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Original Research Article

An audit of cesarean section data using Robson's classification: a study from tertiary care center in North India

Ramandeep Bansal*, Rashmi Bagga, Anne Monga

Department of Obstetrics and Gynecology, Postgraduate Institute of Medical Education and Research, Chandigarh, India

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***Correspondence:**
Dr. Ramandeep Bansal,
E-mail: raman.bansal1120@gmail.com

ABSTRACT

Background: Percentage of women undergoing caesarean section (CS) during childbirth continues to increase globally, more in developed than in developing countries. Accordingly, world health organization (WHO) currently recommends an acceptable rate of CS at 10-15% of total deliveries and the rate of CS may be inappropriately high in several regions of the world including India. So, we planned this study to assess, monitor and compare CS rates using Robson classification. This study aimed to apply Robson's Ten Group Classification System (TGCS) for audit of CS and to determine contribution of each subgroup to overall CS rate to plan further interventions.
Methods: This was a retrospective analysis of data collected from 1000 consecutive women undergoing CS in the department of Obstetrics and Gynecology at a tertiary care center and teaching institute in North India from January 2023 to August 2023.
Results: CS accounted for 26.3% of all deliveries at our institute lower than rate reported from various other tertiary care centers in India. 35.6% of all CS were elective while the rest were performed as emergency procedures. Major contributors to CS were Robson's groups 5, 10 and 2. The main indications for CS was fetal distress (25.3%). Considering the fact that fetal distress, breech, prior CS and refusal of TOLAC accounted for approximately 2/3rd of our CSs.
Conclusions: Careful use of cardiotocography, continuous support during labor, external cephalic version for breech presentation, and proper counseling regarding TOLAC in women with prior CS can help in significant reduction in CS rates.

Keywords: Cardiotocograpy, Caesarean section, Caesarean section rate, Fetal distress, Robson classification, Trial of labour after caesarean section

INTRODUCTION

Percentage of women undergoing cesarean section (CS) during childbirth continues to increase globally. Currently approximately 21% of women undergo CS during childbirth representing a 3-fold increase from 7% during the year 1990 and by the year 2030, this percentage is expected to reach 29%.[1-3] In recent WHO news[2], there were two notable statements: "CSs are absolutely critical to save lives in situations where vaginal deliveries would pose risks, so all health systems must ensure timely access for all women when needed," and "But not all the CSs carried out at the moment are needed for medical reasons. Unnecessary surgical procedures can be harmful, both for a woman and her baby".[2]

This increase in rates of CSs is much more in developed countries than in developing countries. While in sub-Saharan Africa, only 5% of women undergo CS, the frequency is as high as 43% in Latin America and Caribbean. In India, CS rates have doubled (from 8% to 17%) from 2005 to 2016 among private care facilities.[2-5]

But, this increase in CS rates does not necessarily reflect better maternal and neonatal outcomes. Studies have shown that while an increase in CS rates up to 10-15% of total deliveries is associated with better maternal and neonatal outcomes, there is no advantage of having rates above 15%.[6,7] Accordingly, WHO currently recommends an acceptable rate of CS at 10-15% of total deliveries and thus the rate of CS may be inappropriately high in several regions of the world including India.[2-5]

WHO recommends monitoring of rates of CS at all facilities. WHO recommends use of Robson classification for assessing, monitoring and comparing rates of CS.[8, 9]An Ad Hoc analysis at our own tertiary care institute suggests CS rates to be 44.5% of all deliveries (unpublished data). This may be partially due to the fact that being a tertiary care center we usually receive complicated rather than normal pregnancies. Further, there are very few studies from India which have compared rates of CS using Robson classification. So, we planned this study to assess, monitor and compare CS rates using Robson classification.

This study aimed to apply Robson's Ten Group Classification System (TGCS) for audit of CS and to determine contribution of each subgroup to overall CS rate to plan further interventions.

