Original Study

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Evaluating the Rates of Caesarean Section Rates Using the Robson Classification in a Tertiary Care Center

Laxmi Misra[1], Arundhati Kanade[2], Mahindra Borse[2]

[1] Obstetrics and Gynaecology, Sukh Sagar Medical College, Jabalpur, Madhya Pradesh, India.
[2] Obstetrics and Gynaecology, Deenanath Mangeshkar Hospital, Pune, Maharashtra, India.
Corresponding author: Laxmi Misra; Email: laxmimisra91@yahoo.com

Abstract

Background: Across the world, caesarean section (CS) rates have been increasing steadily, leading to concern about avoidable procedures and the resulting maternal and neonatal morbidity. The Robson Ten-Group Classification System (TGCS) is a standardized and widely accepted method for assessing, monitoring, and comparing CS rates across institutions. **Methods:** The current retrospective observational study was carried out for a period of three years in a tertiary care facility. The information was collected through computer-based obstetric data. All the admitted women were categorized into ten Robson groups based on factors such as parity, previous CS, gestational age, onset of labour, foetal presentation, foetal lie, and number of foetuses. Thereafter, the analysis was performed regarding group size, CS rate per group, and contribution to overall CS rate. The objective of the study was to classify women delivering at a tertiary referral hospital according to the Robson TGCS and identify the major contributors to the overall CS rate. **Results:** A total of 5,493 deliveries occurred during the study period, of which 2,649 were CS, yielding an overall CS rate of 48.22%. Group 1 represented the largest proportion of the obstetric population, followed by Groups 2 and 5. Group 5 was the largest contributor to the overall CS rate, followed by Groups 2 and 1. Very high group-specific CS rates were observed in Groups 5, 6, 7, 9, and 10. Together, Groups 1, 2, and 5 accounted for the majority of all CS. **Conclusion**: The Robson TGCS is a practical and effective tool for auditing CS practices. Strategies targeting primary CS reduction, improved induction practices, and appropriate promotion of vaginal birth after caesarean may help optimize CS rates.

Keywords: Caesarean section; Robson classification; Ten-Group Classification System; obstetric audit; tertiary care hospital; Lower Segment Caesarean Section

Introduction

Lower Segment Caesarean Section (LSCS) or Caesarean Section (CS) is the most performed obstetric operation worldwide. CS can be very beneficial for the mother and the baby if used judiciously. In 1985, the World Health Organization set 10%–15% as a rate limit or any region to have a CS. However, in 2015, the World Health Organization issued a revised statement emphasizing that every effort should be made to ensure access to CS for women who need it, rather than focusing on achieving a specific target rate [1,2]. Medical fraternity universally agrees that a CS should not be performed unless an indicated, but its execution ultimately depends on obstetrician's discretion. Unfortunately rising CS rates have started causing worries globally. There is no standard and widely accepted classification to compare CS rates. Robson proposed a system that classified women into 10 groups based on their obstetric characteristics (parity, previous CS, gestational age, onset of labour, foetal lie, presentation and number of foetuses) without any mention regarding indication for CS [3]. The classification has been shown in **Table 1.**

The simplicity of this system allows minimal requirements of resources and variables for its implementation. So, this system can be easily used in the low resource settings. A good example of how a monitoring system can work is Iceland. Iceland began using the Robson classification as the basis of its CS monitoring program in 2000. Between 2000 and 2011, its total CS rate decreased from the highest to the lowest among the nations of the Nordic region. This suggests that implementation of a structured monitoring system may help improve CS surveillance and may be associated with favorable reductions in CS rates [4-5].

Material and Methods

This study which was retrospective and observational in nature was conducted at a tertiary care referral hospital over a 3-year period. The study included all antenatal women who underwent CS, whether primary or repeat, during the study period. Data were obtained from the computerized medical records of the Hospital, and relevant obstetric details were retrieved and analyzed systematically. The primary objective of the study was to evaluate the relative contribution of each group in the Robson Ten-Group Classification System (TGCS) to the overall CS rate. As the institution functions as both a teaching hospital and a referral center, the TGCS was applied to all women who were either registered or referred for delivery during the study period in order to assess the distribution and pattern of caesarean deliveries across the obstetric population.

Classification was done using Robson classification which included categories such as pregnancy, obstetric history, gestational age at birth, and mode of labour and birth.

