

Utility of the Robson Ten-Group Classification System in Categorising Maternal and Neonatal Outcomes at a Tertiary Care Centre: A Prospective Observational Study.

Abstract:

Background: The global rise in caesarean section (CS) rates poses significant challenges to obstetric care. The Robson Ten-Group Classification System (TGCS) offers a standardised framework for auditing delivery outcomes. Whilst validated internationally for CS rate analysis, its prospective utility in comprehensively categorising a broad spectrum of maternal and neonatal outcomes in a high-volume tertiary centre in central India has not been systematically studied.

Methods: A prospective observational study was conducted at the Department of Obstetrics and Gynaecology, Pt. J.N.M. Medical College and Dr. B.R.A.M. Hospital, Raipur, from March 2024 to February 2026 (24 months). A total of 690 women (≥ 28 weeks gestation, aged ≥ 18 years) were consecutively enrolled and classified into Robson groups at admission. Maternal outcomes (mode of delivery, postpartum haemorrhage, ICU admission, surgical site infection) and neonatal outcomes (APGAR score, birth weight, NICU admission, perinatal mortality) were recorded prospectively. Statistical analysis was performed with SPSS v25; a p-value < 0.05 was considered significant.

Results: Group 1 (nulliparous, term, cephalic, spontaneous labour) was the largest cohort ($n = 210$, 30.4%), followed by Group 5 (previous CS, $n = 133$, 19.3%). The overall CS rate was 53.5%; Group 5 contributed the highest absolute share (17.7%; group-specific rate 91.7%), with Group 1 as the second major contributor (13.5%; rate 44.3%). Neonatal outcome differed significantly across Robson groups ($p = 0.001$): Group 8 (multiple pregnancy) recorded a NICU admission rate of 59.3%, whilst Group 10 (preterm, cephalic) showed the highest intrauterine death rate (6.3%) and NICU admission rate (29.7%). Robson classification correlated significantly with gestational age, blood loss, mode of delivery, episiotomy use, APGAR score, birth weight, and neonatal outcome (all $p \leq 0.002$). Maternal morbidity did not differ significantly across groups ($p = 0.69$).

Conclusion: The Robson TGCS is a practical and reliable tool for auditing CS rates and stratifying neonatal risk at a tertiary centre. A high primary CS rate in Group 1 and an almost universal repeat CS rate in Group 5 represent priority targets for quality-improvement interventions. The system should be supplemented with maternal comorbidity data for comprehensive morbidity assessment.

Keywords: *Robson classification; caesarean section audit; maternal outcomes; neonatal outcomes; tertiary obstetric care; VBAC.*

Introduction

The steady global rise in caesarean section rates over recent decades has transformed this life-saving procedure into a subject of intense clinical and public health scrutiny. Whilst appropriately indicated CS unequivocally reduces maternal and neonatal morbidity, its indiscriminate use is associated with increased short- and long-term risks for mother and child, together with escalating healthcare costs [1]. A persistent challenge for clinicians and health systems alike has been the absence of a uniform, reproducible method for analysing CS rates in relation to clinical outcomes.

The Robson Ten-Group Classification System (TGCS), developed in 2001, addresses this gap by classifying all women admitted for delivery into ten mutually exclusive and totally inclusive groups defined by five universally available obstetric parameters: parity, previous CS, onset of labour, fetal presentation, and gestational age [2]. The system mirrors real-world clinical decision-making, eliminates ambiguity, and permits meaningful comparison across institutions, regions, and time periods. Endorsed by the World Health Organization (WHO), it provides a common language for obstetric audit [3,4].

Beyond CS rate monitoring, the TGCS is increasingly applied to a broader spectrum of maternal outcomes—postpartum haemorrhage (PPH), operative vaginal delivery, ICU admission, and infection—and neonatal outcomes including APGAR scores, NICU admission, birth weight, and perinatal mortality [5]. By stratifying women into clinically coherent groups, each with a distinct risk profile, the system permits identification of populations in which targeted interventions may yield the greatest benefit [6,7].

Despite extensive international validation, prospective data from high-volume tertiary centres in central India, applying the Robson system comprehensively to both maternal and neonatal outcomes beyond CS rates, remain limited. This study addresses that gap by prospectively classifying all eligible deliveries over 24 months and systematically linking each Robson group to a wide array of predefined outcomes.

