Analysis and trends of caesarean sections using Robson's classification over 7-year period at a rural teaching hospital

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ABSTRACT

Background: A ten-group classification system of caesarean section was proposed by Michael Robson in 2001. It is helpful in comparing the rates of caesarean section between hospitals. The objective of this study was to determine the caesarean section rates to analyse trends of caesarean section and classify according to Robson's categories. **Methods:** This cross-sectional study was conducted from 2016 to 2022. A total of 3176 women who underwent caesarean section were grouped under Robson's ten-group classification system. **Results:** The most common group was Group 5 (All multiparous women with at least one previous uterine scar, with single cephalic pregnancy, ≥37 weeks gestation) followed by Group 2 (Nulliparous women, with single cephalic pregnancy, >37 weeks gestation who either had labour induced or were delivered by caesarean section before labour). Results were obtained for the specified period (from 2016 to 2022), and Group 5 contributes more to the total CS rates (45% in 2016, 46% in 2017, 46% in 2018, 57% in 2019, 49% in 2020, 52% in 2021, 54% in 2022), followed by Group 2 (20% in 2016, 17% in 2017, 18% in 2018, 19% in 2019, 26% in 2020, 24% in 2021, 24% in 2022). **Conclusion:** Pregnant women with prior uterine scars contribute more to caesarean section rates according to Robson's categories. Hence, strategies must be implemented to lower the primary caesarean section rates.

Keywords: Caesarean section, Robson classification, trends

Introduction

World Health Organization (WHO) advises that overall rate of CS should not be more than 15 percent, as there is no increase in mortality or morbidity noted if the CS rate is more than 15%.[1-3] According to NFHS-3 and NFHS-4 conducted in the years 2005-2006 and 2015-2016, the overall CS rates in India have increased from 10.6% to 17.2% respectively.[4] CS rate in Telangana in 2021-2022 is 54.09%.

Several reasons can explain variations in institutional rates of CS. These include the inherent differences in patient characteristics, type of institution and available resources. In addition, institutional differences in obstetric practice and pregnancy and labor management protocols can account for this variation.[5]

Physicians are able to influence the choice of delivery mode because they have better information than patients about birth physiology and possible complications. Lefevre's "physician-induced demand theory" predicts that physicians can shift the decision of pregnant women toward the one they prefer.[6]

Thus, CS should only be conducted based on medical indications, and efforts should be directed towards improving

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access to all women in need rather than striving to achieve an arbitrary rate.[6,7]

A ten-group classification system of caesarean section was proposed by Michael Robson in 2001, which is useful for comparing caesarean section rates between hospitals. The Robson's criteria classify all deliveries into ten groups on the basis of five parameters: parity, the onset of labour, fetal presentation, number of foetuses, and gestational age.[8,9]

World Health Organisation also recommends the use of Robson's TGCS as it serves as a valuable tool for healthcare professionals including primary care physicians in assessing, monitoring and managing caesarean section rates. Primary care physicians can identify specific groups of women contributing most and least to overall caesarean section rates and help them focus on high-risk populations and tailor interventions accordingly. Primary care physicians can also make informed decisions to optimize caesarean section utilization and enhance overall maternal care.

Aims and Objectives

- To determine the caesarean section rates according to Robson's categories among the women who delivered from 2016 to 2021.
- To determine the yearly trends of caesarean section among the women who delivered over the specified period.

Materials and Methods

This is a retrospective observational study conducted at a rural tertiary care teaching hospital. All the women who delivered (both vaginal and caesarean deliveries) at MIMS between January 2016 to December 2021 were included in this study. Institutional ethics committee clearance was obtained.

A questionnaire was developed and various variables were considered such as, demographic data of the patients, parity, number of fetuses, prior uterine scar, presentation (cephalic or malpresentation), and term or preterm. Induction of labor and mode of delivery were also considered.

Gravida: a woman who currently is pregnant or has been in the past, irrespective of the pregnancy outcome.

Parity: refers to the number of past pregnancies that have gone to viability and have been delivered regardless of the number of children involved.

