International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Tiwari M et al. Int J Reprod Contracept Obstet Gynecol. 2023 Mar;12(3):xxx-xxx
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20230297

Original Research Article

Robson's ten group classification: a tool for predicting cesarean section rates

Meghna Tiwari*, Sanghmitra Singh, Beenu Singh Kushwah

Department of Obstetrics and Gynecology, S.S. Medical College, Rewa, Madhya Pradesh, India

Received: 11 January 2023
Accepted: 27 January 2023

***Correspondence:**
Dr. Meghna Tiwari,
E-mail: drmeghnard@gmail.com

ABSTRACT

Background: Increasing cesarean section delivery rates in India and world is a serious maternal health concern. It is important to understand the trends, reasons behind this change and to find ways to achieve optimum cesaerean section (CS) rates. As per the latest data national family health survey 2019-21 (NFHS 5), CS rates at population level in India seems to be 22% while WHO recommends 10-15% threshold. So, we aim to analyze trend of CS and evaluate it according to Robson's 10 group classification at tertiary care hospital in Rewa, Madhya Pradesh, India.
Methods: A cross sectional study was conducted at department of obstetrics and gynecology, Shyam Shah medical college Rewa for 3 years from May 2019 to April 2022 on all deliveries occurring on or after 28 weeks of gestation by cesarean section.
Results: Total of 26552 deliveries over 3 years period were analyzed, of these 7484 were CSs (28.18%). Overall C section rate increased from 18.97% in 2019 to 39.95% in 2022. Major contributors to this increase were Robson's group 5-32.58%, Robson's group 1-29.45% and Robson's group 2-12.22%.
Conclusions: Robson's group 1, 2 and 5 were major contributors to overall increased cesarean section rates. Fetal compromise, meconium aspiration risk, obstructed labor and cesarean scar tenderness were underlying indications for most of the cesarean sections done. Efforts should be made to implement standard protocol to reduce primary cesarean section rates.

Keywords: CS, Vaginal birth after ceasarean, Fetal distress, Robson's ten group classification, Failed medical induction

INTRODUCTION

Caesarean sections have substantial importance in obstetrics. Over last few decades, the global CS rate has reached an unprecedented high level.[1] Although no specific rate of CS has been recommended, no improvement in maternal and neonatal outcomes have been observed in CS rates above 10%.[1-3]

CSs are life-saving where spontaneous vaginal delivery is not possible or contraindicated, or endangering the life of mother or baby.[1]

In such cases, not performing a CS could be endangering the life of the mother and the fetus. However, it is also true that CS are done without clear indications or with vague indications like obstructed labour with intact membranes or primi breech with IUGR baby or prolonged latent phase of labour etc.[3]

Although CS are life-saving but they are also associated with short and long term complications with increased chances of maternal morbidity and mortality, requirement for blood transfusion, prolonged hospital stay, nosocomial infections, post-partum infections, retained or morbidly adherent placenta, post-partum haemorrhage, suture line infections, incisional hernia, Iatrogenic trauma etc.[4-9] So, it is vitally important to titrate the risks with benefits with the life of baby and mother being at the utmost importance.

Institutional delivery rate, in India, is 89% (94% in urban to 87% in rural settings) as per national family health survey 5, which vary from state to state. This indicates that some women might be exposed to unnecessary CS while others do not get the CS they need.[10] CS rates are comparatively high among women who are educated, belonging to urban areas of residence and who have rich socio-economic status.[11] In urban settings and among the rich, there is a concern that in many countries, the intervention is being over utilised and unnecessary interventions are being done. In rural settings, however, lack of access to adequately staffed and equipped health institutions for providing essential obstetric surgery is contributing largely to maternal mortality and complications.

Therefore, it is a big challenge in the present scenario to have low CS rates while preserving safety of mother and the newborn. This requires continuous auditing of CS. WHO recommended Robson's classification as a global standard tool for monitoring CS. The Robson classification, also known as ten group classification system (TGCS), classifies CS into 10 mutually exclusive and exhaustive groups based on the category of the pregnancy, the previous obstetric record of the woman, the course of labour and delivery, and their gestational age. CS audit is necessary for which Robson's 10 group classification system has been endorsed as "gold standard" (Table 1).[12]

Table 1: Robson's classification.