Materials and Methods

Study design and setting. A prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Pt. J.N.M. Medical College and Dr. B.R.A.M. Hospital, Raipur,

Chhattisgarh—a high-volume tertiary referral centre serving both urban and rural populations—from March 2024 to February 2026.

Participants. All pregnant women aged ≥ 18 years with a gestational age of ≥ 28 weeks who were admitted for delivery and provided written informed consent were eligible. Women with a previous classical CS, uterine rupture in a prior pregnancy, placenta accreta spectrum disorder, or placental abruption at admission were excluded.

Sample size. Using the Cochran formula with a reference CS rate of 31.4% (95% confidence, 5% margin of error), the minimum required sample was 331; 690 women were enrolled to enhance precision.

Classification and data collection. Each participant was classified into one of the ten Robson groups at admission using the WHO-recommended standardised flowchart. Demographic, obstetric, intrapartum, and outcome data were recorded prospectively in a pretested structured proforma by the principal investigator and trained residents, with monthly data audits.

Outcome variables. Maternal outcomes included mode of delivery, blood loss, episiotomy, perineal tear, PPH, ICU admission, surgical site infection (SSI), and maternal mortality. Neonatal outcomes included APGAR score at five minutes, birth weight, NICU admission, intrauterine death (IUD), and preterm delivery rate.

Statistical analysis. Data were analysed using SPSS v25.0. Continuous variables are presented as mean $\pm$ SD; categorical variables as frequencies and percentages. Between-group comparisons used the chi-square or Fisher's exact test for categorical variables and the independent t-test or Mann-Whitney U test for continuous variables. A two-sided p-value < 0.05 was considered statistically significant.

The study was approved by the Institutional Ethics Committee of Pt. J.N.M. Medical College and conducted in accordance with the Declaration of Helsinki.

Results

Study cohort and Robson group distribution. A total of 690 women were enrolled; 705 neonates were analysed (including multiple pregnancies). The majority of participants were aged 24–29 years (67.0%). Most deliveries occurred at term (37– <40 weeks: 81.6%). Group 1 was the largest group ($n = 210$, 30.4%), followed by Group 5 ($n = 133$, 19.3%), Group 3 ($n = 113$, 16.4%), Group 2 ($n = 88$, 12.8%), and Group 10 ($n = 63$, 9.1%) (Table 1). Gestational age distribution differed significantly across Robson groups ($p = 0.001$), with preterm deliveries concentrated in Group 10.

89 **Table 1. Distribution of women across Robson's Ten Groups (N = 690).**

Group	Definition	n (%)	CS rate (%)
1	Nulliparous, singleton, cephalic, ≥ 37 wk, spontaneous labour	210 (30.4)	44.3
2	Nulliparous, singleton, cephalic, ≥ 37 wk, induced or pre-labour CS	88 (12.8)	53.4
3	Multiparous (no prev. CS), singleton, cephalic, ≥ 37 wk, spontaneous labour	113 (16.4)	22.1
4	Multiparous (no prev. CS), singleton, cephalic, ≥ 37 wk, induced or pre-labour CS	39 (5.7)	25.6
5	Previous CS, singleton, cephalic, ≥ 37 wk	133 (19.3)	91.7
6	Nulliparous, singleton, breech	15 (2.2)	93.3
7	Multiparous, singleton, breech (incl. prev. CS)	11 (1.6)	90.9
8	Multiple pregnancy	14 (2.0)	57.1
9	Singleton, transverse or oblique lie	4 (0.6)	100.0
10	Singleton, cephalic, < 37 wk (preterm)	63 (9.1)	57.1
Total		690 (100)	53.5

90 *CS = caesarean section. CS rate = group-specific caesarean section rate.*

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 92 **Caesarean section rates.** The overall CS rate was 53.5% (369/690). Group 5 was the largest absolute
 93 contributor (17.7% of all CS deliveries; group-specific rate 91.7%), followed by Group 1 (absolute
 94 contribution 13.5%; rate 44.3%), Group 2 (6.8%; 53.4%), and Group 10 (5.2%; 57.1%). Groups 6, 7, and
 95 9, though small, had CS rates of 93.3%, 90.9%, and 100.0%, respectively. Vaginal delivery was highest in
 96 Group 3 (77.9%) and Group 4 (74.4%); Group 5 achieved vaginal birth in only 8.3% of cases (Table 1).

