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Original Research Article

Impact of a standardized labour room management protocol on labour processes and World Health Organization Robson classification – a quality dashboard-based study

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ABSTRACT

Background: Crude caesarean section (CS) rates inadequately capture labour room quality because they are confounded by case mix. We evaluated a standardized labour room management protocol using a multidimensional labour room quality dashboard incorporating the World Health Organization (WHO) Robson ten-group classification system (TGCS).

Methods: This retrospective before-and-after quality improvement study compared all deliveries during two identical one-month periods-July 2024 (pre-intervention, n=58) and July 2025 (post-intervention, n=76)-at a tertiary care teaching hospital in India. Labour process, delivery outcome, workflow, case-mix, and Robson-group indicators were compared using chi-square or Fisher's exact test. Multivariable logistic regression identified independent predictors of CS.

Results: Spontaneous onset of labour increased from 29.3% (17/58) to 60.5% (46/76), while induction decreased from 44.8% (26/58) to 13.2% (10/76) (χ^2=19.10, p<0.001). Overall CS rates remained unchanged (39.7% versus 40.8%; p=1.000), as did daytime versus night-time delivery (84.5% versus 86.8%; p=0.890). Robson group 1 increased from 1.7% to 25.0%, while induction-related group 4a decreased from 22.4% to 1.3% (χ^2=41.08, df=9, p<0.001). No individual Robson group showed a significant change in internal CS rates. On adjusted regression, the post-intervention period was not independently associated with CS (aOR 1.55, 95% CI 0.70-3.41, p=0.281); induction showed a non-significant trend toward higher CS odds (aOR 2.41, 95% CI 0.99-5.88, p=0.053).

Conclusions: The standardized protocol reduced induction and increased spontaneous labour without changing CS rates or birth timing. A multidimensional dashboard may provide a more informative assessment of labour ward performance than CS rate alone.

Keywords: Labour room quality improvement, WHO Robson classification, Caesarean section, Induction of labour, Quality dashboard, LaQshya

INTRODUCTION

Rising caesarean section (CS) rates have become a global concern, since unnecessary operative delivery adds avoidable risk for both mother and neonate while placing further strain on already limited health resources.[1] The World Health Organization (WHO) has stressed that obstetric care should aim to give every woman the mode of birth that is right for her, rather than chase an arbitrary institutional CS target.[2]

The crude CS rate on its own, however, is a poor quality indicator, since it is heavily shaped by case mix, referral pattern, and how many high-risk pregnancies a unit manages.[3] The WHO-endorsed Robson ten group classification system (TGCS) gets around this problem by placing every woman into one of ten mutually exclusive, fully inclusive groups based on parity, previous CS, onset of labour, gestational age, fetal presentation and plurality, allowing case mix and group-specific CS rates to be compared meaningfully across settings and over time.[4,5] It is now the internationally preferred tool for CS audit and benchmarking.[6,7]

Maternity “dashboards” that track several process and outcome indicators together, rather than relying on the CS rate alone, have been promoted as a clinical governance tool ever since the royal college of obstetricians and gynaecologists introduced the concept.[8] In India, the government's labour room quality improvement initiative (LaQshya) has strengthened intrapartum care through standardized protocols, infection control and respectful maternity care, but there is still little evidence from Indian tertiary centres on how such protocols actually change labour processes and Robson-group distribution, as distinct from infrastructure or documentation compliance.[9,10]

Our department introduced a standardized labour room management protocol to rationalize induction practice, encourage spontaneous labour wherever appropriate, and bring induction and operative-delivery decisions under consultant-led, consensus-based review. We assessed its impact using a labour room quality dashboard that brings together routinely collected process, outcome, workflow and Robson-classification indicators, comparing performance before and after the change. Our primary aim was to examine the effect of the protocol on labour processes, delivery outcomes and WHO Robson group distribution; secondary aims were to compare the timing of birth and to identify independent predictors of caesarean delivery.

METHODS

This retrospective before-and-after quality improvement study was carried out in the department of obstetrics and gynaecology of a tertiary care teaching hospital in India, comparing all deliveries in two identical calendar months: July 2024 (pre-intervention) and July 2025, after the standardized labour room protocol had been implemented (post-intervention).

