-progression of labour (29.2%) were the leading indications, both of which are potentially modifiable through improved intrapartum monitoring, judicious oxytocin augmentation guided by partograph, and one-to-one midwifery support in the first stage of labour [12]. The independent association of advanced maternal age (≥35 years) and maternal obesity (BMI ≥30) with primary CS in Group 1 reflects a changing demographic and nutritional profile of the obstetric population, warranting pre-conception and antenatal optimisation interventions.

From a quality-improvement standpoint, the Robson audit points to three actionable targets: (1) reducing elective repeat CS in Group 5 through VBAC counselling and a structured intrapartum monitoring pathway; (2) reducing primary CS in Group 1 through labour-support protocols, active management of labour, and objective CTG interpretation training; and (3) reviewing Group 2 (pre-labour CS and inductions in nulliparous women) to ensure inductions meet evidence-based criteria (failed induction accounted for 49.4% of Group 2 CS, suggesting potential for improved induction management). The WHO recommendation [13] is not to achieve a specific numerical target but to ensure every CS performed has a valid clinical indication — a goal achievable through regular Robson-based audit cycles.

Limitations: single-centre design and cross-sectional methodology preclude causal inference; data on antenatal risk stratification, patient preferences, and medico-legal concerns driving CS decisions were not systematically captured; neonatal outcomes data were incomplete for home-birth transfers. A prospective pre-post interventional study following targeted quality-improvement implementation would provide higher-level evidence.

5. CONCLUSION

Robson TGCS identified Group 5 (previous CS) and Groups 1+2 (nulliparous term singleton) as the dominant drivers of the elevated CS rate (38.1%) at this tertiary care hospital. The critically low VBAC attempt rate and the preventable primary CS in Group 1 represent the greatest modifiable opportunities. Regular Robson-based audit, VBAC counselling pathways, active labour management protocols, and clinical decision-support for CTG interpretation should be prioritised as quality-improvement initiatives

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