Table 1: Robson classification groups

Number	Group
1	Nulliparous, single cephalic, >37 weeks in spontaneous labour
2	Nulliparous, single cephalic, >37 weeks (2a: induced labour 2b: CS before labour)
3	Multiparous (excluding previous CS), single cephalic, >37 weeks in spontaneous labour
4	Multiparous (excluding previous CS), single cephalic, >37 weeks, induced or CS before labour
5	Previous CS, single cephalic, >37 weeks
6	All nulliparous breeches
7	All multiparous breeches (including previous CS)
8	All multiple pregnancies (including previous CS)
9	All abnormal lies (including previous CS)
10	All single cephalic, <37 weeks (including previous CS)

Pregnancy was described as either single cephalic, single breech, single transverse/oblique presentation, and multiple pregnancies. Obstetric history was grouped as either nulliparous, multiparous without history of CS, and multiparous women with a history of caesarean sections. Gestation was determined based on the gestational age at the time of delivery. Labour and delivery factors were described as spontaneous labour, induced labour, and caesarean delivery without induction of labour. All caesarean sections performed were then assigned to one of the 10 Robson groups.

The study outcomes included calculation of the relative contribution of each Robson group to the overall CS rate, the CS rate within each Robson group, and the relative size of each group in the total obstetric population. In addition, the CS rate among women undergoing induction of labour and among those entering spontaneous labour was determined. CS rates in primigravida and multigravida women were also calculated separately, and the distribution of foetal lie in the study population was assessed.

Quantitative data were represented by mean ± standard deviation, while qualitative data were reported in frequencies and percentages. A p-value < 0.05 was taken as statistically significant. Quantitative differences among two groups were assessed with the unpaired Student's t-test. Quantitative differences among proportions in two independent groups were assessed with the Z test for proportions. Relationships among categorical data were assessed through chi-square test if the number of observations in each cell was equal or greater than five; if not, the relationship was assessed through Fisher's exact test. All statistical analysis was done using SPSS v.20.

Results

During a study period of three years, 5493 deliveries were recorded which included both vaginal and caesarean births. When classified in the TGCS, Group 1 constituted the largest segment of the obstetric population, accounting for 1,760 deliveries (32.0%). This was followed by Group 2 with 1,145 deliveries (20.8%), Group 5 with 840 deliveries (15.3%), Group 3 with 660 deliveries (12.0%), Group 10 with 552 deliveries (10.0%), Group 4 with 210 deliveries (3.8%), Group 8 with 149 deliveries (2.7%), Group 6 with 114 deliveries (2.1%), and Groups 7 and 9 with 32 (0.6%) and 31 (0.6%) deliveries, respectively. Thus, the largest contributors to the total obstetric population were Groups 1, 2, and 5. This distribution in the study group has been shown in **Figure 1.**

Among the 2,649 women who underwent CS, the majority were between 23 and 32 years of age. The mean age of participants who underwent CS was 28.24 ± 4.59 years, with an overall age range of 18–52 years. Specifically, 315 women (11.9%) were aged 18–22 years, 863 (32.6%) were aged 23–27 years, 1,016 (38.4%) were aged 28–32 years, 383 (14.5%) were aged 33–37 years, and 72 (2.7%) were older than 37 years. The age distribution of patients who underwent CS is shown in **Figure 2.**

Marked variation in CS rates was observed across the Robson groups **(Table 2)**. Group 1 had a CS rate of 29.4%, whereas Group 2 showed a substantially higher rate of 57.1%. In multiparous women without a previous CS, the rate was 8.6% in Group 3 and 16.2% in Group 4. Group 5 demonstrated a notably high CS rate of 91.9%, highlighting the major influence of previous caesarean delivery on repeat operative birth. Caesarean delivery was universal in Groups 6 and 9, both of which had a rate of 100%, while Group 7 showed a similarly high rate of 93.8%. Group 8 had a CS rate of 72.5%, and Group 10 had a rate of 60.0%.

