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PREVALENCE AND DETERMINANTS OF CESAREAN SECTION BASED ON ROBSON'S TEN-GROUP CLASSIFICATION: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Cesarean section (CS) rates have been increasing globally, raising concerns regarding overuse and associated maternal and neonatal risks. The Robson Ten-Group Classification System (TGCS) provides a standardized method to assess and compare CS rates across settings and identify contributing groups.

Objectives: To determine the prevalence of cesarean section and its determinants using the Robson classification in a tertiary care hospital in Bihar.

Methods: A hospital-based cross-sectional analytical study was conducted from January 2021 to December 2021 among 245 women admitted for delivery. Participants were classified into Robson's ten groups based on obstetric characteristics. Data were collected using a pre-designed proforma and analyzed using SPSS version 25. Descriptive statistics were used to calculate prevalence, while associations between variables and mode of delivery were assessed using Chi-square test. A p-value <0.05 was considered statistically significant.

Results: The overall cesarean section rate was 42.9%. The largest proportion of women belonged to Robson Group 1 (25.3%), followed by Group 2 (20.4%) and Group 3 (19.6%). Group 5 (previous cesarean section) had the highest CS rate (87.8%) and was the major contributor to overall CS rates. Groups 2 and 1 also contributed substantially. Significant determinants of cesarean section included previous cesarean section ($p<0.001$), onset of labor ($p<0.001$), maternal age ($p=0.042$), parity ($p=0.031$), and fetal presentation ($p=0.018$).

Conclusion: Cesarean section rates were high in the study setting, with repeat cesarean sections being the predominant contributor. Targeted strategies focusing on reducing primary cesarean deliveries, promoting appropriate labor management, and utilizing Robson classification for regular audit are essential to optimize CS rates and improve obstetric care.

Keywords: Cesarean section; Robson classification; prevalence; determinants; tertiary care hospital; India

INTRODUCTION

Cesarean section (CS) is one of the most commonly performed surgical procedures worldwide and plays a crucial role in reducing maternal and perinatal morbidity and mortality when medically indicated. Over the past few decades, there has been a substantial rise in cesarean section rates globally, raising concerns about its overuse and associated health risks [1]. The World Health Organization has suggested that population-level CS rates higher than 10–15% are not associated with additional reductions in maternal and neonatal mortality, indicating that unnecessary cesarean deliveries may contribute to avoidable complications and increased healthcare costs [2].

Globally, cesarean section rates have increased from approximately 7% in 1990 to over 21% in recent years, with projections suggesting further escalation if current trends continue [3]. This rise has been attributed to multiple factors including increased maternal age, higher prevalence of obstetric interventions, medico-legal concerns, patient preferences, and improved access to healthcare facilities [4]. While CS is a life-saving intervention in specific obstetric conditions, its indiscriminate use has been linked to short- and long-term adverse outcomes such as surgical complications, increased risk in subsequent pregnancies, and neonatal respiratory issues [5]. In low- and middle-income countries like India, the trend of rising cesarean section rates is particularly concerning due to disparities in access and utilization. National surveys have reported a steady increase in CS rates across both public and private healthcare sectors, with higher rates observed in urban and private settings [6]. According to the National Family Health Survey (NFHS-5), the cesarean section rate in India has increased significantly, reflecting changing obstetric practices and healthcare utilization patterns [7]. Despite this rise, there remains considerable variation across regions and institutions, indicating the influence of local practices and healthcare infrastructure [8]. To better understand and monitor cesarean section trends, the Robson Ten-Group Classification System (TGCS) has been recommended by the WHO as a standardized and reproducible method for auditing CS rates [9]. This system classifies all women admitted for delivery into ten mutually exclusive and totally inclusive groups based on obstetric characteristics such as parity, previous CS, gestational age, onset of labor, fetal presentation, and number of fetuses. The Robson classification facilitates meaningful comparisons across different settings and helps identify target groups contributing most to the overall CS rate [10].

In the Indian context, there is limited institution-based evidence evaluating cesarean section rates using the Robson classification, particularly in tertiary care settings where high-risk referrals are common. Most existing studies focus on overall CS prevalence without adequately analyzing group-specific contributions and determinants. This creates a critical gap in understanding the drivers of rising CS rates and limits the development of targeted interventions to optimize obstetric care.

Given this background, there is a need for systematic evaluation of cesarean section practices using standardized classification systems in tertiary healthcare settings in Bihar. Such analyses can provide insights into the distribution of CS across different Robson groups and identify modifiable factors contributing to increased rates. Therefore, the present study aims to assess the prevalence of cesarean section and its determinants using the Robson Ten-Group Classification System in a tertiary care hospital in Bihar.

