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Original Article

Frequency of Cesarean Section According to the Robson Classification in a Tertiary Care Hospital in Lahore

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ABSTRACT

The Robson Ten-Group Classification System (TGCS) uses basic obstetric characteristics to categorize birthing women into ten different groups. The World Health Organization (WHO) recommended TGCS in its 2015 Executive Statement as a standard tool for monitoring and evaluating cesarean section rates at health facilities and national levels. **Objectives:** To determine the frequency of cesarean section according to Robson's criteria in the Tertiary care hospital of Lahore. **Methods:** This descriptive cross-sectional study was conducted in the Department of Gynecology and Obstetrics, Services Hospital, Lahore, from July 2023 to December 2023. A total of 135 women aged 18- 40 years undergoing delivery were selected, and those with major obstetric complications were excluded. Data were collected by non-probability, consecutive sampling. Patients were assessed for Robson classification by the researcher herself, and cesarean section was recorded for each group. Data were analyzed by computer software SPSS version 25.0. **Results:** Most of the patients, 81(60.0%), were between 18 and 30 years of age. The frequency of cesarean section was found in 53 (39.3%) patients. Cesarean section rate in different groups (1-10) according to Robson's classification was found to be 18.2%, 29.2%, 52.9%, 27.3%, 60.0%, 80.0%, 30.0%, 37.5%, 60.0%, and 100.0%, respectively. **Conclusions:** Robson Groups 3 and 5 were primary contributors to cesarean section rates, followed by Groups 6 and 2. These results underline the importance of the minimization of primary cesarean sections and the encouragement of normal delivery.

INTRODUCTION

There has been an alarming increase in the frequency of CS in recent decades, which makes the health professionals and policymakers worldwide worried. The World Health Organization (WHO) advises that the CS birth rates must not be more than 10-15 % of all births because there are no positive correlations between high CS birth rates and maternal or neonatal outcomes [1]. Most regions of the world have exceeded these recommendations, indicating overuse of surgical delivery. According to the latest statistics, the worldwide CS rate has grown to an estimated 21.1 %, and it is expected to grow to 28.5 % in 2030 [2]. The growing trend highlights the need for systematic audit and analysis to make sure that the CS procedures are appropriately indicated. Robson Ten-Group Classification System (TGCS) has become an effective audit tool in CS births. This system classifies all deliveries into ten mutually

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exclusive groups using five basic obstetric attributes of parity, previous CS, gestational age, onset of labor, fetal presentation, and plurality [3]. The TGCS offers a standardized audit and comparison framework to enable healthcare professionals to disaggregate and analyze the factors that lead to the rates of CS to understand areas that need intervention [4, 5]. The system has been widely accepted worldwide, proving that it is effective in finding patterns and improvement areas in obstetric care. The same tendency may be observed in Pakistan, where current reports indicate the rates of 20-30% in urban populations and a worrying 27-37.7% increase during the last 20 years [6, 7]. The key to this issue is to understand the local institutional information, since the healthcare professionals should be aware of the particular contributing factors in the unique socio-cultural healthcare context of Pakistan [8, 9]. Although it is acknowledged that the Robson TGCS is a useful tool, there are few studies that use this classification system in the Pakistani healthcare environment [10, 11].

In particular, institutional-level information about Lahore is limited, which limits the creation of specific, evidence-based interventions. Local data used to develop health policies and clinical guidelines will be more sensitive to the socio-economic and cultural realities that define obstetric practice. The purpose of this study is to fill this knowledge gap by providing a cross-sectional analysis of the frequency of CS section in Services Hospital, Lahore, based on Robson Ten-Group Classification System. Since the practice of CS delivery has far-reaching consequences on the health of mothers and children, this study aimed to make a contribution to the creation of more sustainable and efficient obstetric care systems in Pakistan.