METHODS

Current study was a retrospective analysis of data collected from 1000 consecutive women undergoing CS in the department of Obstetrics and Gynecology at Post Graduate Institute of Medical Education and Research, Chandigarh, a tertiary care center and teaching institute in North India which caters to approximately 6000 child births annually. Study was conducted from January 2023 to August 2023. Routine monthly audit of CS has been carried out in our institute for many years and since July 2022, Robson classification is being routinely used to categorize CS at our institute. All our faculty and resident doctors are well trained in its implementation and Robson classification charts are displayed in all required areas for easy accessibility. Resident doctors fill all the relevant data (including though not limited to age, parity, gestational age, mode of previous deliveries, number of fetuses, fetal presentation, previous CS, onset of labor; fetal outcomes: birth weight, APGAR score, and fetal complications; maternal complications: postpartum hemorrhage, need for blood transfusion, intensive care unit (ICU) admission, and maternal mortality) on Google scholar form which is checked from time to time by concerned faculty members. Robson classification was used at time of admission to categorize women (Table 1).[10] The study was approved by the institutional ethics committee.

Statistical analysis

All the data was entered in SPSS version 25. Data was expressed as mean, median or mode. Discrete (categorical) variables were compared using Chi square test or Fisher exact test. Continuous variables were compared using Mann Whitney or Kruskal Wallis test.

Table 1: Robson's ten group classification system.

Group	Robson's ten group classification system
Group 1	Nulliparous, single, cephalic pregnancy >37 weeks in spontaneous labour
Group 2	Nulliparous, single, cephalic pregnancy >37 weeks who had labour induced or delivered before labour by Caesarean section (CS)
Group 3	Multiparous, without previous uterine scar with single, cephalic pregnancy >37 weeks in spontaneous labour
Group 4	Multiparous, without previous uterine scar with single, cephalic pregnancy >37 weeks who had labour induced or delivered before labour by CS
Group 5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy >37 weeks
Group 6	All nulliparous with a single breech pregnancy
Group 7	All multiparous with a single breech including women with previous scars
Group 8	All women with multiple pregnancies including those with uterine scars
Group 9	All women with a single pregnancy with transverse or oblique lie including women with previous scars
Group 10	All women with single, cephalic <37 weeks including women with previous scars

RESULTS

Current study included 1000 women who underwent CS during the study period. During the same period, a total of 3807 women gave childbirth. Thus, CS accounted for 26.3% of all deliveries at our institute. 35.6% of all CS were elective while the rest were performed as emergency procedures. Mean age was 29.5±4.8 years with 59.3% of women between the ages of 21 to 30 years. Mean gestational age was 254.1±20.6 days. Gestational age was <37 weeks (preterm) in 41.4% and >40 weeks (post-dated) in 3.2% of women. 29.8% of women were primigravida. 120 (12%) women had 2 living children while 26 (2.6%) had 3 or more living children at time of CS. 84.3% of women received adequate antenatal supervision during pregnancy. 79.2% had cephalic presentation while 7.5% had multiple gestation.

Most common cause of CS was fetal distress (25.1%) followed by meconium-stained liquor in early labour (9%). 43% of women had previous CS. CS was carried out in as many as 11.8% of women as they were not willing for trial of labour. 1% of childbirths resulted in stillbirths. Serious

maternal complication was seen in 2.8% of women while 3.5% of women needed admission to intensive care units for close monitoring/ complications. These as well as other demographic and clinical data are summarized in Table 2.

Table 2: Demographic data of study population.