Groups	Clinical characteristics
1	Nulliparous, singleton, cephalic, 37 weeks or more, spontaneous labor
2	Nulliparous, singleton, cephalic, 37 weeks or more, induced labor or cesarean section before labor
3	Multiparous, without previous cesarean section, singleton, cephalic, 37 weeks or more, spontaneous labor
4	Multiparous, without previous cesarean section, singleton, cephalic, 37 weeks or more, induced labor or cesarean section before labor
5	Multiparous, with prior cesarean section, singleton, cephalic, 37 weeks or more
6	All nulliparous breech
7	All multiparous breech (including previous cesarean section)
8	All multiple pregnancies (including previous cesarean section)
9	All pregnancies with transverse or oblique lie (including previous cesarean section)
10	Singleton, cephalic, 36 weeks or less (including previous cesarean section)

At present CS rate in our institute is 28.18%.

Although many studies are done earlier for standardisation and classification of cesaerean deliveries like Prameela et al but no study has been done in Central Vindhya region to know CS rate based on Robson's classification.[13] This was an attempt to find out which clinically relevant groups based on Robson's classification contribute most to the caesarean deliveries.

METHOD

A cross sectional study was conducted at "department of obstetrics and gynaecology, S. S. M. C. Rewa, Madhya Pradesh India". Approval from institutions ethics committee was exempted as this was a record-based study.

Study population included a total of 7484 women who underwent CS more than or equal to 28 weeks of gestation in the hospital during the specified 3 years' time period.

Dependent variable was Robson's 10 group classification system.

The study population included all woman who underwent CS at the hospital during the specified time period. Patients undergoing laparotomy for uterine rupture and files with missing information were excluded. Woman who underwent CS were identified from the labour number register, maternity OT register, admission register and discharge register. The admission and discharge register, and labour number register contain information about all women who delivered in the hospital regardless of mode of delivery (vaginal, CS).

All the study information was noted on a predesigned proforma and results were calculated. For all the women included in the study, bio-data, maternal history, pregnancy-related information (parity, gestational age, fetal presentation, number of fetus and onset of labour), management outcomes, and maternal and fetal outcomes at discharge (complications, birth weight) were recorded from case sheets.

Inclusion criteria

Patients with onset of labour (Spontaneous/ induced/ planned CS), number of fetus (Singleton/ multiple), fetal presentation (Cephalic/ breech/ abnormal lie) and parity (with/ without caesarean) were included in the study.

Exclusion criteria

Term normal or instrumental deliveries, preterm normal or instrumental deliveries and all women who underwent laparotomy for uterine rupture were excluded.

Statistical analysis

Data collected was analysed using simple statistical methods like percentage and proportion.

Study centre

S. S. medical college is a leading tertiary referral hospital affiliated with Madhya Pradesh medical sciences University, Jabalpur where around 10,000 to 11000 deliveries take place annually. The hospital serves both referred cases and admitted cases with all degrees of complications.

RESULTS

Total number of deliveries conducted during the specified time period in the hospital was 26552, out of which 7484 were delivered by caesarean section, which denotes percentage of CS was 28.18%. Table 2 and Figure 1 shows the categorisation of CS as per Robson's groups.

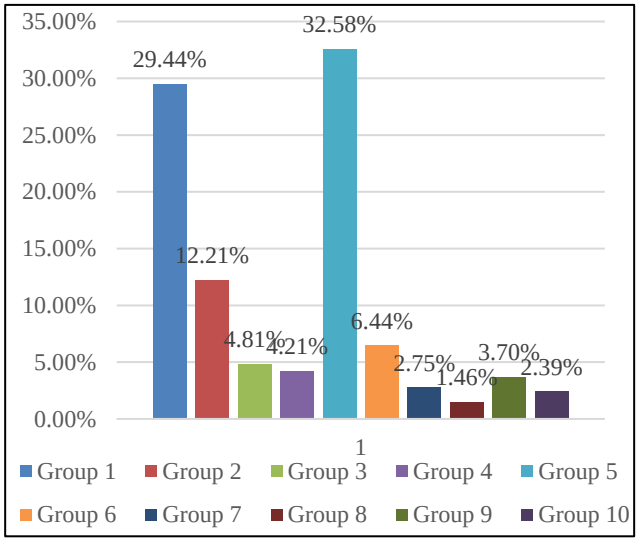

Figure 1: Contribution of various Robson's groups.

Maximum contribution to CS was Robson's group 5 (multiparous with prior caesarean section, singleton, cephalic, >37 weeks) viz., 32.58% followed by group 1 (nulliparous, single, cephalic, term in spontaneous labour) and group 2 (nulliparous, single, cephalic, term induced or caesarean before labour) viz., 22.45% and 12.25% respectively.