The analysis of parity demonstrated CS rate more among multiparous women than among primiparous women, being 58.8% and 39.8%, respectively **(Table 3).** Of all women who underwent CS, 1,220 (46.1%) were primiparous and 1,429 (53.9%) were multiparous, indicating a slightly greater contribution from multiparous women to the total CS burden **(Table 4).**

Labour characteristics also showed important differences. Of the total 5,493 deliveries, 2,991 women (54.45%) underwent spontaneous labour, whereas 2,502 (45.55%) did not. However, the CS rates was considerably lower

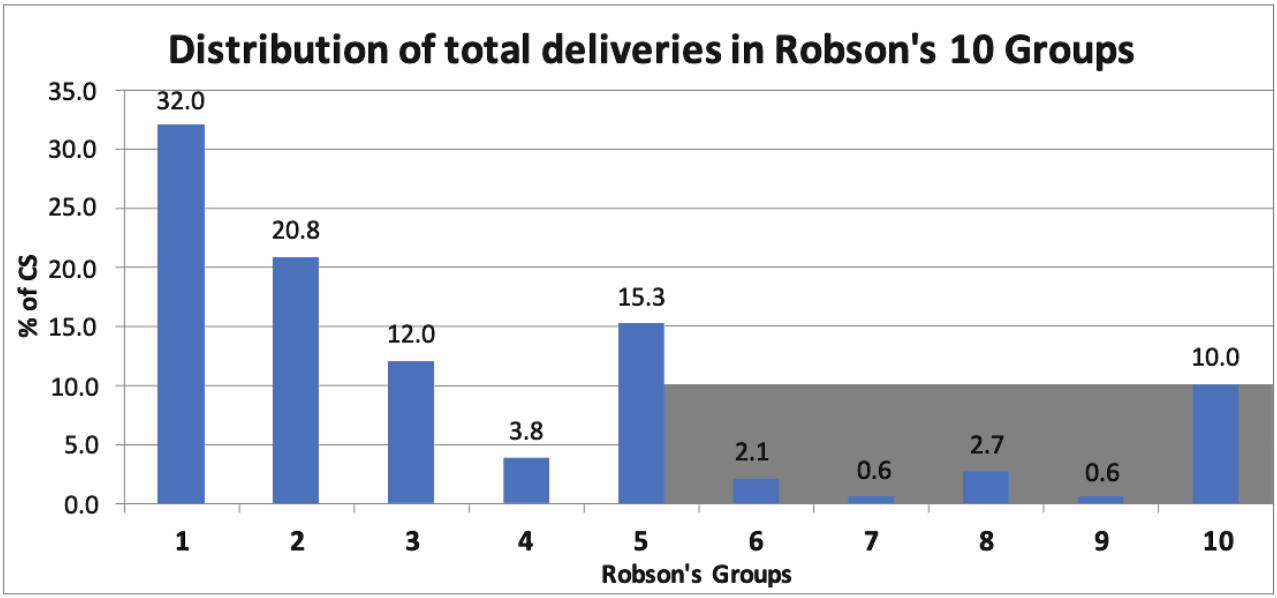

Figure 1: The distribution of total deliveries studied according to Robson's 10 group classification in the study group.