METHODS

This descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Services Hospital, Lahore, from July 2023 to December 2023. The study was done as a postgraduate residency training and was approved by the College of Physicians and Surgeons, Pakistan (CPSP/REU/OBG-2019-068-9331; dated 10th July 2023). A sample size was calculated using the WHO formula for cross-sectional studies: $n = Z^2 \times P(1-P) / d^2$, where Z = 1.96 (95% confidence level), P = expected CS prevalence based on a previous study by Kant and Mendiratta [12], and d = 5% (margin of error). This yielded a minimum sample size of 135. This sample size was calculated for the primary study objective of estimating the overall CS rate and does not provide adequate power for subgroup comparisons across all Robson groups. Data were collected by non-probability, consecutive sampling. All booked or unbooked women undergoing delivery, aged between 18 and 40 years, and with any parity were included in the study. While women with h/o chronic hypertension (BP >140/90 mmHg on 2 consecutive occasions), pregnancy-induced hypertension or gestational diabetes mellitus (assessed on history), premature rupture of membrane, and antepartum hemorrhage (assessed on clinical examination) were excluded from the study. A total of 135 women undergoing delivery at the Department of Obstetrics and Gynecology, Services Hospital, Lahore, fulfilling the inclusion criteria were selected. Informed consent was taken from each patient. All patients were assessed for Robson classification (as mentioned in the operational definition) by the researcher herself, and cesarean section was noted in each group. All data (age, place of living, booked or un-booked, Robson classification, and cesarean section) were recorded on a specially designed form. All patients were managed according to standard protocol & guidelines under consultant supervision. Clinical records and patient history were used to classify labor onset as either spontaneous, induced, or pre-labor cesarean section. Gestational age was established by the first trimester or early second trimester ultrasound reports, where possible, and otherwise by the last menstrual period and confirmed by physical examination. A previous cesarean section was confirmed by the medical history or patient records. The presentation of the fetus was established based on the clinical examination and ultrasound data. Parity was noted according to patient history and confirmed by the antenatal records when possible. To achieve accuracy and consistency of Robson classification, the following measures were taken: All classifications were done by one researcher who was trained on the system of Robson Ten-Group Classification prior the study; all classification criteria were applied consistently with the use of a standardized data collection performa; history of a cesarean section was verified using medical records (where available)(72% of cases); data entry was done.

The analysis of data was done using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). The primary variables of interest did not have any missing data. The Shapiro-Wilk test was used to test the normality of continuous variables (age). Age was presented in terms of mean and standard deviation. Categorical variables such as place of residence (rural/urban), booking status (booked/un-booked), Robson classification group (1–10), and CS (yes/no) were provided in frequencies and percentages with 95% confidence interval where necessary. The chi-square test was first taken into consideration in the analysis of the association between Robson classification and cesarean section. Nevertheless, a small number of expected cells counts (less than 5) in a few of the Robson groups (Groups 8, 9, and 10) led to the adoption of Fisher's exact test because it is not based on asymptotic tests and gives more valid p-values when there

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is sparse data. The chi-square test was used to analyze the demographic variables (age group, place of living, booking status) in which the expected number of cells was sufficient. There was no multivariate analysis because of the small sample size and descriptive study aim.

RESULTS

A total of 135 women were included in this study. The age range was 18 to 40 years, with a mean age of 28.19 ± 4.16 years. The majority of patients were aged 18–30 years (81, 60.0%). In terms of place of residence, 74 (54.8%) patients lived in the rural setting, and 61 (45.2%) lived in the urban setting. The booking status was almost equal, 69 (51.1%) and 66 (48.9%) were booked and un-booked patients, respectively. In table 1, vaginal delivery was done in 82 (60.7%) cases, and the CS was done in 53 (39.3%) cases (Table 1).

Table 1: Distribution of Patients According to Age, Place of Living, Booking Status, and Mode of Delivery (n=135)

Variables	Category	n (%) / Mean ± SD
Age (Years)	18–30	81 (60.0%)
	31–40	54 (40.0%)
	—	28.19 ± 4.16
Place of Living	Rural	74 (54.8%)
	Urban	61 (45.2%)
Booking Status	Un-booked	66 (48.9%)
	Booked	69 (51.1%)
Mode of Delivery	Cesarean Section	53 (39.3%)
	Vaginal Delivery	82 (60.7%)

The study shows distribution of patients under the Robson classification groups. Group 1 (nulliparous, singleton cephalic, term, spontaneous labor) had the highest percentage of 33 (24.4%), and Group 2 (nulliparous, singleton cephalic, term, induced labor or pre-term CS had 24 (17.8%) (Table 2).

Table 2: Distribution of Patients According to Robson's Classification (n=135)

Robson's Group	n (%)
1	33 (24.4%)
2	24 (17.8%)
3	17 (12.6%)
4	11 (8.2%)
5	15 (11.1%)
6	10 (7.4%)
7	10 (7.4%)
8	8 (5.9%)
9	5 (3.7%)
10	2 (1.5%)

The results show the percentage of cesarean sections by the Robson Ten-Group Classification System. The overall cesarean section rate was 39.3% (95% CI: 30.9–47.6). Group 1 (nulliparous, singleton cephalic, term, spontaneous labor) (33 (24.4%) deliveries) and Group 2 (nulliparous, singleton cephalic, term, induced labor or pre-labor CS) (24 (17.8) deliveries) were the largest Robson groups. The highest CS rates were observed in Group 10 (100.0%, 95% CI: 15.8–100.0), Group 6 (80.0%, 95% CI: 44.4–97.5), and Groups 5 and 9 (60.0% each; 95% CI: 32.3–83.7 and 14.7–94.7, respectively). The lowest CS rates were found in Group 1 (18.2%, 95% CI: 7.0–35.5), Group 4 (27.3%, 95% CI: 6.0–61.0), and Group 2 (29.2%, 95% CI: 12.6–51.1). In terms of contribution to the total CS rate, Group 3 (multiparous, singleton cephalic, term, spontaneous labor), Group 5 (previous cesarean section) each contributed 17.0%, with Group 6 (nulliparous breech) and Group 2 contributing 15.1% and 13.2%, respectively. It was found that the relationship between Robson classification and cesarean section was statistically significant (p<0.001, Fisher's exact test) (Table 3).