Parameter	Value (%)
Age in years (mean±SD)	29.5±4.8 (range= 18-45 years)
Age ≤20 years	22 (2.2)
Age: 20-30 years	593 (59.3)
Age: 31-39 years	365 (36.5)
Age ≥40 years	20 (2)
Gestational age in days (mean±SD)	254.1±20.6 (range= 162-295 days)
Gestation age <37 weeks (preterm)	414 (41.4)
Gestational age = 37-40 weeks (term)	554 (55.4)
Gestational age >40 weeks (post-dated)	32 (3.2)
Primigravida	298 (29.8)
No of living children	
None	458 (45.8)
One	396 (39.6)
Two	120 (12)
Three	24 (2.4)
Four	1 (0.1)
Five	1 (0.1)
History of previous abortion Yes (202=1; 72=2; 22=3; 10=4; 2=5; 1=8;)	309 (30.9)
History of previous ectopic pregnancy	31 (3.1)
Adequate antenatal supervision (at least 4 visits)	
Yes	843 (84.3)
No	157 (15.7)
Pre-existing medical or obstetric disorder	842 (84.2)
Lie	
Cephalic	792 (79.2)
Breech	177 (17.7)
Oblique/transverse	31 (3.1)
Type of Caesarean section (CS)	
Emergency	644 (64.4)
Elective	356 (35.6)
Stage of labour when CS was done	
Pre-labour	481 (48.1)
Latent phase - 1st stage	408 (40.8)
Active phase - 1st stage	101 (10.1)
Second stage	10 (1)
Immediate indication for CS (caesarean section)	
Abruption	26 (2)
Breech	133 (13.3)
Not willing for trial of labour	118 (11.8)
Failure of progress due to various causes	32 (3.2)
Failure of induction	18 (1.8)
Cord prolapse/ presentation	13 (1.3)
Heart disease	9 (0.9)
Foetal distress	251 (25.1)
Meconium-stained liquor in early labour	90 (9)
Placenta accreta spectrum disorders	27 (2.7)
Placenta previa	61 (6.1)
Scar tenderness/ dehiscence (n=18) or uterine rupture (n=2)	20 (2)
Cephalo-pelvic disproportion including macrosomia (n=3)	7 (0.7)

Continued.

Parameter	Value (%)
Reverse end diastolic flow	11 (1.1)
Transverse (n=22)/ oblique lie (n=1)	23 (2.3)
Pre-eclampsia/ eclampsia with comorbidities like pulmonary edema, previous CS, fetal growth retardation or pulmonary embolism etc Previous >2 CS (n=105) or one CS with comorbidities, fibroid, short stature, twins, Rh isoimmunization, short interconception interval, previous laparotomy etc	122 (12.2)
Miscellaneous: Previous myomectomy (n=4), neurological disorders (n=3) previous thoracostomy (n=2), chorioamnionitis (n=2), antepartum haemorrhage, worsening renal disorders, brow presentation, shoulder presentation, previous hysterotomy, fetal congenital heart block, rectovaginal fistula and triplets (n=1each)	19 (1.9)
Multiple gestation	75 (7.5)
Still birth	10 (1)
APGAR score at 5 minutes	
>7	57 (5.7)
7-10	943 (94.3)
Birth weight in grams (mean±SD)	2412.3±721 (range: 495 - 5014g)
Birth weight < 2.5 kg	357 (35.7)
Birth weight < 2 kg	239 (23.9)
Birth weight < 1.5 kg	94 (9.4)
Birth weight > 4 kg	6 (0.6)
Maternal complication	
Need for Intensive care unit admission	35 (3.5)
Intraoperative complication	19 (1.9)
Post-operative complication	4 (0.4)
Maternal near miss	5 (0.5)
Neonatal outcome	
Stable and satisfactory	832 (83.2)
Still- birth	10 (1)
Early neonatal death	1 (0.1)
Admission to intensive care unit	157 (15.7)
Previous caesarean section	
None	570 (57)
One	301 (20.1)
Two	111 (11.1)
Three	18 (1.8)
Induction of labour before CS	165 (16.5)

Table 3: Categorization of caesarean sections as per Robson classification.