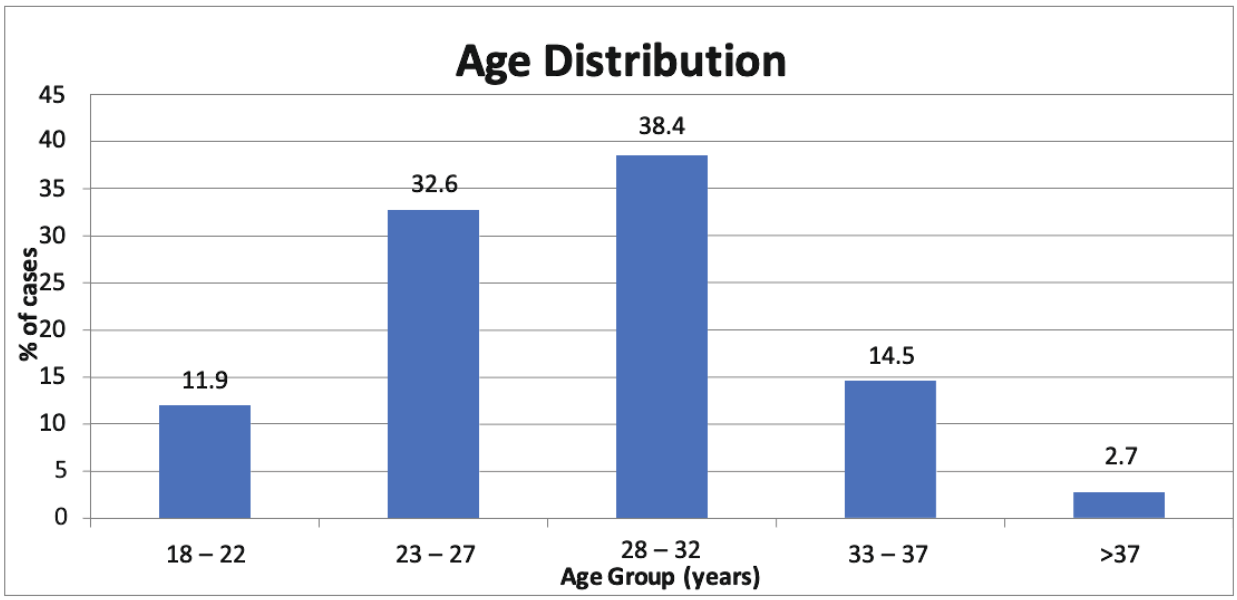

Figure 2 The age distribution of cases studied in the study group.

among patients who entered spontaneous labour than among those who did not, at 34.13% and 65.07%, respectively. Consistent with this, among the 2,649 women who underwent CS, 1,628 (61.5%) had not gone into spontaneous labour, whereas 1,021 (38.5%) had undergone spontaneous labour. These findings suggest that absence of spontaneous labour was associated with a substantially greater likelihood of caesarean delivery in the study population.

A similar trend was observed with induction of labour. Among the women who underwent CS, 515 (19.44%) had labour induced, whereas 2,134 (80.55%) had no induction. Of the 1,189 women in whom labour was induced, 515 underwent CS, yielding a CS rate of 43.31% in the induced labour group.

With regard to foetal lie, most women who underwent CS had a longitudinal lie, seen in 2,614 cases (98.7%), while oblique and transverse lie were observed in 17 (0.6%) and 18 (0.7%) cases, respectively. Similarly, cephalic presentation predominated among caesarean deliveries, being present in 2,468 cases (93.2%), whereas breech and shoulder presentations were noted in 165 (6.2%) and 16 (0.6%) cases, respectively.

Taken together, these findings show that although Groups 1 and 2 constituted the largest proportions of patients, the greatest section rates were seen in Groups 5, 6, 7, 8, 9, and 10.

Table 2: The distribution of CS cases studied according to Robson's 10 group classification in the study group				
Robson's Group	No. of CS(a)	No. of vaginal deliveries (b)	Total deliveries (a+b)	% of CS (a divided by a+b) x 100
1 (Nulliparous, single cephalic, >37 weeks in spontaneous labor)	518	1242	1760	29.4
2 (Nulliparous, single cephalic, >37 weeks 2a: induced labour ii. 2b: CS before labour)	654	491	1145	57.1
3 (Multiparous, excluding previous CS, single cephalic, >37 weeks in spontaneous labour)	57	603	660	8.6
4 (Multiparous, excluding previous CS, single cephalic, > 37 weeks, induced or CS before labour)	34	176	210	16.2
5 (Previous CS, single cephalic, >37 weeks)	772	68	840	91.9
6 (All nulliparous breeches)	114	0	114	100.0
7 (All multiparous breeches (including previous CS)	30	2	32	93.8
8 (All multiple pregnancies including previous CS)	108	41	149	72.5
9 (All abnormal lies including previous CS)	31	0	31	100.0
10 (All single cephalic, <37 weeks, including previous CS)	331	221	552	60.0

Table 3 - The distribution of CS in each parity			
Parity	No. of CS(a)	Total deliveries (CS + vaginal deliveries) (x)	% of CS (a/x) multiplied by 100
Primiparous	1220	3063	39.8
Multiparous	1429	2430	58.8

Table 4 - The distribution of parity of cases studied in the study group				
Parity	No. of CS(a)	Total deliveries (CS + vaginal deliveries) (x)	% of CS (a/x) multiplied by 100	% of cases (a/z) multiplied by 100
Primiparous	1220	3063	55.8	46.1
Multiparous	1429	2430	44.2	53.9
Total	**2649(z)**	**5493(y)**	**100.0**	**100.0**

Previous CS, lack of spontaneous labour, and induction-related labour characteristics appeared to be important contributors to the overall CS burden in this tertiary referral hospital.