METHODOLOGY

Study Design: This study was conducted as a hospital-based cross-sectional analytical study.

Study Setting: The study was carried out in the Department of Obstetrics and Gynecology of a tertiary care teaching hospital in Bihar. The institution caters to a large population and serves as a referral center for high-risk pregnancies from surrounding urban and rural areas.

Study Duration: The study was conducted over a period of one year from January 2021 to December 2021.

Study Population: The study population included all women admitted for delivery at the study hospital during the study period.

Inclusion Criteria

- All pregnant women admitted for delivery (vaginal or cesarean) during the study period
- Women with singleton or multiple pregnancies
- Women with gestational age ≥28 weeks

Exclusion Criteria
- Women who left against medical advice before delivery
- Incomplete or missing clinical records
- Women admitted for abortion or termination of pregnancy before viability

Sample Size: The sample size was calculated using the formula for estimating a proportion in a cross-sectional study:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where:
- Z = 1.96 (for 95% confidence level)
- p = expected prevalence of cesarean section (assumed 30% based on previous NFHS data)
- q = 1 − p = 70%
- d = absolute precision (6%)

The calculated sample size was approximately 224. After adjusting for potential incomplete records and rounding, a final sample size of 245 participants was included in the study.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible women admitted for delivery during the study period were included until the required sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a pre-designed, semi-structured proforma. Information was obtained from patient case records, labor room registers, and direct interviews when required. Variables recorded included socio-demographic characteristics, obstetric history, clinical details, mode of delivery, and indications for cesarean section. Each participant was classified into one of the ten Robson groups based on standard criteria, including parity, gestational age, onset of labor, fetal presentation, number of fetuses, and previous cesarean section status. Data collection was conducted by trained investigators under supervision to ensure accuracy and completeness.

Study Variables: The primary dependent variable was the mode of delivery (cesarean section vs vaginal delivery). Independent variables included maternal age, parity, previous cesarean section, gestational age, fetal presentation, onset of labor (spontaneous/induced/pre-labor CS), number of fetuses, and Robson classification groups. Additional variables such as booking status, referral status, and obstetric risk factors were also considered to assess determinants of cesarean section.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize the data as frequencies and percentages for categorical variables, and mean with standard deviation for continuous variables. The prevalence of cesarean section was calculated. Association between independent variables and mode of delivery was assessed using the Chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of participants were strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 245 women were included in the study. The majority of participants were aged 20–29 years (66.1%), resided in rural areas (60.4%), and were booked cases (71%) (Table 1).

Table 1: Socio-demographic Characteristics of Study Participants (n = 245)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	<20	28	11.4
	20–29	162	66.1
	≥30	55	22.4
Residence	Rural	148	60.4
	Urban	97	39.6
Booking Status	Booked	174	71.0
	Unbooked	71	29.0
Referral Status	Referred	102	41.6
	Direct admission	143	58.4

Obstetric characteristics revealed that 45.7% were nulliparous, and 27.8% had a previous cesarean section. Most pregnancies were term (84.1%) with cephalic presentation (87.3%) and singleton gestation (94.7%). Spontaneous onset of labor was observed in 55.5% of cases (Table 2).

Table 2: Obstetric Characteristics of Study Participants (n = 245)

Variable	Category	Frequency (n)	Percentage (%)
Parity	Nulliparous	112	45.7
	Multiparous	133	54.3
Previous Cesarean Section	Yes	68	27.8
	No	177	72.2
Gestational Age	<37 weeks	39	15.9
	≥37 weeks	206	84.1
Fetal Presentation	Cephalic	214	87.3
	Non-cephalic	31	12.7
Number of Fetuses	Singleton	232	94.7
	Multiple	13	5.3
Onset of Labor	Spontaneous	136	55.5
	Induced	49	20.0
	Pre-labor CS	60	24.5

According to the Robson classification, Group 1 (25.3%) and Group 2 (20.4%) constituted the largest proportion of deliveries, followed by Group 3 (19.6%) and Group 5 (16.7%) (Table 3).