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 98
 99 **Neonatal outcomes.** Neonatal outcome differed significantly across Robson groups ($p = 0.001$) (Table 2).
 100 Overall, 88.2% of neonates (621/704) were stable, 10.4% (73/704) required NICU admission, and 1.4%
 101 (10/704) were intrauterine deaths. Group 8 carried the highest NICU burden (59.3%), whilst Group 10

had the highest rates of both IUD (6.3%) and NICU admission (29.7%). Low birth weight (1500–<2500 g) was predominantly observed in Group 10 (27.6% of the group) and Group 8 (18.1%). Most neonates (81.6%) had a normal birth weight of 2500–3999 g. APGAR scores differed significantly across groups ($p = 0.01$); low scores (≤ 6) were most frequent in Group 10.

Table 2. Neonatal outcomes by Robson group (N = 704 neonates).

Group	IUD, n (%)	NICU admission, n (%)	Stable, n (%)
1	0 (0.0)	19 (9.0)	192 (91.0)
2	1 (1.1)	4 (4.5)	83 (94.3)
3	0 (0.0)	5 (4.4)	108 (95.6)
4	1 (2.6)	2 (5.1)	36 (92.3)
5	4 (3.0)	5 (3.8)	124 (93.2)
6	0 (0.0)	2 (13.3)	13 (86.7)
7	0 (0.0)	1 (9.1)	10 (90.9)
8	0 (0.0)	16 (59.3)	11 (40.7)
9	0 (0.0)	0 (0.0)	4 (100.0)
10	4 (6.3)	19 (29.7)	40 (64.1)
Total	10 (1.4)	73 (10.4)	621 (88.2)

IUD = intrauterine death; NICU = neonatal intensive care unit. Distribution differs significantly across groups ($p = 0.001$).

Maternal outcomes. Of 690 women, 661 (95.8%) were stable at discharge. Twenty-three required ICU admission, four developed SSI, and two had postpartum febrile illness. Blood loss differed significantly across Robson groups ($p = 0.002$); excessive blood loss (>1000 mL) occurred in four cases. Episiotomy was performed in 62.9% of vaginal deliveries and differed significantly across groups ($p = 0.001$), with

the highest proportions in Groups 1 (78.6%) and 2 (~90.2%). Perineal tear was rare (1/321 vaginal deliveries; $p = 0.95$). Overall maternal morbidity did not differ significantly across Robson groups ($p = 0.69$).

Table 3. Maternal outcomes by Robson group (N = 690).

Group	Stable, n (%)	ICU admission, n (%)	SSI, n (%)	Febrile illness, n (%)
1	202 (96.2)	6 (2.9)	1 (0.5)	1 (0.5)
2	84 (95.5)	3 (3.4)	0 (0.0)	1 (1.1)
3	111 (98.2)	1 (0.9)	1 (0.9)	0 (0.0)
4	38 (97.4)	1 (2.6)	0 (0.0)	0 (0.0)
5	127 (95.5)	4 (3.0)	2 (1.5)	0 (0.0)
6	14 (93.3)	1 (6.7)	0 (0.0)	0 (0.0)
7	11 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
8	14 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
9	4 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
10	56 (88.9)	7 (11.1)	0 (0.0)	0 (0.0)

SSI = surgical site infection. Association between Robson group and maternal morbidity: $p = 0.69$ (not significant).

Discussion

This prospective study of 690 deliveries prospectively classified by the Robson TGCS at a high-volume tertiary centre in central India confirms the system's practical value in auditing CS rates and stratifying neonatal risk. An overall CS rate of 53.5%—substantially higher than the WHO's recommended range of 10–15%—was primarily driven by Group 5 and Group 1, consistent with international findings [8,9].