Multiple pregnancy: pregnancy in which more than one fetus develops in the uterus at the same time.

Transverse lie: long axis of the foetus is perpendicular to the maternal spine.

Oblique –lie: long axis of the foetus lies oblique to the maternal spine.

Presentation: part of the foetus which occupies the lower pole of uterus.

Cephalic presentation: It is the most common presentation with 96.5% incidence at term, where fetal head occupies the lower pole of the uterus.

Breech presentation: It is less commonly seen with an incidence of 3% at term. Podalic pole or the breech of the foetus occupies the lower pole of uterus.

Shoulder presentation: this is seen in cases of transverse lie, where shoulder occupies the lower pole of the uterus.

Term gestation: It refers to the gestational age from 37 weeks to 41 weeks 6 days.

Preterm: pregnancy is considered preterm if the delivery occurs between the period of viability and 36 weeks 6 days of gestational age.

Labor: defined as uterine contractions resulting in progressive cervical effacement and dilation, often accompanied by a bloody discharge referred to as *bloody show,* which results in delivery of the baby.

Caesarean section: It is a fetal delivery through an open abdominal incision (laparotomy) and an incision in the uterus (hysterotomy). The first cesarean documented occurred in 1020 AD, and since then, the procedure has evolved tremendously.[10]

Body Mass Index (BMI)-BMI is calculated by the formula weight (in kilograms) divided by height (in meter square). BMI of 18.5 kg/m2 to 24.9 kg/m2 is normal.

A total of 7,889 deliveries were conducted in the specified study period, of which 3,176 (40.25%) were delivered by caesarean section. All the caesarean deliveries were categorised under Robson's ten group classification system [Table 1].

Results

Over the six-year study period, a total of 7889 deliveries were conducted. The average age group of the study population noted was 24.3 years (ranged from 17 years to 33 years). Among the study group, majority of them are housewives (90%). The average Body Mass Index noted was 26.2 Kg/m2 (ranging from 18 to 30 Kg/m²). Among the 7,889 deliveries that were conducted, 3,176 were caesarean sections with a rate of 40.25% (range: 34.12% to 47.09%) as shown in Table 2.

Overall, the maximum contribution was from group 5 (Multiparous term women with prior uterine scar) accounting to 48.7% of all caesarean deliveries and about 19.5% among all the deliveries that were conducted in the specified study period. The yearly

trends of group 5 [Table 3] showed an increase in the absolute contribution of 15.3% in 2016 to 24.4% in 2021.

Table 4 shows yearly trends of group 2 (Nulliparous term women with single cephalic presentation who either had labor induced or were delivered by caesarean section before the onset of labor) accounts to 19.6% of all caesarean deliveries and 7.8% among all the deliveries conducted in the study period. There is an increase in absolute CS rate in group 2 from 6.7% in 2016 to 11.1% in 2021.

Discussion

Robson's ten-group classification system (TGCS) helps to group the indications of caesarean sections into ten categories.[11] It also helps to identify the most common factors contributing to increasing CS rates and establish preventive measures to decrease them.

Women with previous uterine scar (Group 5) comprised majority of CS rates. The reasons included a shorter inter-conception interval, women who required a repeat caesarean section due to cephalopelvic disproportion (CPD), failed induction, contracted pelvis and women who were not willing for TOLAC (Trial of Labor After Caesarean).

After Group 5, Group 2 is the second largest group. Induction of labor carries a higher risk of fetal distress, meconium-stained liquor, failed inductions and increased rates of caesarean deliveries and neonatal ICU admissions when compared with spontaneous labor progression.