The 6.44% of CS belong to group 6 (all nulliparous breech). CS rate in group 3 (multiparous without previous caesarean, singleton, cephalic term in spontaneous labour) was 4.81%, while 4.20% were contributed by group 4(multiparous without previous caesarean, singleton, cephalic, term induced or caesarean before labour). CS rate in group 10(singleton, cephalic, <37 week including previous caesarean sections) was 3.70% and in group 7 (all multiparous breech) was 2.75%.

Furthermore, caesarean section rate in group 9 (all pregnancies with transverse or oblique lie including previous CS) was 2.52%. Least was observed in group 8 (all multiple pregnancies including previous CS) as 1.45%.

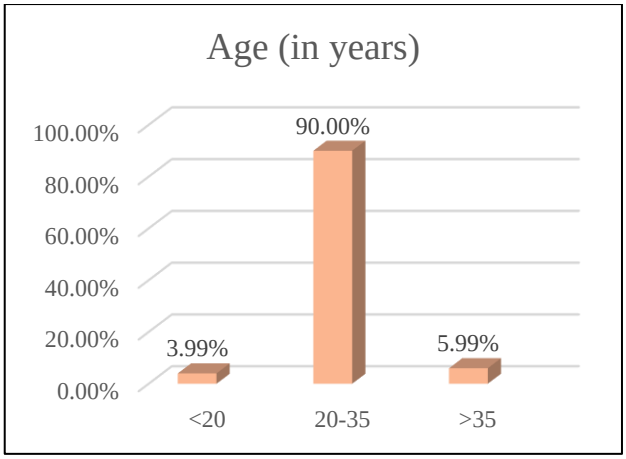

Figure 2: Distribution of cesarean section based on age.

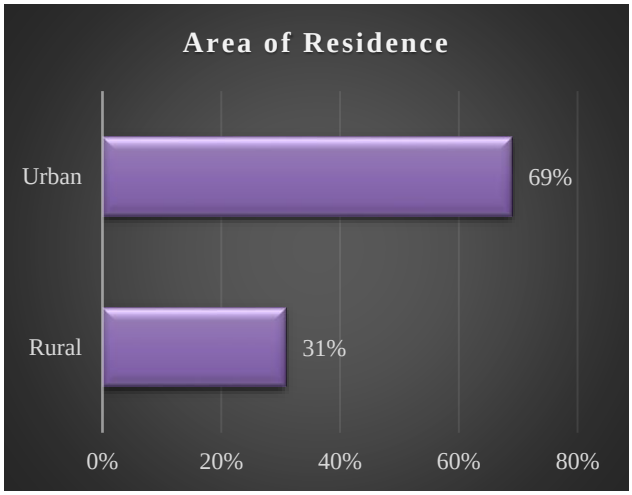

Figure 3: Distribution of cesarean section based on residence.

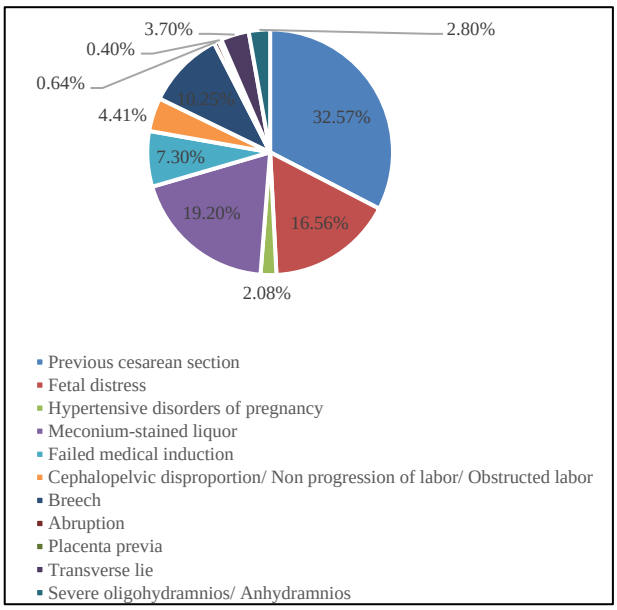

Figure 4: Indications for caesarean section.

Table 2: Categorisation of caesarean-section as per Robson's classification.

Robson's group	Total no. of deliveries in each group	Total no. of CS in each group	Relative size of group (%)	CS rates (%)	Contribution made by each group in total CS (%)
1	9584	2204	36.09	22.99	29.44
2	3775	914	14.21	24.21	12.21
3	5851	360	22.03	6.15	4.81
4	2516	315	9.47	12.51	4.21
5	2846	2438	10.71	85.66	32.58
6	601	482	2.26	80.19	6.44
7	307	206	1.15	67.10	2.75
8	191	109	0.71	57.06	1.46
9	277	277	1.04	100	3.70
10	604	179	2.96	31.29	2.39

Table 3: Characteristics of study participants.