Intervention

A departmental policy change was introduced in December 2024 after a high baseline caesarean section rate was identified at our centre. Before this, antenatal women were routinely admitted to the labour room either in early labour or at ≥37 weeks of gestation for induction of labour.

The intervention comprised standardization of induction indications with restriction of non-medically indicated early-term induction, consultant-led decision-making for induction and operative delivery, structured labour monitoring, and a departmental preference for spontaneous labour onset where clinically appropriate. The labor room staff was sensitized about policy change.

Data for comparison were collected for July 2024 (pre-intervention) and July 2025 (post-intervention). July was chosen in both years because it falls at a stable point in the department's academic and duty-roster cycle, which limits confounding from staffing turnover, and because comparing identical calendar months also controls for seasonal variation in case-mix and workload.

All women who delivered during the two study periods were eligible for inclusion; records with missing data on mode of delivery or labour characteristics were excluded. Data were extracted from labour room and operative registers and analysed at the individual-delivery level (n=134) using python 3.12 (pandas, SciPy and statsmodels). Categorical variables were compared using Pearson's chi-square test, and Fisher's exact test was used wherever expected cell counts fell below 5, including for all Robson group-specific comparisons. Women were classified using the WHO Robson ten-group classification system (TGCS).[4,5] For each Robson group we calculated the relative group size, the within-group caesarean rate, and its contribution to the overall caesarean rate, and compared these between the two periods.

Binary logistic regression was used to identify independent predictors of caesarean delivery. A full a-priori model (period, previous CS, nulliparity, induction, gestational age, hypertensive disorders, PPROM) showed quasi-separation, as previous CS almost perfectly predicted CS; we therefore used a more parsimonious model retaining period, nulliparity and induction of labour, in keeping with international evidence that induction independently influences CS risk.[11] Adjusted odds ratios (aOR) with 95% confidence intervals are reported; $p<0.05$ was taken as significant.

We built a labour room quality dashboard from routinely collected obstetric quality indicators across five domains, to compare labour room performance before and after the protocol was implemented. This was intended as a descriptive quality-improvement tool, and no composite score was calculated.

Domain A (case-mix)

Primigravida proportion, previous caesarean section, high-risk pregnancy, preterm pregnancy.

Domain B (labour process)

Spontaneous onset, induction, elective caesarean section, emergency caesarean section.

Domain C (delivery outcome)

Vaginal delivery rate, caesarean section rate.

Domain D (workflow)

Daytime (06:01-18:00) versus night-time (18:01-06:00) deliveries; distribution across four six-hour blocks.

Domain E (WHO Robson indicators)

Relative group size, group-specific CS rate, absolute and relative contribution to overall CS rate.

Outcome measures

Primary outcome: the change in induction rate, spontaneous onset of labour, overall caesarean section rate, and WHO Robson group distribution. Secondary outcomes: vaginal delivery rate, daytime versus night-time delivery, Robson group-specific caesarean rates, distribution across six-hour time blocks, and independent predictors of caesarean section.

RESULTS

A total of 134 deliveries were analysed, comprising 58 in July 2024 and 76 in July 2025. The demographic, obstetric and high-risk pregnancy characteristics of the study participants are presented in Table 1. Maternal age was similar between the pre- and post-intervention periods (28.3±3.7 versus 28.8±4.1 years, p=0.437). The post-intervention period had higher proportions of primigravidas (38.2% versus 22.4%), previous caesarean sections (22.4% versus 5.2%), and high-risk pregnancies (46.1% versus 34.5%), while preterm pregnancies were less frequent (14.5% versus 25.9%).

The protocol was associated with a clear shift in how labour began: spontaneous labour rose sharply and induction fell, while elective CS without labour stayed much the same (Table 2 and Figure 1).

Despite this shift, the overall CS rate, vaginal delivery rate, and the split between daytime and night-time delivery did not change significantly (Table 2).

Women were also redistributed across the WHO Robson groups: group 1 (nulliparous, spontaneous, term, cephalic) grew substantially while induction-related group 4a shrank, alongside a fall in group 2a and small increases in groups 5-8 (Table 3 and Figure 2).