A study was performed at a tertiary teaching institute in north India from 2015 to 2017, also showed a similar result i.e. group 5

Table 1: Robson's ten group classification system

Group	Description
Group 1	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
Group 2	Nulliparous women with a single cephalic pregnancy, ≥37 weeks of gestation who either had labour induced or were delivered by caesarean section before labour
Group 3	Multiparous women without a previous uterine scar, with a single cephalic pregnancy, ≥37 weeks of gestation in spontaneous labour
Group 4	Multiparous women without a previous uterine scar, with a single cephalic pregnancy, ≥37 weeks of gestation who either had labour induced or were delivered by caesarean section before labour
Group 5	All multiparous women with at least one previous uterine scar, with a single cephalic presentation ≥37 weeks of gestation
Group 6	All nulliparous women with a single breech pregnancy
Group 7	All multiparous women with a single breech pregnancy, including women with previous uterine scars
Group 8	All women with multiple pregnancies, including women with previous uterine scars
Group 9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scar
Group 10	All women with a single cephalic pregnancy, <37 weeks of gestation, including women with previous uterine scars

Table 2: Yearly trends of RTGCS from 2016 to 2021

Robson Category	2016	2017	2018	2019	2020	2021	Total
1	79 (11.1%)	72 (9.0%)	45 (7.8%)	33 (6.6%)	13 (6.5%)	19 (4.9%)	261 (8.2%)
2	140 (19.8%)	139 (17.3%)	104 (18.0%)	95 (19.1%)	52 (25.9%)	92 (23.7%)	622 (19.6%)
3	11 (1.6%)	16 (2.0%)	11 (1.9%)	8 (1.6%)	5 (2.5%)	13 (3.3%)	56 (1.8%)
4	6 (0.8%)	19 (2.4%)	14 (2.4%)	10 (2.0%)	7 (3.5%)	11 (2.8%)	67 (2.1%)
5	319 (45.1%)	373 (46.4%)	264 (45.8%)	286 (57.4%)	98 (48.8%)	202 (51.9%)	1542 (48.7%)
6	16 (2.3%)	21 (2.6%)	20 (3.5%)	14 (2.8%)	8 (4.0%)	7 (1.8%)	86 (2.7%)
7	11 (1.6%)	21 (2.6%)	22 (3.8%)	13 (2.6%)	4 (2.0%)	16 (4.1%)	87 (2.7%)
8	16 (2.3%)	18 (2.2%)	12 (2.1%)	7 (1.4%)	3 (1.5%)	3 (0.8%)	59 (1.9%)
9	4 (0.6%)	6 (0.7%)	5 (0.9%)	4 (0.8%)	0 (0%)	5 (1.3%)	24 (0.8%)
10	105 (14.9%)	119 (14.8%)	80 (13.9%)	28 (5.6%)	11 (5.5%)	21 (5.4%)	364 (11.5%)
Total no. of CS	707	804	577	498	201	389	3176
Total no. of deliveries	2072	1848	1400	1304	439	826	7889
% of CS among total no. of deliveries	34. 12%	43. 50%	41. 21%	38. 19%	45. 78%	47. 09%	40. 25%

Table 3: Yearly trends of Group 5

Year	Number of CS in Group 5	Total caesarean deliveries	Relative contribution to overall CS rate (%)	Total deliveries	Absolute contribution to overall CS rate (%)
2016	319	707	45.1%	2072	15.3%
2017	373	804	46.4%	1848	20.1%
2018	264	577	45.8%	1400	18.8%
2019	286	498	57.4%	1304	21.9%
2020	98	201	48.8%	439	22.3%
2021	202	389	51.9%	826	24.4%
Total	1542	3176	48.7%	7889	19.5%

Table 4: Yearly trends of Group 2					
Year	Number of CS in Group 2	Total caesarean deliveries	Relative contribution to overall CS rate (%)	Total deliveries	Absolute contribution to overall CS rate (%)
2016	140	707	19.8%	2072	6.7%
2017	139	804	17.3%	1848	7.5%
2018	104	577	18.0%	1400	7.4%
2019	95	498	19.1%	1304	7.2%
2020	52	201	25.9%	439	11.8%
2021	92	389	23.7%	826	11.1%
Total	622	3176	19.6%	7889	7.8%

contributed to more to the CS rates (29.4% on an average) followed by group 2 accounting for 22.2% of overall CS rates.[12] Similar results were obtained in a cross-sectional study conducted at a tertiary teaching hospital in southern India in 2017, and group 5 accounted to 34.9% to overall CS rate followed by Group 2 contributing to 18.9%.[13]

A study conducted in Sweden between 2017 and 2020, also showed group 5 followed by group 2 as major indications for CS rate with 28.7% and 20% respectively.[14]

In comparison to other studies conducted by Wahane[15] and by Patil and Rajith,[16] Robson group 5 contributed 32.1% and 46% to CS rates respectively.