Table 3: Distribution of Deliveries According to Robson Ten-Group Classification (n = 245)

Robson Group	Description (Simplified)	Total (n)	Percentage (%)

Group 1	Nulliparous, term, spontaneous labor	62	25.3
Group 2	Nulliparous, term, induced/pre-labor CS	50	20.4
Group 3	Multiparous, term, spontaneous labor	48	19.6
Group 4	Multiparous, term, induced/pre-labor CS	29	11.8
Group 5	Previous CS, term, singleton	41	16.7
Group 6	Nulliparous breech	6	2.4
Group 7	Multiparous breech	5	2.0
Group 8	Multiple pregnancy	2	0.8
Group 9	Transverse/oblique lie	1	0.4
Group 10	Preterm singleton cephalic	1	0.4

The overall prevalence of cesarean section was 42.9%. The highest cesarean section rates were observed in Group 5 (87.8%), followed by Groups 6 and 7. Group 2 also contributed substantially with a CS rate of 56% (Table 4).

Table 4: Prevalence of Cesarean Section and Group-wise Contribution (n = 245)

Robson Group	Total (n)	CS (n)	CS Rate (%)
Group 1	62	12	19.4
Group 2	50	28	56.0
Group 3	48	6	12.5
Group 4	29	11	37.9
Group 5	41	36	87.8
Group 6	6	5	83.3
Group 7	5	4	80.0
Group 8	2	1	50.0
Group 9	1	1	100
Group 10	1	1	100
Total	**245**	**105**	**42.9%**

Statistically significant associations were found between cesarean section and maternal age, parity, previous cesarean section, onset of labor, and fetal presentation. Notably, previous cesarean section and pre-labor cesarean showed strong associations with higher CS rates ($p < 0.001$) (Table 5).

Table 5: Association Between Selected Variables and Cesarean Section

Variable	Category	CS (%)	p-value
Age (years)	<20	28.6	0.042*
	20–29	40.1	
	≥30	52.7	
Parity	Nulliparous	44.6	0.031*
	Multiparous	41.4	
Previous CS	Yes	88.2	<0.001*
	No	25.4	
Onset of Labor	Spontaneous	22.8	<0.001*
	Induced	44.9	

	Pre-labor CS	100	
Fetal Presentation	Cephalic	38.3	0.018*
	Non-cephalic	67.7	

*Statistically significant ($p < 0.05$)

DISCUSSION

The present study assessed the prevalence and determinants of cesarean section using the Robson Ten-Group Classification System in a tertiary care hospital in Bihar. The overall cesarean section rate was 42.9%, which is considerably higher than the optimal range suggested by the World Health Organization [2]. The major contributors to the overall CS rate were Robson Groups 5, 2, and 1, with Group 5 (previous cesarean section, term singleton) showing the highest CS rate. Significant determinants included previous cesarean section, onset of labor, maternal age, parity, and fetal presentation.

The high overall cesarean section rate observed in this study aligns with global and national trends indicating a rising burden of CS, particularly in tertiary care settings [1,3]. Similar hospital-based studies from India have reported CS rates ranging from 30% to 50%, especially in referral centers managing high-risk pregnancies [8,11]. The elevated rate in the present study can be attributed to the tertiary care nature of the institution, where complicated and referred cases are more frequently encountered.

Robson Group 5 emerged as the single largest contributor to the overall CS rate, with a very high group-specific CS rate. This finding is consistent with previous studies, which have identified previous cesarean section as a key driver of repeat CS [9,12]. The increasing trend of primary cesarean sections inevitably leads to a rise in repeat procedures, creating a cyclical effect. Limited uptake of vaginal birth after cesarean (VBAC), due to concerns regarding uterine rupture and medico-legal issues, may further contribute to this trend.

Groups 1 and 2 (nulliparous women with term singleton cephalic pregnancies) together constituted a substantial proportion of deliveries and contributed significantly to the overall CS rate. Ideally, these groups should have lower CS rates, as they represent low-risk pregnancies [9]. However, higher rates in Group 2, particularly among induced labor and pre-labor cesarean sections, suggest potential overuse of interventions or suboptimal labor management practices. Similar observations have been reported in other studies, emphasizing the need for stricter adherence to evidence-based labor protocols [13].

The association between previous cesarean section and higher likelihood of CS observed in this study is well-documented in literature [12,14]. Women with a prior CS were significantly more likely to undergo repeat cesarean delivery, highlighting the importance of strategies aimed at reducing primary CS rates. Additionally, pre-labor cesarean sections were strongly associated with increased CS prevalence, reflecting planned surgical interventions often performed due to obstetric indications or clinician preference.

Maternal age was another significant determinant, with higher CS rates observed among women aged ≥30 years. This finding is consistent with previous studies suggesting that advanced maternal age is associated with increased obstetric complications and a higher likelihood of operative delivery [15]. Similarly, nulliparous women were found to have higher CS rates compared to multiparous women, which may be related to longer labor duration, increased likelihood of labor dystocia, and cautious clinical decision-making in first pregnancies.