Characteristics	Variable	N	Percentage (%)
Age (Years)	<20	299	3.99
	20-35	6736	90
	>35	449	5.99
Area of residence	Rural	2320	30.99
	Urban	5164	69
Gravidity	Primigravida	3855	51.5
	Multigravida	3629	48.5
Gestational age (Weeks)	<37	179	2.39
	37-42	7196	96.15
	>42	0	0
History of previous caesarean delivery	0 previous	4638	61.97
	1 previous caesarean	2206	29.47
	2 previous caesareans	630	8.41
	3 previous caesareans	10	0.13
Fetal presentation	Cephalic	6440	86.05
	Breech	767	10.24
	Others	277	3.70
Number of fetus	Singleton	7375	98.54
	Multiple	109	1.45
Onset of labor	Spontaneous	5212	69.64
	Induced	547	7.30
	Planned C section	1725	23.04
Fetal outcome	Live birth	7123	95.17
	IUD	361	4.82
Birth weight (Kg)	<2.5	1531	20.45
	2.5-4	5286	70.63
	>4	667	8.91

Table 4: Indications leading to caesarean sections.

Indication	N	Percentage (%)
Previous C section	2438	32.57
Fetal distress	1240	16.56
Hypertensive disorders of pregnancy	156	2.08
Meconium-stained liquor	1437	19.2
Failed medical induction	547	7.30
Cephalopelvic disproportion/ non progression of labor/ obstructed labor	330	4.41
Breech	767	10.25
Abruption	48	0.64
Placenta previa	30	0.4
Transverse lie	277	3.7
Severe oligohydramnios/ anhydramnios	214	2.8

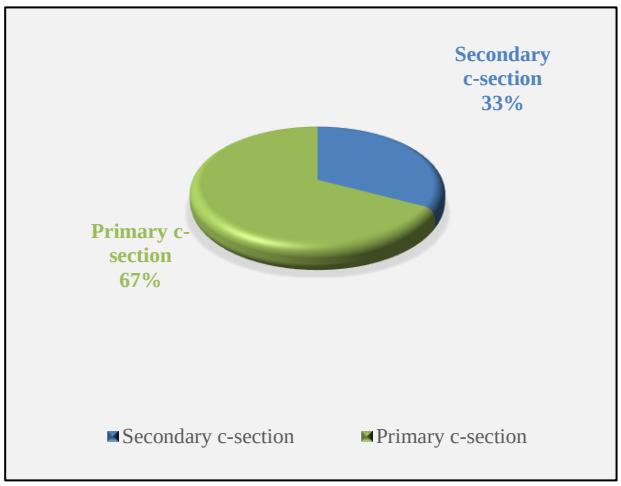

Figure 5: Incidence of primary caesarean vs secondary caesarean.

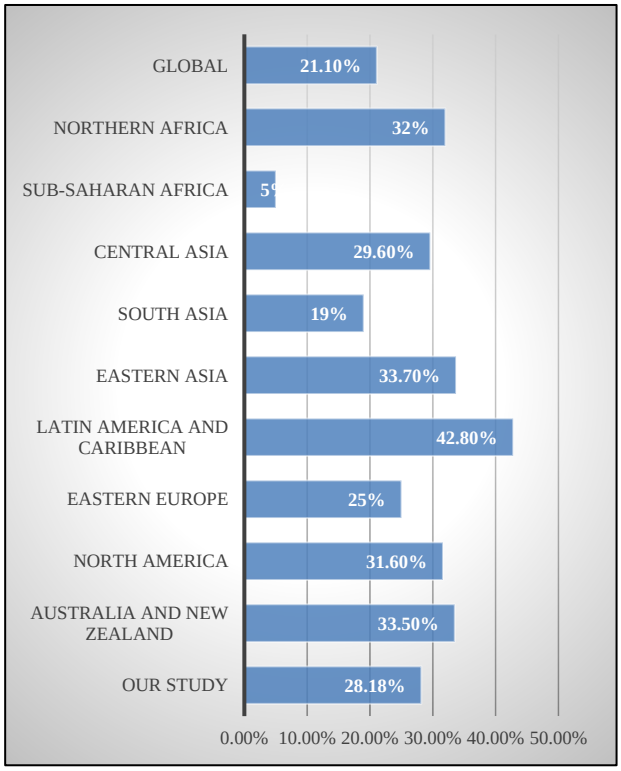

Figure 6: CS rates worldwide according to United Nations geographical grouping report, 2018.