In contrast, a study conducted by Abubeker *et al.*,[17] the overall CS rate was 34.7%. Group 10 contributed to 19.1% followed by Group-2 (18.3%). As this study was conducted at a tertiary teaching hospital with maternal-fetal medicine unit where they get the high-risk referral patients (with major obstetric and medical co-morbidities). When compared with our study, Group 10 accounts for 11.5% of overall CS rates.

In contrast, a study conducted by Punatar and Pattani,[18] the majority of the CS were in Group 1 followed by Group 5 of Robson's categories with 34.09% and 26.34% respectively. The major indications for CS in group 1 were fetal distress and meconium-stained liquor.

Common medical indications for a caesarean section include abnormal presentation, fetal distress, umbilical cord prolapses, placenta previa, uterine rupture, failed labour induction, macrosomia, preeclampsia, and previous caesarean section. Without guidelines with specific standards, some of these indications are subjective and variable for decision-makers (physician or other healthcare professionals, including midwives).[19,20] For a more detailed assessment with an evidence-based approach, the effects of each step of service given to pregnant women based on the caesarean indications until the date of birth should be examined by a doctor on an institution basis.[21]

With appropriate caesarean indications, the vaginal delivery rights of patients and the foetuses should be protected. The Robson 1 and 2 groups, which are low-risk individuals, should be prioritised with realistic targets to lower the caesarean rates.[22] To increase this awareness, it is necessary to work together with health facilities, nongovernmental organizations, and medical chambers (such as the Society of Gynaecology and Obstetrics or National Medical Association) to "improve the quality of the caesarean decision."

Robson's classification of caesarean section helps the primary physicians to analyse and compare the CS rates and raise awareness about the quality of care, clinical management practices, importance of the data and its interpretation and use. It also helps the primary care physicians to implement the strategies to reduce the CS rates.

Strengths of this study are large sample size which was studied over years and helps to categorise and identify the majority group. The yearly audit helps to conceptualise the strategies to lower CS rates among the majority group which further decreases CS rates.

Limitations of the study are, firstly, this study was conducted in a single institute, hence the result may not be generalisable and secondly subdivisioning of the Robson's TGCS is not performed. Other limitations are Trial of labor after caesarean section was not performed because of various reasons. Reasons being less interconception interval, lack of maternal consent because of fear of complications etc., Maternal and perinatal outcomes with respect to individual groups is not studied.

Strategies and interventions should be implemented to reduce the rate of primary caesarean section, which further reduces the Group 5 rates. Certain nonclinical strategies recommended by WHO are interventions targeted at women, interventions targeted at health care professionals and Interventions targeted at health organisations, facilities or systems. Clinical strategies recommended by the WHO are guided throughout the pregnancy, labor and puerperium.[23,24]

Conclusion

In this study, majority of the women belonged to the group with prior uterine scar. To lower the absolute CS rate, certain strategies must be implemented to lower the primary CS rates, adequate skill and training to perform operative vaginal delivery, assisted breech delivery, external cephalic version, delivery of multifetal gestation, trial of labor after caesarean etc.

Key messages

Strategies to lessen the primary caesarean section rates to be adopted. Adequate skills and drills to be part of the curriculum to train personnel to do operative vaginal delivery when need arises.

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Conflicts of interest

There are no conflicts of interest.

References

1. WHO Monitoring emergency obstetric care: A handbook, Geneva, Switzerland; 2009.

2. Lefevre M. Physician induced demand for C-sections: does the convenience incentive matter? Health, Econometrics and Data Group (HEDG) Working Papers 14/08, HEDG, c/o Department of Economics, University of York; 2014.