Category	Number of women (%) (N=1000)
1	64 (6.4)
2	127 (12.7)
3	31 (3.1)
4	31 (3.1)
5	253 (25.3)
6	67 (6.7)
7	77 (7.7)
8	75 (7.5)
9	22 (2.2)
10	253 (25.3)

Robson's ten group classification system (RTGCS)

In current study, categories 10 (All women with single, cephalic <37 weeks including women with previous scars) and 5 (multiparous with prior CSs, singleton, cephalic, ≥37 weeks) of RTGCS accounted for 25.3% of all CSs each. Group 2 was third highest (12.7%) followed by group 7 (7.7%), 8 (7.5%) and 1 (6.4%) in that order. Refusal for trial of labour accounted for 11.8% of all CSs and 41.9% of all CSs in group 5. Groups 2 and 5 in combination accounted for 380 (38%) of all CSs while Group 1, 2, 4 and 5 accounted for 475 (47.5%) i.e., nearly half of all CSs. These data are summarized in Table 3. Primary indications of CS in various Robson groups are given in Table 4.

Table 4: Immediate indication of caesarean section among different Robson groups.

Indication for CS	Number of women in different Robson groups; total= 1000 women Robson groups										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Abruption	-	6	-	1	-	2	4	-	-	13	26
Breech	-	-	-	-	-	59	47	27	-	-	133
Not willing for trial of labour	-	-	-	-	106	-	-	-	-	12	118
Failure of progress due to various cause	6	11	4	1	3	-	-	1	-	6	32
Failure of induction	1	7	-	1	5	-	-	-	-	4	18
Cord prolapse/presentation	-	3	-	1	-	1	1	1	2	4	13
Heart disease	-	3	-	-	3	-	-	1	-	2	9
Foetal distress	32	55	15	11	23	3	4	7	2	-	-
Meconium-stained liquor	24	23	11	4	11	-	-	4	-	13	90
Placenta accreta spectrum disorders	-	-	-	-	5	-	4	2	-	16	27
Placenta previa	1	8	1	7	6		5	3		30	61
Scar tenderness/dehiscence or uterine rupture	-	-	-	-	12	-	1	1	-	6	20
Cephalo-pelvic disproportion including macrosomia	-	3	-	1	2	-	-	-	-	1	7
Reversal of end-diastolic flow	-	1	-	-	-	-	-	3	-	7	11
Transverse/oblique lie	-	-	-	-	-	-	-	8	15	-	-
Pre-eclampsia/eclampsia with comorbidities like pulmonary edema, previous CS, fetal growth retardation or pulmonary embolism etc		1	-	2	5	2	-	1	-	9	20
Previous ≥2 CS or one CS with comorbidities, fibroid, short stature, twins, Rh isoimmunization, short interconception interval, previous laparotomy etc	-	-	-	-	68	-	11	14	1	28	122
Miscellaneous	-	6	-	2	4	-	-	2	2	3	19
Total	64	127	31	31	253	67	77	75	22	253	1000

DISCUSSION

Past three decades have witnessed an alarming increase in rates of CS though CS rates vary both between countries and within a country. Our rates (26.3%) are lower than those reported from Latin America and Caribbean (42.8%), eastern Asia (33.7%), Australia and New Zealand (33.5%), Northern Africa (32%), North America (31.6%) and central Asia (29.6%) and higher than Eastern Europe (25%), south Asia (19%), Sub-Saharan Africa (5%) and global average (21.1%).[11] Likely reasons for the above discrepancy include women's access to CS, difference in population characteristics, different obstetrical risk factors and institutional policy on use of CS.

Our rate of 26.3% was lower than rate reported by other studies from various other tertiary care centers in India such as 38.2% by Pravina et al, 35.4% by Das et al, 52.7% by Pati et al and 61.2% by Naik et al and while it was comparable to rate of 25.5% reported by Mittal et al for year 2017.[11-15] The likely reason for this is strong adherence to Robson classification at our institute and a policy of auditing CS rates on a monthly basis with emphasis on keeping CS rates to minimal possible. However, our CS rate is still higher than CS rates of India as a whole as well as from states of Punjab (24.6%), Haryana (11.7%) and Himachal Pradesh (16.7%) (which form major chunk of our patients) during the years 2015-2016 (NHFH-4).[16] The likely reason for this excess rate is that being a tertiary care center, we receive more women with childbirth related complications thereby resulting in higher rates of CS.