Group 5 and repeat CS. Group 5 (previous CS) contributed 91.7% of its deliveries by CS, accounting for 17.7% of all CS in the cohort. This is comparable to Chong et al. (2012), who reported that Group 5 and Group 1 together accounted for 75% of the rise in CS rates over 11 years [10], and to Tan et al. (2015), who found Group 5 contributing 25.9% to the overall CS rate [11]. The vaginal birth after caesarean (VBAC) rate of only 8.3% in the present study is notably lower than the 18.8% reported by Tan et al. [11] and the higher rates achievable in centres with structured VBAC programmes [12]. Strategies to increase VBAC rates—including rigorous candidate selection, dedicated VBAC clinics, and enhanced intrapartum monitoring—could meaningfully reduce the CS burden driven by Group 5.

Group 1 and primary CS. The 44.3% CS rate in Group 1 (nulliparous, low-risk, spontaneous labour) is substantially higher than the 20–30% reported from high-income settings and the 30–40% range typical of Indian tertiary centres [13,14]. This reflects several system-level factors: a low threshold for diagnosing fetal distress, CTG over-interpretation, medico-legal concerns, limited labour analgesia, and variable adherence to labour management guidelines. Because each primary CS in Group 1 directly augments future Group 5 numbers and associated complications—including abnormal placentation and surgical morbidity—reducing unnecessary operative delivery in this group is the single most impactful intervention available to this institution.

Neonatal risk and high-risk groups. Group 8 (multiple pregnancy) and Group 10 (preterm, cephalic) emerged as the groups with the greatest neonatal vulnerability. The 59.3% NICU admission rate in Group 8 and the 29.7% rate in Group 10 are consistent with international data demonstrating the combined effects of prematurity, malpresentation, and operative delivery on neonatal morbidity [5,15]. The group-specific IUD rate of 6.3% in Group 10 principally reflects complications of preterm birth and associated conditions such as hypertensive disorders of pregnancy. The Robson framework’s ability to prospectively identify these groups supports targeted preparedness—including NICU staffing anticipation and antenatal counselling—at the time of admission.

Maternal morbidity. The absence of a statistically significant association between Robson group and overall maternal morbidity ($p=0.69$) is partly explained by a limitation inherent to the classification itself: the TGCS does not capture maternal comorbidities such as hypertensive disorders of pregnancy, gestational diabetes mellitus, or anaemia, which are known to independently influence maternal outcomes. As highlighted by Colais et al. [16] and Barnard-Mayers et al. [17], supplementing Robson-based analyses with comorbidity data is essential for a comprehensive morbidity assessment. The high episiotomy rate (62.9%) merits an institution-specific audit; evidence-based guidelines favour a restrictive approach, which reduces severe perineal trauma by approximately 30% [18].

Recommendations. Based on these findings, the following priority interventions are proposed: (1) optimise labour management in Group 1 through standardised CTG training, rigorous partograph use, and increased availability of labour analgesia; (2) establish a structured VBAC programme for eligible Group 5 candidates; (3) implement indication-based induction protocols for Group 2 & 4, avoiding elective induction without adequate cervical favourability; and (4) maintain heightened NICU preparedness for Groups 8 and 10. A formal, cyclical Robson-based audit mechanism should be institutionalised to monitor the impact of these interventions over time.

This study has several strengths, including its prospective design, large sample size, comprehensive outcome ascertainment, and standardised classification methodology. Limitations include the single-centre tertiary setting (which inflates CS rates relative to lower-level facilities), the absence of detailed CS indication data, and short-term follow-up precluding assessment of long-term outcomes.

Conclusion

The Robson Ten-Group Classification System is a practical, reproducible, and clinically meaningful framework for auditing obstetric outcomes at a tertiary centre. An overall CS rate of 53.5%, driven principally by Group 5 and Group 1, underscores the urgent need to promote VBAC and reduce primary CS in low-risk nulliparous women. Neonatal risk was concentrated in Groups 8 and 10, where targeted antenatal preparation and NICU resources are warranted. Used alongside maternal comorbidity data and detailed CS indication records, the Robson TGCS provides a powerful platform for evidence-based quality improvement in obstetric care.

Acknowledgements

The authors acknowledge the patients who consented to participate, the clinical and nursing staff of the labour ward and maternity units, and the Department of Obstetrics and Gynaecology, Pt. J.N.M. Medical College and Dr. B.R.A.M. Hospital, Raipur, for facilitating data collection and follow-up.

Conflict of Interest

The authors declare no conflicts of interest relevant to this work.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sector.

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