DISCUSSION

CS rate depicted in year 2013-14 in India was 16.4% which rose to 22% in 2019-21 when a health survey was conducted by national family health survey. Average caesarean section rate in Asian countries (27.3%) was much lower when compared to USA (31.1%).[14] Vogel et al reported wide variations in CS rates ranging from 9.8 % in Niger to 47.6% in China in WHO multicentric survey (2010-2011). According to the United Nations geographical grouping report 2018, CS rate ranges between 5% and 42.8% among different countries.[15] Also, indications for high CS rates vary between and within countries. This includes institution-specific policies and financing, different obstetrical risk factors with different population demographics, discrepancies in a woman's access to CS, and quality of healthcare.

Caesarean deliveries performed in the absence of appropriate clinical justification do not reduce maternal or infant morbidity and mortality rates if performed at a rate higher than 10-15%.[16] As we observed in the present study, rate of CS in our hospital is 28.18% which is on increasing trend as in 2019 contribution of CS to total deliveries was 18.97% and it increased to 39.95% by 2022.

In the present study, CS rate was 28.18%, which is similar to study by Prameela et al (29.33%) conducted in a tertiary hospital of Mysore, Karnataka and lower than study by Jain et al (42.13%) conducted in a tertiary care hospital of Gwalior, Madhya Pradesh and also from study by Reddy et al (44.61%) conducted in Belagavi, Karnataka as they implied higher referrals with complications from their respective districts.[17,18]

In the present study also, major contributors of caesarean sections were group 5, 1 and 2 in decreasing order. Dhodapkar et al from India found group-1, group-5 and group-2 as the most prevalent groups accounting for 33.3%, 19.7% and 14.6% cases respectively as major contributors almost similar to our study.[19] Also, use of induction, pre-labour caesarean section and caesarean section after induction in multiparous has increased according to them. In present study group 2 and 4 had an increased caesarean section rate when compared with group 1 and 3 respectively. Hence Induction of labour should be limited and strictly evidence based.

In a study from a university hospital in Cote d'Ivoire, however, the most common groups were groups 1, 2 and 3.[20] Higher contribution of group 2 (nulliparous single cephalic term pregnancy, induced or caesarean before labour) in the study from Cote d'Ivoire could be explained by variations in indications for inductions of vaginal birth or CS in the two settings.

According to Robson's classification across all HDI groups (very high/high/medium or low) Vogel et al analysed the contributions of specific groups of Robson's classification across all HDI groups (very high, high, medium, low).[21] Increased use of caesarean section surgery occurred across all HDI groups that include most Robson groups including an increase in the proportion of women undergoing a prelabour caesarean section (in very high/high and low HDI countries) and a rise in the proportion of women with a previous caesarean section (in medium and low HDI countries). The nulliparous population was the largest contributor to the overall caesarean section rate, and therefore increasing use of CS in this group (in very high/high and low HDI countries) escalated rates higher.

In most high-income settings, groups 5, 2 and 1 are the major contributors to overall CS rate unlike the studies from low-income settings.[22]

In the present study, as shown in Table 2, group 1 was major population group (36%) which was admitted in our institute, similar to Reddy et al. Also, group 2 including nulliparous women induced or pre labour caesarean sections were having group size of 14.21% which reflects most of the nulliparous women getting admitted in our hospital were in spontaneous labour. CS rate in group 1 was 22.99%, which is higher than Kazmi et al (13%).[23] The high CS rate in group 1 suggests that large number of high risk nulliparous women getting referred from peripheries, who need emergency delivery by CS to avoid serious maternal and fetal outcomes. Also, in urban population the average maternal age is rising due to late marriages, and older women especially nulliparas and therefore, patients with recurrent abortions and bad obstetric history that have a higher risk for caesarean delivery. Operative vaginal delivery rate has also declined in recent years due to risk of various maternal and fetal injuries. In depth analysis and further audit of indications of caesarean section need to be done among referred and directly admitted nulliparous women to achieve optimal CS rate in this group. Cephalopelvic disproportion to be ruled out by per vaginal examination by senior most obstetrician or Senior Resident available. Failed medical induction followed by fetal distress and meconium-stained liquor was major contributions for increased CS rate in these cases. Differences in opinions regarding indications of induction of labour, quantity, dosing schedule and choice of inducing agents especially in high-risk pregnancy, resulted in a greater number of failed induction and fetal distress, and hence, a greater number of CS. Proper case selection, adhering to standard guidelines, and uniform clinical practical algorithms are needed to avoid unnecessary and untimely induction and CS.