Group 5 (previous CS) became the largest single contributor to the overall CS burden after the intervention, since almost every woman with a prior CS underwent a repeat CS in both periods. No individual Robson group showed a significant within-group change in CS rate, other than group 2a, and that finding rests on only four post-intervention women (Table 3).

On multivariable analysis, the post-intervention period was not independently associated with caesarean delivery once nulliparity and induction of labour were accounted for; induction showed a trend toward higher odds of CS that fell just short of significance (Table 4 and Figure 3). Taken together, the protocol changed how women entered labour and how they were distributed across Robson groups, without measurably altering the overall CS rate, the timing of birth, or within-group CS rates, apart from the small group 2a subset noted above.

Labour room quality dashboard summary

Table 5 pulls together Domains A-D of the labour room quality dashboard, giving an at-a-glance comparison of case-mix, labour process, delivery outcome and workflow indicators before and after the protocol was introduced (Domain E, the Robson-based indicators, is presented separately in Table 3).

Table 1: Study population, case-mix and high-risk pregnancy characteristics.

Variable	July 2024 (n=58), (%)	July 2025 (n=76), (%)	P value
Maternal age (years), mean±SD	28.26±3.66	28.76±4.13	0.437
Primigravida	22.4	38.2	-
Previous caesarean section	5.2	22.4	-
Any high-risk pregnancy factor[a]	34.5	46.1	-
Preterm pregnancy (<37 weeks)	25.9	14.5	-
Hypertensive disorders of pregnancy	5.2	10.5	0.349[b]
Gestational diabetes mellitus	13.8	11.8	0.797[b]
Twin pregnancy	0.0	2.6	0.505[b]
PPROM	0.0	3.9	0.258[b]
Hypothyroidism	19.0	22.4	0.673[b]
Bad obstetric history	1.7	3.9	0.633[b]
Fetal growth restriction	0.0	6.6	0.069[b]
Intrahepatic cholestasis of pregnancy	0.0	6.6	0.069[b]

[a]Presence of ≥1 of: hypertensive disorders of pregnancy, gestational diabetes, twin pregnancy, PPROM, hypothyroidism, bad obstetric history, fetal growth restriction, or intrahepatic cholestasis; [b]Fisher's exact test

Table 2: Labour process, delivery outcome and workflow indicators.

Domain/indicator	July 2024 (n=58), N (%)	July 2025 (n=76), N (%)	P value
Labour process: spontaneous labour	17 (29.3)	46 (60.5)	<0.001[a]
Labour process: induced labour	26 (44.8)	10 (13.2)	<0.001[a]
Labour process: elective caesarean section	15 (25.9)	20 (26.3)	<0.001[a]
Delivery outcome: vaginal birth	35 (60.3)	45 (59.2)	1.000[b]
Delivery outcome: caesarean section	23 (39.7)	31 (40.8)	1.000[b]
Workflow: daytime delivery (06:01-18:00)	49 (84.5)	66 (86.8)	0.890[b]
Workflow: night-time delivery (18:01-06:00)	9 (15.5)	10 (13.2)	0.890[b]

[a]Pearson chi-square (3-category test across the three labour-onset categories, df=2); [b]Pearson chi-square with continuity correction

Table 3: WHO Robson group distribution, group-specific caesarean rate and contribution to overall caesarean burden.

Robson group	N (%) July 2024	N (%) July 2025	CS rate % July 2024	CS rate % July 2025	Rel. contrib.[a] % July 2024	Rel. contrib.[a] % July 2025	Fisher's p[b]
Group 1	1 (1.7)	19 (25.0)	0.0	5.3	0.0	3.2	1.000
Group 2a	9 (15.5)	4 (5.3)	22.2	100.0	8.7	12.9	0.021
Group 3	12 (20.7)	22 (28.9)	0.0	0.0	0.0	0.0	1.000
Group 4a	13 (22.4)	1 (1.3)	23.1	100.0	13.0	3.2	0.286
Group 5	7 (12.1)	15 (19.7)	100.0	100.0	30.4	48.4	1.000
Group 6	0 (0.0)	2 (2.6)	-	100.0	0.0	6.5	NE
Group 7	0 (0.0)	2 (2.6)	-	100.0	0.0	6.5	NE
Group 8	0 (0.0)	2 (2.6)	-	50.0	0.0	3.2	NE
Group 9	1 (1.7)	0 (0.0)	100.0	-	4.3	0.0	NE
Group 10	15 (25.9)	9 (11.8)	66.7	55.6	43.5	16.1	0.678