Discussion

WHO has in 2015 proposed the use of the Robson Classification at the facility level as a global standard for assessing, monitoring, and comparing CS rates within healthcare facilities over time and between facilities [2].

This retrospective study classifies all the antenatal patients delivering in the facility in the study period into ten groups of Robson's Classification. During the study period a total of 5493 deliveries, both caesarean and vaginal deliveries, took place at the facility. The study group comprises of all the CS in the study period, i.e., 2649. So, the total number of vaginal deliveries comes out to be 2844. The study observes the CS cases according to the Robson's Classification to identify groups contributing most to the CS so that close monitoring and analysis of those groups can be done to reduce the CS rate.

The CS rate at facility comes out to be 48.22%. This CS rate is very high than the once recommended CS rate of WHO (10-15%). Although WHO retracted their statement in 2015 and emphasized that every woman requiring CS should receive it irrespective of CS rate. The caesarean rates at population level in India seem to be 17.2 %. In India as per District level household survey 3 (DLHS) CS rate is 28.1% in private sector and 12% in public sector health facilities [6]. According to NFHS-4, Telangana ranks highest in terms of CS rate with 57.7% and Nagaland ranks lowest with CS rate of 5.8%. Maharashtra has CS rate of 20.1%, although this rate significantly varies between urban and rural areas. According to NFHS-5 (2019–21), the population-level CS rate in India was 21.5%. CS rates were 47.4% in private health facilities and 14.3% in public health facilities [7].

The CS rate in TGCS group 1 was 29.4% and relative contribution to overall CS is 19.6% in this study. Although Group 1 represented maximum 32% (1760) deliveries of total deliveries. Another study found the relative contribution to CS from nulliparous group 1 was 18.6% and CS rate was of 16.4% [8]. In the present study, the CS rate in Group 1 was relatively high. Women in this group are generally considered to be at low risk for caesarean delivery because they are less likely to have pre-existing medical indications warranting operative intervention. When CS is performed in this group, it is most often attributable to intrapartum complications such as labour dystocia or foetal

distress. Consequently, the CS rate in Group 1 is expected to remain relatively low and is regarded as an important indicator, as primary caesarean delivery in these women may substantially influence the likelihood of repeat CS in subsequent pregnancies.

Previous studies have described strategies aimed at reducing caesarean delivery rates in this group. In one such study published in 2009, several targeted measures were implemented to lower the overall CS rate [9]. Within Group 1, particular emphasis was placed on improving the assessment and management of foetal distress and dystocia, which constituted the major indications for caesarean delivery in that cohort. The investigators reported replacing routine cardiotocography-based monitoring with alternative foetal heart rate surveillance methods and mandated the use of the partogram for all labouring women, although clinician compliance was initially variable. In addition, promotion of vacuum-assisted vaginal delivery, in appropriately selected cases, in preference to forceps also contributed to a reduction in caesarean deliveries [10].

Groups 2 and 4 of the TGCS constituted 20.8% and 3.8% of total deliveries, respectively, making them the next largest groups after Group 1. These categories include nulliparous women and multiparous women without a prior CS, respectively, with term singleton cephalic pregnancies who underwent induction of labour or pre-labour CS. Out of 1189 patients in whom labour was induced, 515 underwent CS (43.31%).

The CS rate for Group 2 is 57.1%, and the relative contribution of Group 2 to the overall CS rate is 24.7%. The second-highest relative contribution to the overall CS rate comes from Group 2. Another study has found that the relative contribution of Group 2 to the overall CS rate is 15.3% [11]. The CS rate for Group 4 is 16.2%, and the relative contribution of Group 4 to the overall CS rate is 1.3%. The CS rate of women belonging to Group 1 experiencing spontaneous labour was 29.4%, while the CS rate of women experiencing labour induced by physicians, included in Groups 2 and 4, was 41.71%.The elevated rates in these groups may reflect a substantial prevalence of clinical conditions warranting intervention, such as term pre-eclampsia, although the possibility of elective induction of labour or pre-labour CS for non-medical or less clearly defined indications cannot be excluded.

The rising number of women undergoing labour induction further underscores the need for closer evaluation of these groups. Detailed assessment of the indications for terminating pregnancy before the onset of spontaneous labour, either by induction or CS before labour, as well as review of labour induction protocols and their implementation, may help identify deficiencies in adherence to evidence-based obstetric practice. Such an approach could assist in recognizing potentially avoidable CS and in developing targeted measures to safely reduce caesarean delivery rates in these groups. The group of women undergoing CS for non- progress of labour require detailed evaluation.