Table 3: Stratification of Cesarean Section with Respect to Robson's Classification (With 95% Cis)

Robson Group	Total Deliveries, n (%)	CS, n (%)	95% CI	Contribution to Overall CS (%)
1	33 (24.4%)	6 (18.18%)	7.0–35.5	11.3
2	24 (17.8%)	7 (29.17%)	12.6–51.1	13.2
3	17 (12.6%)	9 (52.94%)	27.8–77.0	17.0
4	11 (8.2%)	3 (27.27%)	6.0–61.0	5.7
5	15 (11.1%)	9 (60.00%)	32.3–83.7	17.0
6	10 (7.4%)	8 (80.00%)	44.4–97.5	15.1
7	10 (7.4%)	3 (30.00%)	6.7–65.2	5.7
8	8 (5.9%)	3 (37.50%)	8.5–75.5	5.7
9	5 (3.7%)	3 (60.00%)	14.7–94.7	5.7
10	2 (1.5%)	2 (100.00%)	15.8–100.0	3.7
Total	135 (100%)	53 (39.26%)	30.9–47.6	100

Note: Confidence intervals calculated using the Wilson score method for proportions. *p-value calculated using Fisher's exact test due to small expected cell counts in Robson Groups 8, 9, and 10

The stratification of cesarean section rates by maternal age, place of residence, and booking status is given, with 95 percent confidence intervals. The cesarean section rate was slightly higher among women aged 31–40 years (40.7%, 95% CI: 27.6–54.8) compared to those aged 18–30 years (38.3%, 95% CI: 27.7–49.6), but this difference was not statistically significant (p=0.773). Regarding place of living, urban residents had a higher CS rate (45.9%, 95% CI: 33.0–59.2) compared to rural residents (33.8%, 95% CI: 23.2–45.7). This, however, was not statistically significant (p=0.151). With respect to booking status, un-booked patients demonstrated a CS rate of 42.4% (95% CI: 30.3–55.2), while booked patients had a rate of 36.2% (95% CI: 25.0–48.7). This was also not statistically significant (p=0.461). In general, all the demographic factors analyzed (maternal age, place of residence, or booking status) did

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not have a statistically significant influence on cesarean section rates in this study (Table 4).

Table 4: Stratification of Cesarean Section with Respect to Age Groups, Place of Living, and Booking Status (With 95% Cis)

Variables	Category	CS Yes, n (%)	95% CI	p-value
Age Group (Years)	18–30	31 (38.3%)	27.7–49.6	0.773
	31–40	22 (40.7%)	27.6–54.8	
Place of Living	Rural	25 (33.8%)	23.2–45.7	0.151
	Urban	28 (45.9%)	33.0–59.2	
Booking Status	Un-Booked	28 (42.4%)	30.3–55.2	0.461
	Booked	25 (36.2%)	25.0–48.7	