Second largest population group was group 3 including multiparous women in spontaneous labour (22%). This shows major population getting admitted in our institute were in spontaneous labour, similar to Jain et al.[17] Multiparous women contributed a total of 9.01% to overall caesarean section, similar to Jain et al (8%) but higher than Kazmi et al (2.59%).[17,23] According to Pati et al group 2 was the major contributor followed by groups 1, 3, and 10.[24] Multiparous women included in group 3 and 4 indicate low risk population and CS rate can be further reduced in them by proper fetal heart rate monitoring by intermittent auscultation during the first stage of labour i.e., for every 15 min and every 5 min in second stage of labour, as per WHO. The EFM (electronic fetal monitoring) to be used in selected patients like patients undergoing induction of labour, foetal growth restriction (FGR), gestational diabetes mellitus (GDM) etc. But, due to the risk profile, majority of patients have electronic foetal monitoring during labour in our institute. Improving fetal monitoring during labour may potentially reduce the caesarean delivery rate. Cephalopelvic disproportion was not a major issue.

Major contributor to overall CS rate was group 5 of multiparous women with previous caesarean section accounting for 32.57% of total CS. This is similar to Gomathy et al, Tahira Kazmi et al, Prameela et al, Reddy et al.[13,18,23,25] CS rate in this particular group was 85.66%, which is similar to Jain et al (87.86%) but higher than Kazmi et al (58.2%) and lower than reported by Prameela et al (96.9%), Gomathy et al (93.2%) and Reddy et al (93.5%). This shows higher CS rate within this group. Refusal for VBAC (Vaginal birth after caesarean) was the most common indication, followed by unsuitable candidates for VBAC. Reasons for refusal of VBAC were fear of prior stitches getting open up, unable to tolerate labour pain, unwilling to accept prolonged induction in case of poor Bishop's score, and belief that elective repeat caesarean delivery (ERCD) to be a safer mode of delivery, especially in patients with a previous bad obstetrical history. Also, many of the times underlying cause was multiparous women with history of previous caesarean getting referred without any prior investigations, previous delivery records and inability to get proper and relevant history related to previous delivery that lend up in emergency caesarean in order to safeguard the life of mother and fetus. In our institute, induction of labour using prostaglandins is totally avoided in this group and oxytocin for augmentation of labour is used occasionally under careful observation and in lesser doses. More liberal application of induction in appropriate patients and augmentation of labour when indicated increased the rate of successful TOLAC (Trial of labour after cesarean) ending with safe VBAC in our hospital. Also, many multiparous women with two or more than two previous caesarean sections are getting admitted contributing to 22.48% of total population within group 5 as shown in Table 3, lesser trial of labour can be given in them due to risk of scar rupture.

In present study, Robson's group 6 and group 7 represented a high group specific CS rate however the relative size of these groups was small. Group specific caesarean section rate for nulliparous breech pregnancies (group 6) was 80.19 % while 67.10% for multiparous breech pregnancies (group 7) similar to Jain et al but lower than reported by Kazmi et al (90.9%) in group 6 and 90.2% in group 7 and Reddy et al (89.3% in group 6 and 84.2% in group 7). This can be explained by the fact that many times women with breech presentation reported to hospital late either due to late referral or delay in reaching hospital from remote peripheries, in active phase of labour with presenting part deep in the pelvis who got delivered vaginally by assisted breech vaginal delivery. Also, patients who prefer vaginal delivery should be offered trial of assisted vaginal breech delivery. Caesareans in group 6 and 7 can be reduced by training residents in the art of vaginal breech delivery and external cephalic versions in the antenatal period. For breech presentations near term, the ACOG recommends that version be offered and attempted whenever possible. Its success rate averages about 60%.

Group 8 and 9 were the smallest groups (0.7% and 1.04% of admitted population respectively). Group specific rate for group 8 was 57.06% and for group 9 was 100%. It shows internal podalic version to be tried for 2nd twin with breech presentation whenever conditions are favourable. Better augmentation and observation for progression with frequent fetal heart rate auscultation can reduce rates of meconium-stained liquor and non- progression of labour. Also, some c sections were done in our institute when 1 twin was intrauterine fetal demised and second was live to save the one alive. Group 9 included all women with abnormal lies (including previous CS). Internal podalic versions should be tried in them whenever appropriate with favourable cervix.