According to the Robson's Classification, there were certain groups whose contribution towards the CS rate was high. This made it possible for them to be targeted effectively. The present research project also considered the CS rates among various groups. The health administration and the local researchers must use the information gathered regarding the CS rates and devise ways that will make it possible to use this information effectively. If this system is applied in our hospital, a tertiary care teaching hospital, it can make a big difference in terms of reduction of CS rate. The Robson TGCS demonstrates the need to focus on the case of women in group 1, 2 and 5 particularly if the section rate needs to be reduced. These 3 groups together contribute 73.4% of total CS occurring in the hospital. Efforts should be made to reduce primary CS (Groups 1 and 2) and promote the practice of Vaginal Birth after Caesarean (VBAC) - Group 5. If used uniformly, this system can also allow comparison between different institutions, regions and even countries to help in identifying the priority areas for the changes in clinical practice and help in reducing the caesarean rate.

Study Strengths and Limitations

The strengths of this study include the use of the internationally accepted Robson Ten-Group Classification System, a large sample size covering all deliveries over a three-year period, and the use of real-world institutional data from a tertiary care referral hospital. The study not only quantified the overall caesarean section rate but also identified the Robson groups contributing most substantially to the caesarean burden, thereby providing practical direction for targeted clinical audit and quality-improvement strategies. This research has many limitations. The study's retrospective, single-centre methodology restricts its validity and renders it susceptible to potential biases related to incomplete or erroneous information based on records. Since the study was carried out in a tertiary referral hospital, there is a possibility that the CS rate might be skewed by the presence of more complicated pregnancies. Furthermore, while the Robson classification clearly states the important factors, no investigation was made into why CS was chosen and the other factors involved in the process of making the decision. The analysis was largely descriptive, without multivariable assessment of predictors of CS, and no year-wise trend analysis was performed over the study period.

CLINICAL, ETHICAL AND SOCIAL IMPLICATIONS

1. The high overall caesarean section rate indicates the need for regular institutional review of indications for caesarean delivery, particularly in high-contributing groups such as Groups 5, 2 and 1.
2. The findings suggest that reducing primary caesarean sections in nulliparous women may help lower repeat caesarean rates in future pregnancies.
3. The high contribution of women with previous caesarean sections emphasizes the need for careful counseling and appropriate selection of patients for vaginal birth after caesarean section.
4. Caesarean section should be performed when clinically justified, and not merely because of convenience, institutional practice patterns, fear of litigation, or non-medical preferences.
5. Women should receive balanced counseling regarding the benefits and risks of caesarean delivery, induction of labour, and trial of labour after caesarean, allowing informed and shared decision-making.
6. Ethical obstetric care requires avoiding both extremes: Unnecessary caesarean sections and delayed caesarean sections when the mother or foetus truly needs operative delivery.

Conclusion

In conclusion, the classification into 10 groups according to Robson was found to be a useful way to determine the most important factors contributing to the CS rate in this hospital. Group 5, group 2, and group 1 were found to be the main contributors to the caesarean rate. Efforts to decrease primary CS and increase VBAC may help decrease CS delivery among these women. The classification of Robson could therefore be used routinely to conduct audits within obstetrics.

Declarations

Acknowledgment: None.

Artificial intelligence uses declaration statement: No artificial intelligence tools were used in the preparation of this manuscript.

Author Contribution: LM, AK and MB conceptualized the study. AK and MB made the initial draft, and contributed to literature review, interpretation of findings and critical revision of manuscript for intellectual content. LM was involved in data acquisition, statistical analysis and manuscript editing. All authors approved the final version of manuscript with LM being the guarantor.

Ethical approval: The study was conducted in accordance with the ethical standards of the responsible Ethics Committee and in compliance with the Declaration of Helsinki. Ethical approval was obtained from the Scientific Research Committee, Deenanath Mangeshkar Hospital and Research Centre, Pune (DMHRC Code: DNB_2019_OBGY_023). Written informed consent was obtained from all participants prior to their inclusion in the study.

Conflict of interest: None to declare

Data availability statement: Data supporting the findings of the study are available from the corresponding author upon reasonable request.

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