3. Robson M, Hartigan L, Murphy M. Methods of achieving and maintaining an appropriate caesarean section rate. Best Pract Res Clin Obstet Gynaecol 2013;27:297-308.

4. Available from: http://rchips.org/nfhs. [Last accessed on 2019 Jan 30].

5. World Health Organization. WHO statement on caesarean section rates, vol. WHO/RHR/15.02. Geneva: World Health Organization; 2015. (WHO/RHR/15.02).

6. Lefèvre M. Physician induced demand for C-sections: Does the convenience incentive matter?. Available from: https://www.york.ac.uk/media/economics/documents/hedg/workingpapers/1408.pdf.

7. Robson M, Hartigan L, Murphy M. Methods of achieving and maintaining an appropriate caesarean section rate. Best Pract Res Clin Obstet Gynaecol 2013;27:297-308.

8. ACOG. American College of Obstetrics and Gynecology Committee Opinion, No 559, Caesarean delivery on maternal request. Obstetr Gynecol 2013;121:904-7.

9. Vogel JP, Pilar Betrán AP, Vindevoghel N, Souza JP, Torloni MR, Zhang J, *et al*. On behalf of the WHO Multi- Country Survey on Maternal and Newborn Health Research Network. 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:e260-70.

10. Berghella V, Baxter JK, Chauhan SP. Evidence-based surgery for cesarean delivery. Am J Obstet Gynecol 2005;193:1607-17.

11. Robson MS. Can we reduce the caesarean section rate? Best Pract Res Clin Obstet Gynaecol 2001;15:179-94.

12. Mittal P, Pandey D, Suri J, Bharti R. Trend prediction for caesarean deliveries based on Robson classification system at tertiary referral unit of north India. J Obstet Gynaecol India 2020;70:111-8.

13. Murugesan K, Rengaraj S. Analysis of caesarean section using Robson Ten group classification system in tertiary care canter from southern India; A cross-sectional study. Int J Adv Med Health Res 2021;8:75-82.

14. Savchenko J, Ladfors L, Hjertberg L, Hildebrand E, Brismar Wendel S. Towards safer childbirth: A journey of a thousand miles. Acta Obstet Gynecol Scand 2022;101:837-8.

15. Wahane A, Ghaisas AS. Analysis of caesarean sections according to Robson's criteria at a tertiary care teaching hospital in central India. Int J Reprod Contracept Obstet Gynecol 2020;9:4221-6.

16. Patil SB, Rajitha D. Robson classification: Beyond caesarean rates. Int J Reprod Contracept Obstet Gynecol 2023;12:2241-6.

17. Abubeker FA, Gashawbeza B, Gebre TM, Wondafrash M, Teklu AM, Degu D, *et al*. Analysis of caesarean section rates using Robson Ten group classification system in a tertiary teaching hospital, Addis Ababa, Ethiopia; A cross-sectional study. BMC Pregnancy Childbirth 2020;20:767.

18. Punatar P, Pattani B. Analysis of cesarean section rates based on ROBSON classification system in a tertiary care hospital in West Coast of Gujarat, India. Int J Innov Res Med Sci 2023;8:160-4.

19. Warner WL. Arriving at the appropriate ceserean delivery rate. District Newsletter. ACOG. July 2013.

20. Nijagal MA, Kuppermann M, Nakagawa S, Cheng Y. Two practice models in one labor and delivery unit: Association with caesarean delivery rates. Am J Obstet Gynecol 2015;212:491.e1-8.

21. Spong CY, Berghella V, Wenstrom KD, Mercer BM, Saade GR. Preventing the first caesarean delivery: Summary of a joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop. Obstet Gynecol 2012;120:1181-93.

22. Triunfo S, Ferrazzani S, Lanzone A, Scambia G. Identification of obstetric targets for reducing caesarean section rate using the Robson Ten Group Classification in a tertiary level hospital. Eur J Obstet Gynecol Reprod Biol 2015;189:91-5.

23. WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0IGO.

24. Available from: www.who.int/reproductivehealth/publications/maternal_perinatal_health/anc-positive-pregnancy-experience/en/.