In current study, major contributors to CS were Robson's groups 5, 10 and 2. In the study of Pati et al, major contributors were group 2 followed by groups 1, 3 and 10 while in a study by Sungkar et al, major contributors were group 10 followed by groups 1, 3 and 8.[13,17] In the study of Vogel et al, groups 1, 2 and 5 were major contributors in high human development index countries.[18] Above difference stresses on need to use Robson classification universally so as to develop institute specific strategies targeting each subgroup to achieve optimal CS rates.

The main indications for CS in the current study were fetal distress (25.3%), malpresentation (breech-13.3%;

transverse/ oblique lie- 2.3%), prior CS (12.2%) and lack of will for trial of labor (11.8%). The incidence of primary (57%) was more than repeat CS (43%). In study by Pravina et al, commonest indications were previous CS (36.4%), fetal distress (31.1%), malpresentation (7.9%) and failed induction (6.8%).[11] In another study, common indications were previous CS (30%), arrest of labour (13.9%), cephalopelvic disproportion (11.8%) and fetal distress (11%).[12]

The most common reason for CS in our study was fetal distress seen in 25.3%. This number further increases to 34.3% if we include meconium-stained liquor in this group as well. In one study, measures suggested to reduce rates of CS consequent to fetal distress included proper training of resident doctors in interpretation of cardiotocography trace using standard guidelines, raising threshold for doppler changes in intrauterine growth retardation and use of vibroacoustic stimulation test.[11] The best way of reducing the CS rates consequent to prior CS is reducing the rates of 1st CS. The rate of primary CS among major contributors (groups 5, 10, 2 and 7) can be reduced by adopting different approaches for each indication.

Another major contributor to high CS rate in our study by refusal for trial of labour after CS (TOLAC). Main reasons for refusal of TOLAC included fear of labour pain, fear of opening up of stitches and belief that repeat CS is safer than vaginal delivery (VD). Vaginal birth after CS (VBAC) is associated with lower maternal morbidity, lower rate of complications in future pregnancies and lower overall rates.[11] Accordingly, all women with previous CS shall be evaluated for the possibility of VBAC and counseled about its benefits (low risk of placenta previa/accreta in future pregnancies and low risk of pelvic adhesions) during antenatal visits.[19] Though all women at our center received counseling regarding VBAC, our numbers suggest counseling to be more robust and specifically aimed at allaying anxiety and fear of women regarding TOLAC.

Another major contributor to CS rates was breech presentation while compared to other studies, contribution of failed induction and failure to progress to overall CS rates was relatively small in our study. This is likely related to the use of uniform treatment protocols at our institute. Considering the fact that fetal distress, breech, prior CS and refusal of TOLAC accounted for approximately 2/3rd of our CSs we recommend that careful use of cardiotocography, continuous support during labor, external cephalic version for breech presentation, and proper counseling regarding TOLAC in women with prior CS can help in significant reduction in CS rates.

In current study, 3.5% of women needed admission to ICU while neonatal complications were seen in 16.8% of newborns. Further well conducted studies will throw light on short and long-term risks among neonates delivered by CS and whether the reduction in CS rate will improve maternal and neonatal outcomes.

The main limitation was that being a tertiary care institute, our results may not be applicable to the general population as we often receive complicated cases.

CONCLUSION

To conclude, Robson classification is easy to use and helps in proper assessment, monitoring and comparison of CS rates at institute, state, national or international level. Proper audit of CS rates using Robson classification will help the institute to identify major contributors of CS and helps to take institute specific measures to reduce CS rates. Main efforts to reduce CS rate should be directed toward counseling of women for TOLAC during antenatal counseling, proper monitoring of fetal distress, external cephalic version for breech presentation and efforts to reduce rates of primary CS. Main strengths of our study were uniform treatment protocol and the fact that all our residents and consultants are well trained in use of Robson classification.

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