[a]Relative contribution=proportion of that period's total caesarean sections (23/58, 39.7% in 2024; 31/76, 40.8% in 2025) contributed by the group. [b]Fisher's exact test comparing vaginal: CS ratio within the group between 2024 and 2025; NE=not estimable (zero deliveries in one period). Overall Robson group distribution differed significantly between periods ($\chi2=41.08$, df=9, $p<0.001$)

Table 4: Parsimonious multivariable logistic regression for predictors of caesarean section

Predictor	Adjusted OR	95% CI	P value
Post-intervention period (July 2025 versus July 2024)	1.55	0.70-3.41	0.281
Nulliparity	0.50	0.22-1.14	0.098
Induction of labour	2.41	0.99-5.88	0.053

Likelihood ratio $\chi^2=5.20$, df=3, p=0.158

Table 5: Labour room quality dashboard - domains A-D.

Domain	Indicator	July 2024 (%)	July 2025 (%)
A. case-mix	Primigravida	22.4	38.2
A. case-mix	Previous caesarean section	5.2	22.4
A. case-mix	Any high-risk pregnancy factor	34.5	46.1
A. case-mix	Preterm pregnancy (<37 weeks)	25.9	14.5
B. labour process	Spontaneous onset of labour	29.3	60.5
B. labour process	Induction of labour	44.8	13.2
B. labour process	Elective caesarean section	25.9	26.3
B. labour process	Emergency caesarean section	13.8	14.5
C. delivery outcome	Vaginal delivery rate	60.3	59.2
C. delivery outcome	Caesarean section rate	39.7	40.8
D. workflow	Daytime delivery (06:01-18:00)	84.5	86.8
D. workflow	Night-time delivery (18:01-06:00)	15.5	13.2

Emergency caesarean section=caesarean delivery following spontaneous or induced labour; elective caesarean section=caesarean delivery without labour; high-risk pregnancy factor=presence of one or more of: hypertensive disorders of pregnancy; gestational diabetes; twin pregnancy; PPROM; hypothyroidism; bad obstetric history; FGR; or IHCP

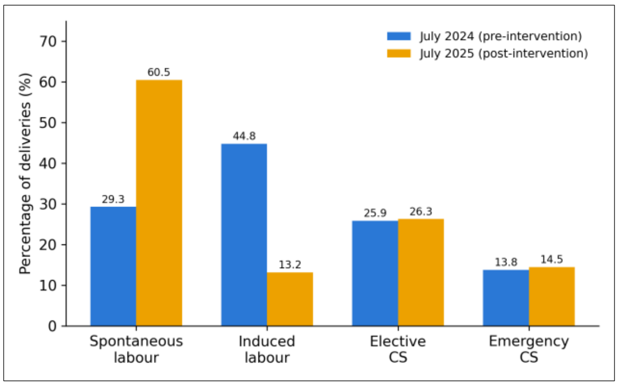

Figure 1: Labour process indicators, July 2024 versus July 2025.

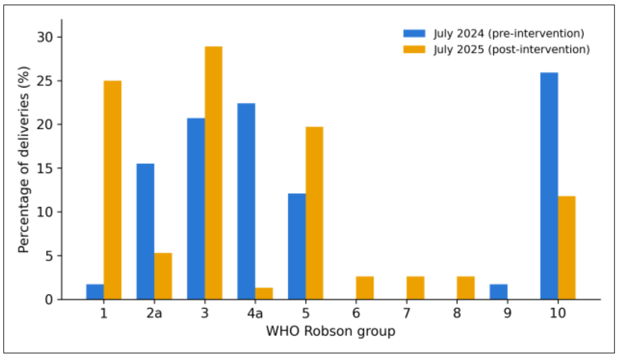

Figure 2: WHO Robson group distribution, July 2024 versus July 2025.