Non-cephalic presentation was also significantly associated with higher CS rates, as cesarean delivery is often preferred in cases of breech or transverse lie to reduce perinatal risks. This is consistent with standard obstetric practice and findings from earlier studies [5,13].

From a public health perspective, the findings of this study underscore the importance of targeted interventions to optimize cesarean section rates. The Robson classification provides a valuable framework for identifying high-contributing groups and guiding policy decisions. Efforts should

focus on reducing primary cesarean sections, promoting safe VBAC practices, improving labor management, and enhancing antenatal risk stratification. Regular audit and feedback using Robson classification can help institutions monitor trends and implement corrective measures.

The strengths of this study include the use of a standardized WHO-recommended classification system, inclusion of all eligible deliveries during the study period, and comprehensive analysis of determinants. However, certain limitations must be acknowledged. Being a single-center study, the findings may have limited generalizability. The cross-sectional design precludes causal inference. Additionally, some clinical decision-making factors and provider-related influences could not be fully explored.

CONCLUSION

The present study demonstrated a high prevalence of cesarean section (42.9%) in a tertiary care hospital setting, with Robson Groups 5, 2, and 1 contributing most significantly to the overall rate. Previous cesarean section, induction or pre-labor cesarean, maternal age, parity, and fetal presentation were identified as key determinants. The findings highlight the critical role of repeat cesarean sections in driving overall rates, emphasizing the need to reduce primary cesarean deliveries. Strengthening evidence-based labor management, promoting safe vaginal birth after cesarean where feasible, and regular auditing using the Robson classification system are essential strategies. Institutional policies targeting high-contributing groups can help optimize cesarean section rates and improve maternal and neonatal outcomes while avoiding unnecessary surgical interventions.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants.

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REFERENCES

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. BMJ global health. 2021 Jun 15;6(6):e005671.
2. Betrán AP, Torloni MR, Zhang JJ, Gülmezoglu AM, Aleem HA, Althabe F, Bergholt T, De Bernis L, Carroli G, Deneux-Tharaux C, Devlieger R. WHO statement on caesarean section rates. Bjog. 2015 Jul 22;123(5):667.
3. Boerma T, Ronsmans C, Melesse DY, Barros AJ, Barros FC, Juan L, Moller AB, Say L, Hosseinpoor AR, Yi M, Neto DD. Global epidemiology of use of and disparities in caesarean sections. The Lancet. 2018 Oct 13;392(10155):1341-8.
4. Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, Gibbons D, Kelly NM, Kennedy HP, Kidanto H, Taylor P. Short-term and long-term effects of caesarean section on the health of women and children. The Lancet. 2018 Oct 13;392(10155):1349-57.
5. Keag OE, Norman JE, Stock SJ. Long-term risks and benefits associated with cesarean delivery for mother, baby, and subsequent pregnancies: Systematic review and meta-analysis. PLoS medicine. 2018 Jan 23;15(1):e1002494.
6. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), India, 2015–16. Mumbai: IIPS; 2017.
7. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-5), India, 2019–21. Mumbai: IIPS; 2021.
8. Guilmoto CZ, Dumont A. Trends, regional variations, and socioeconomic disparities in cesarean births in India, 2010-2016. JAMA network open. 2019 Mar 22;2(3):e190526.
9. World Health Organization. Robson classification: implementation manual, Geneva. 2017 [Internet].

10. Robson MS. Classification of caesarean sections. Fetal and maternal medicine review. 2001 Feb;12(1):23-39.
11. Singh G, Gupta ED. Rising incidence of caesarean section in rural area in Haryana, India: a retrospective analysis. Internet J Gynecol Obstetr. 2013;17(2):1-5.
12. Vogel JP, Betrán AP, Vindevoghel N, et al. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. The Lancet Global Health. 2015 May 1;3(5):e260-70.
13. Torloni MR, Betran AP, Souza JP, Widmer M, Allen T, Gulmezoglu M, Merialdi M. Classifications for cesarean section: a systematic review. PloS one. 2011 Jan 20;6(1):e14566.
14. Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, Moawad AH, Caritis SN, Harper M, Wapner RJ, Sorokin Y. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstetrics & Gynecology. 2006 Jun 1;107(6):1226-32.
15. Bayrampour H, Heaman M, Duncan KA, Tough S. Advanced maternal age and risk perception: a qualitative study. BMC pregnancy and childbirth. 2012 Sep 19;12(1):100.