In a study by Sungkar et al group 10 was the major contributor, followed by groups 1, 3, and 8.[26] Group 10 which included all women with a singleton pregnancy in cephalic presentation, <37 weeks gestation including women with previous uterine scars represented 2.96% of obstetric population and group specific CS rate for group 10 was 31.29% contributing 2.39% to the overall CS rate. According to Robson, size of group 10 should be less than 5%. Kazmi et al reported a smaller group size (1.8%) and higher group specific CS rate of 80.8%. Group 10 in our study denotes we are dealing with an obstetric population with high risk for preterm labour and a low CS rate implies that most of women with preterm labour were admitted with labour pains and successfully delivered vaginally.

The difference among institutions clearly signifies the importance of Robson's classification, which helps in the development of centre-specific strategies and goals pertaining to particular subgroups of TGCS (Ten group classification system) to control the rising CS rate.

WHO multi-country surveys concluded that the proportion of women with previous caesarean section has increased. Some caesareans are also conducted on maternal requests. Moreover, patients with intrahepatic cholestasis of pregnancy are also increasing and so is pregnancy with diabetes. Ideal figure recommended by WHO could not be achieved, but need to reduce caesarean in primi gravida.

The incidence of primary CS was more than repeat CS in our institute. The main indications of CS among the primary group were fetal distress, failed induction, meconium-stained liquor, and malpresentation. Reducing the rate of primary CS will further reduce the incidence of previous CS and the overall CS rate. The rate of primary CS and CS among other major contributors (groups 2 and 1) can be reduced by adopting different approaches for each indication. Among various indications for caesarean, fetal distress was observed in 16.56%. Interobserver variations in the interpretation of CTG trace and different management approach, especially for category 2 CTG trace, requires special attention. Proper training of postgraduates and senior residents for interpreting CTG trace using one of the standard guidelines, increasing the threshold for Doppler changes in IUGR fetus, and practice of vibroacoustic stimulation test is required to reduce the CS rate for fetal distress. More judicious use of uterotonic drugs like oxytocin, better monitoring with augmentation of labour and monitoring foetal heart rate more frequently can further help.

The performance of CS among low-risk groups (groups 1, 2, 3 and 4) for non-absolute indications—foetal compromise and failure of labour to progress-should be further examined. Few CS are also done on maternal request due to increasing sedentary lifestyle and poor tolerance to pain.

In addition to this, proper use and interpretation of partograph, continuous labour monitoring, external cephalic version for breech presentation, and trial of labour in twin pregnancy with first baby in cephalic presentation can also contribute to lowering of primary CS.

CONCLUSION

"Robson's ten group classification system" helps us to identify the major contributors of overall CS rate. In present study, women with previous CS constitute the major determinant of overall CS rates, evidence-based labour management protocols, labour induction protocols, careful fetal heart monitoring, proving pregnant women with respectful and friendly environment to reduce her apprehension should be strictly followed to reduce CS rates to optimum among nullipara, which will further keep a check on the size of group 5.

Standardization of indication of caesarean deliveries, regular audits, more frequent monitoring, use of aid tools and definite protocols in hospital will help in curbing the CS rate in hospital. At the same time, one should make every effort to provide the caesarean delivery to the woman in clinically indicated need rather than to achieve a specific rate.

ACKNOWLEDGMENTS

Authors would like to thank the staff of department of obstetrics and gynecology, S. G. M. H. and associated S. S. M. C. Rewa, Madhya Pradesh for their support during study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR et al. The increasing trend in caesarean section rates: Global, regional and national estimates: 1990-2014. J Pone. 2016;11(2).
2. World Health Organization Human Reproduction Programme. WHO Statement on caesarean section rates. Reprod Heal Matters. 2015;23(45):149-50.
3. Ye J, Zhang J, Mikolajczyk R, Torlani MR, Gulmezoglu AM, Betran AP. Association between