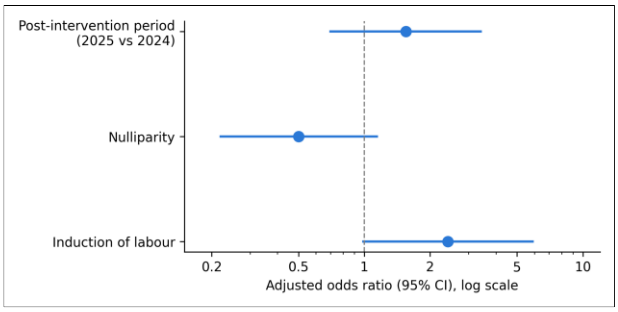

Figure 3: Forest plot of adjusted odds ratios for caesarean delivery (log scale).

DISCUSSION

This before-and-after study found that a standardized labour room protocol changed how women entered labour, favouring spontaneous onset over induction, while the overall CS rate, timing of birth, and within-group Robson CS rates stayed largely the same - a useful reminder that labour room quality cannot be judged from the crude CS rate alone.

Induction fell from 44.8% to 13.2%, with a matching rise in spontaneous labour (Table 2 and Figure 1), pointing to more selective, protocol-driven decision-making around induction. Induction policies have become more liberal worldwide, and while induction that is properly indicated does improve outcomes, indiscriminate induction adds to labour ward workload without a clear corresponding benefit.[1,11] Our findings suggest that standardized, consultant-led induction criteria can promote more appropriate use of induction while increasing spontaneous onset of labour.

That the overall CS rate did not change despite this shift fits with WHO guidance that quality improvement should target the appropriateness of care rather than chase a fixed CS target.[2] It should also be read alongside the rise in case-mix complexity over the same period: previous CS nearly quadrupled and high-risk pregnancy factors became more common (Table 1), a shift that could plausibly have cancelled out any CS-reducing effect of more selective induction. This fits the multivariable analysis, where the intervention period was not independently associated with CS once nulliparity and induction were accounted for (Table 4 and Figure 3), and with the instability of the full a-priori model once previous CS was added - previous CS, rather than labour management practice, was the dominant determinant of CS risk here, in line with earlier Robson-based literature identifying previous CS (group 5) as a persistent driver of institutional CS rates.[5,7,12]

Bringing in the WHO Robson classification uncovered changes which a CS-rate audit alone would have missed. The rise in group 1 and fall in group 4a (Table 3 and Figure 2) track the drop in induction and confirm that the protocol changed which obstetric population entered labour. Within-group CS rates barely moved except in group 2a, based on just four post-intervention women and best treated as hypothesis-generating. Group 5 became the largest relative contributor to CS after the intervention (48.4% of all CS), echoing international observations that previous CS increasingly drives institutional CS burden as primary CS rates climb.[5,7]

The protocol made no real difference to daytime-versus-night-time birth timing (Table 2): induction practice changed, but the biological onset and progress of labour still largely dictated when women delivered. A workflow-focused intervention, such as scheduling induction timing more deliberately, may be needed to influence this domain.[8]

This study adds to the small body of Indian LaQshya-related literature, most of which has looked at infrastructure and documentation compliance, by using a multidimensional dashboard - modelled loosely on the RCOG maternity dashboard.[8-10] This study brings together case-mix (Domain A), labor process (Domain B), outcome (Domain C), workflow (Domain D) and Robson-based indicators (Domain E).

It revealed selective change in Domains B and E alongside stability in Domains C and D, a pattern that a single-indicator audit would have missed entirely.

Strengths

The study has several methodological strengths. Restricting comparison to identical calendar months (July) in the two years controlled for seasonal variation in patient inflow, case-mix and staffing, while still allowing a full year to pass between the two audit points. Every consecutive delivery within each study month was included, which limits the selection bias that comes with sampled or convenience cohorts. Caesarean sections were classified using the standardized WHO Robson ten-group system, so the indication-specific contribution to the overall CS rate is reported in an internationally comparable, reproducible way. Every statistic reported here was cross-checked against the individual-level dataset, which gives the results internal consistency and makes them auditable.