DISCUSSION

The analysis of cesarean section (CS) rates based on the Robson Ten Group Classification System of different demographic variables presents important information on trends, results, and rational healthcare choices. The average age in the present research of 135 participants was reported to have an average of 28.19 ± 4.16 years, with a large percentage (60.0%) in the 18-30 age bracket and a large number of respondents (54.8%) in rural regions. The status of booking showed a slightly better level of booked patients (51.1%). Cesarean was at 39.26% as compared to 60.7% in vaginal deliveries. Age-CS rates association has been supported by some studies, giving inconclusive findings on whether this is statistically significant. The cesarean section rate was a little higher in the older group (40.7% in 31-40 years) in the present results, though the statistical value (p=0.773) did not show any definite correlation. Equally, a Turkish study revealed that risks related to age had a strong impact on the cesarean delivery outcome, as they are rising among older mothers, presumably because of obstetric reasons that necessitate surgery [13, 14]. In the present study, the cesarean section rate was slightly higher among women aged 31–40 years than among those aged 18–30 years; however, this difference was not statistically significant (p=0.773). Similar variation in the relationship between maternal age and cesarean delivery has been reported in Pakistani studies, suggesting that age-related patterns may differ according to the obstetric population and healthcare setting. [15]. The cesarean section rate was higher among urban residents than rural residents in the present study (45.9% vs. 33.8%), although this difference was not statistically significant (p=0.151). Findings from an urban tertiary-care hospital in Lahore have highlighted several clinical and decision-making factors influencing cesarean delivery, including fetal distress, failed induction, failure to progress, and patient-related factors. These findings suggest that the relationship between place of residence and cesarean delivery is likely multifactorial and warrants further investigation. [16]. The cesarean rate among the un-booked patients was slightly higher than that among the booked, although neither of the factors was statistically significant, pointing to the existence of complexities in maternal decision-making and facility preparedness, which would need an extended investigation into the subject using qualitative research [5, 17]. Group 10, which comprises women with preterm singleton cephalic pregnancies, had the highest rate of all deliveries (2/2, 100%) by CS, regardless of prior cesarean section history, according to stratification based on Robson's groups. To lower infant morbidity and death, cesarean birth is frequently clinically justifiable in this population, which is generally linked to increased obstetric risk. A significant amount of the total cesarean section rate was contributed by Group 5 (prior cesarean section), which is indicative of the rising trend of repeat cesarean births. This emphasizes how crucial it is to encourage vaginal birth after cesarean (VBAC) when it is clinically suitable. Groups 2 and 4, which comprise pre-labor cesarean sections and induced labor, also made significant contributions, highlighting the necessity of carefully assessing labor induction procedures and decision-making procedures [18]. Controlling the rising rate of cesarean sections still requires reducing needless initial cesarean surgeries in nulliparous women (Groups 1 and 2). These results are in line with earlier research from Pakistan and other South Asian nations, where Robson Group 5 is often cited as the primary cause of cesarean section rates. Studies from Karachi and Lahore, as well as worldwide audits based on WHO guidelines, have shown similar patterns, emphasizing the growing influence of repeat cesarean procedures on overall rates. Group 3's significant contribution in this study, however, contrasts with other findings from other countries, where this group usually has lower rates of cesarean sections, indicating potential differences in clinical practice patterns and institutional decision-making [19, 20]. These statistics and comparative insights on cesarean sections in relation to age, living conditions, and booking conditions are what enhance our understanding of health care delivery systems and patient demographics that impact obstetric practices. The relatively small sample size (n=135), which was not powered for comparisons across individual Robson groups, resulted in unstable estimates and wide confidence intervals for smaller groups. Non-probability consecutive sampling may have introduced selection bias and limited generalizability. Exclusion of women with major obstetric complications may also have influenced the observed cesarean section rate. The single-center cross-sectional design and limited study period further restrict external validity and assessment of temporal trends. Additionally, previous cesarean history was based on patient reports in

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28% of cases, potentially introducing misclassification and affecting Robson-group assignment. The lack of adjustment for multiple comparisons also increases the risk of type I error; therefore, subgroup findings should be considered exploratory rather than definitive.

No multivariate analysis was performed to adjust for potential confounders such as age, parity, and booking status simultaneously. This decision was based on the study's descriptive cross-sectional design and the relatively small sample size (n=135), which was calculated to estimate the overall cesarean section rate rather than to test multiple associations. Multivariate modeling with this sample size would be underpowered and could produce unstable estimates. Therefore, the bivariate associations reported in this study should be considered exploratory and may be influenced by unmeasured confounding. Future research with larger sample sizes should employ multivariate regression techniques to assess independent predictors of cesarean section while controlling for relevant confounders. Larger sample numbers in future research are necessary to confirm these findings and allow for more thorough subgroup analyses. Moreover, the lack of multiple comparison adjustment can promote the risk of type I error. Thus, subgroup analysis must be treated as a hypothesis-generating and not definitive. Future research should widen the demographic aspect and explore qualitative aspects that affect these surgical decisions to determine issues that affect cesarean deliveries.

CONCLUSIONS

The overall cesarean section rate in the study population was 39.3%. Robson Groups 3 and 5 each accounted for 17.0% of cesarean deliveries, followed by Groups 6 and 2. These group-specific findings should be interpreted cautiously because of the relatively small sample size and limited numbers in some Robson groups. Maternal age, place of residence, and booking status were not significantly associated with cesarean section. Overall, the findings describe the distribution of cesarean sections across Robson groups in the study population. Given the single-center cross-sectional design, non-probability sampling, relatively small sample size, and limited study period, the findings should be interpreted cautiously and may not be generalizable to other settings.

Authors' Contribution

Conceptualization: HL
Methodology: HL, SC
Formal analysis: SJ
Writing and Drafting: KUK, ZK, AH
Review and Editing: SJ, KUK, HL, SC, ZK, AH

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflict of Interest

All the authors declare no conflict of interest.

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