rates of caesarean section and maternal and neonatal mortality in the 21st century: A worldwide population-based ecological study with longitudinal data. BJOG. 2016;123(5):745-53.
4. Betran AP, Torlani MR, Zhang J, Ye Z, Mikolajczyk R, Tharaux CD et al. What is the optimal rate of caesarean section at population level? A systematic review of ecologic studies. Reprod Heal. 2015;12(57):43-6.
5. Reproductive health: Managing complications in pregnancy and childbirth: A guide for midwives and doctors. World Health Organization 2003. Available at: https://apps.who.int/iris/handle/10665/42644. Accessed on 12 Nov, 2022.
6. Rijken MJ, Meguid T, Akker VDT, Roosmalen V, Stekelenburg J, Dutch Working Party for International Safe Motherhood and Reproductive Health. Global surgery and the dilemma for obstetricians. Lancet (London, England). 2015;386(10007):1941-2.
7. Belachew J, Cnattingius S, Mulic-Lutvica A, Eurenius K, Axelsson O, Wikstrom AK. Risk of retained placenta in women previously delivered by caesarean section: A population-based cohort study. BJOG. 2013;121(12):224-9.
8. Kok N, Ruiter L, Hof M, Ravelli A, Mol BW, Pajkrt E et al. Risk of maternal and neonatal complications in subsequent pregnancy after planned caesarean section in a first birth, compared with emergency caesarean section: A nationwide comparative cohort study. BJOG. 2014;121(2):216-23.
9. Villar J, Carroli G,Zavaleta N, Donner A, Wojdyla D, Faundes A et al. Maternal and neonatal individual risks and benefits associated with caesarean delivery: Multicentre prospective study. BMJ. 2007;335(7628):1025.
10. Tsega F, Mengistie B, Dessie Y, Mengesha MM. Prevalence of Cesarean Section in Urban Health Facilities and Associated Factors in Eastern Ethiopia: Hospital Based Cross Sectional Study. J Preg Child Heal. 2015;2:169-73.
11. Johnson CT, Johnson TRB, Adanu RMK, Debas HT, Donkor P, Gawande A et al (Eds). Obstetric Surgery. Essential Surgery: Disease control priorities (3rd ed) 1. International Bank for Reconstruction and Development/ the World Bank. 2015.
12. Robson MS. Can we reduce the caesarean section rate? Best Pract ReS. Clin Obstet Gynaecol. 2001;15(1):179-94.
13. Prameela RC, Shilpa G, Farha A, Prajwal S. Analysis of Cesarean section rate using Robson's Ten Group Classification System and comparing the trend at a tertiary hospital for 2 years. J South Asian Federation Obstetr Gynaecol. 2016 8(3):175-80.
14. Cesarean section rates continue to rise amid growing inequalities in access. Rising rates suggest increasing numbers of medically unnecessary, potentially harmful procedures 2021 June 16. Available at: http://https://www.who.int/news/item/16-06-2021-caesarean-section-rates-continue-to-rise-amid-growing-inequalities-in-access. Accessed on 12 November, 2022.
15. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. BMJ Glob Heal. 2019;6(6).
16. Radhakrishnan TR, Vasanthakumari KP, Babu PK. Increasing trend of caesarean rates in India: Evidence from NFHS-4. JMSCR. 2017;5(8):26167-76.
17. Jain R, Joshi V. Analysis of caesarean section using the Robson's ten group classification system -a way of monitoring obstetric practice. New Indian J OBGYN. 2021;9(1):71-7.
18. Reddy AY, Dalal A, Khursheed R. Robson Ten Group Classification System for analysis of cesarean sections in an Indian Hospital. Res J Obstet Gynecol. 2018;11(1):1-8.
19. Dhodapkar SB, Bhairavi S, Daniel M, Chauhan NS, Chauhan RC. Analysis of caesarean sections according to Robson's ten group classification system at a tertiary care teaching hospital in South India. Int J Reprod Contracept Obstet Gynecol. 2015;4:745-9.
20. Loué VA, Gbary EA, Koffi SV, Koffi AK, Traore M, Konan JK et al. Analysis of caesarean rate and indications of university hospitals in sub-Saharan African developing countries using Robson classification system: The case of Cocody's hospital center, Abidjan-Cote d'Ivoire. IJRCOG. 2017;5:1773-7.
21. 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 Heal. 2015;3(5):260-70.
22. Kelly S, Sprague A, Fell DB, Murphy P, Aelicks N, Guo Y et al. Examining caesarean section rates in Canada using the Robson classification system. J Obstet Gynaecol Can. 2013;35(3):206-14.
23. Kazmi T, Saiseema S, Khan S. Analysis of cesarean section rate-according to Robson's 10-group classification. Oman Med J. 2012;27(5):415-7.
24. Pati T, Marandi S, Mohapatra S. Analysis of caeserian section rate using Robson's classification in a tertiary care hospital of eastern Odisha. JMSCR 2018;6(9):157-161.
25. Gomathy EG, Radhika K, Kondareddy T. Use of the Robson classification to assess caesarean section trends in tertiary hospital. Int J Reprod Contracept Obstet Gynecol. 2018;7(5):1796-800.
26. Sungkar A, Santoso BI, Surya R, Fattah AN. Classifying cesarean section using Robson classification: an Indonesian tertiary hospital survey. Maj Obs Gin. 2019;27(2):66-7.

Cite this article as: Tiwari M, Singh S, Kushwah BS. Robson's ten group classification: a tool for predicting cesarean section rates. Int J Reprod Contracept Obstet Gynecol 2023;12:xxx-xx.