Limitations

The study also has real limitations. It comes from a single tertiary-care centre with a modest sample size, limiting statistical power and generalizability, particularly to units with a different referral case-mix. Our centre sees a disproportionate share of high-risk and previously-referred pregnancies, worth keeping in mind when comparing our figures with population-level benchmarks. Several Robson groups had very few deliveries, hence the use of Fisher's exact test for those subgroups and estimates within these small strata should be read with caution.

Data collection was retrospective, so some documentation-related bias and missing variables cannot be ruled out. Only one month per year was studied; this controlled for seasonal confounding but cannot rule out secular or month-to-month trends outside the study window, so findings are best read as indicative rather than conclusive of a lasting effect. Neonatal and maternal morbidity outcomes were not assessed in this cycle, since the focus was on process and mode-of-delivery indicators - an important gap, since any fall in CS rate ultimately needs to be shown not to come at the cost of neonatal or maternal safety.

These limitations point in a clear direction for future work: larger, prospective, multicentre studies are needed to validate this Robson-based dashboard approach in other settings, with neonatal and maternal morbidity outcomes built in from the start to confirm that this kind of intervention is safe as well as effective.

CONCLUSION

A standardized labour room management protocol rationalized induction practice and increased spontaneous labour, without changing the overall caesarean section rate or the timing of birth, and instead redistributed women across the WHO Robson groups against a backdrop of rising case-mix complexity. Labour room quality is better judged using a multidimensional framework - case-mix, process, outcome, workflow and Robson-classification indicators together - than by the caesarean section rate on its own. The labour room quality dashboard described here uses only routinely collected data and could support evidence-based governance in similar obstetric units.

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REFERENCES

1. Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR. The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. PloS One. 2016;11(2):e0148343.
2. World Health Organization Human Reproduction Programme. WHO Statement on caesarean section rates. Reprod Health Matters. 2015;23(45):149-50.
3. Triep K, Torbica N, Raio L, Surbek D, Endrich O. The Robson classification for caesarean section-A proposed method based on routinely collected health data. PLoS One. 2020;15(11):e0242736.
4. World Health Organization. Robson classification: implementation manual. 2017. Available at: https://www.who.int/publications/i/item/9789241513197. Accessed on 15 June 2026.
5. Vogel JP, Betrán AP, Vindevoghel N, Souza JP, Torloni MR, Zhang J, et al. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. Lancet Glob Health. 2015;3(5):e260-70.
6. Boatin AA, Schlotheuber A, Betran AP, Moller AB, Barros AJD, Boerma T, et al. Within country inequalities in caesarean section rates: observational study of 72 low and middle income countries. BMJ. 2018;360:k55.
7. Litorp H, Kidanto HL, Nystrom L, Darj E, Essén B. Increasing caesarean section rates among low-risk groups: a panel study classifying deliveries according to Robson at a university hospital in Tanzania. BMC Pregnancy Childbirth. 2013;13:107.
8. Arulkumaran S, Chandraharan E, Mahmood T, Louca O, Mannion C. Maternity dashboard: clinical performance and governance score card. Good Practice No. 7. London: Royal College of Obstetricians and Gynaecologists; 2008.
9. Ministry of Health and Family Welfare, Government of India. LaQshya: Labour Room Quality Improvement Initiative- guidelines. New Delhi: Ministry of Health and Family Welfare; 2017.
10. Jatkar A, Narayan GN, Akare M, Rath S, Jatkar VG, Nazneen M, et al. Bridging Gaps in Maternal Care: Evaluating LaQshya (Labor Room Quality Improvement Initiative) Implementation at a Tertiary Hospital. Cureus. 2025;17(8):e90350.

11. Grobman WA, Rice MM, Reddy UM, Tita ATN, Silver RM, Mallett G, et al. Labor induction versus expectant management in low-risk nulliparous women. N Engl J Med. 2018;379(6):513-23.
12. Eftekharian C, Husslein PW, Lehner R. Cesarean Section Rate and Perinatal Outcome Analyses According to Robson's 10-Group Classification System. Matern Child Health J. 2021;25(9):1474-81.

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