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Analyzing trends in Cesarean Section by Action Oriented Classification (Robson Criteria) at Creek General Hospital, Karachi

Saba Pario, Shaista Bashir Anwar, Kaweeta Kumari, Uzair Ahmed, Muhammad Muhib, Ghania Naeem

ABSTRACT

Objectives: The objective of this study is to analyze Cesarean section trends using the Robson classification system and identify the cause of cesarean section in each group, in a tertiary care hospital located in Karachi, Pakistan.

Study Design and Settings: This cross-sectional study was conducted in the obstetric department of Creek General Hospital Karachi, from 1 Jan 2021 to 31 Dec 2022.

Methodology: Data collection utilized a non-probability consecutive sampling method. This study examined the sociodemographic characteristics, indications for cesarean section, and the Robson classification system in the women who underwent cesarean section in the hospital during specified duration. Inclusion criteria of study were all women who underwent for C-section procedure during the study timeline. Data was analyzed using IBM SPSS Statistics version 26. The study adhered to the Helsinki Declaration and ethical approval.

Results: The Robson classification system was analyzed in this study, and group 5 was shown to be the primary contributor followed by group 2 and then group 1. Most frequently noted indication was previous CS (43.2%), followed by non-progress of labor (15.1%), and fetal distress (11.6%).

Conclusion: Cesarean section rate can be reduced by encouraging vaginal birth after cesarean section in multiparous women who had one cesarean section, under supervision of senior obstetrician. Meanwhile, the Non-progress of labor can be targeted by improving antenatal and intrapartum care, birth preparation classes and presence of companion during labor.

Through CTG interpretation and their standardized management protocols will be effective in preventing and curbing the rising cesarean rate due to fetal distress

Keywords: Cesarean Section, Delivery, Pregnancy, Robson.

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INTRODUCTION:

A Cesarean section (C-section/CS) is a surgical obstetric procedure employed to assist delivery of the baby, an incision is made on the mother's abdomen and uterus, this procedure is usually recommended in pregnancies where vaginal deliver (VD) can pose a significant threat to the mother, fetus or both. VD may be complicated by prolonged or obstructed labor, fetal distress, elevated blood pressure or glucose, multiple pregnancies, or abnormal position/presentation of the fetus. [1]

C-section has been a mode of delivery for decades (i.e. dating back to 1500, when the first successful C-section was performed in Switzerland) in either emergency or planned setting. This procedure significantly reduces maternal and neonatal morbidity and mortality, although C-section has profound benefits it may be detrimental if practiced unreasonably. [2]

In recent times, there has been an escalating trend in the unnecessary pratice of C-sections, with an alarming annual increase of 4% globally.[3] This trend is particularly pronounced in South Asia, where a significant upsurge in deliveries via

C-section has been observed, rising from a rate of 3.2% in 1990 to a 20% in 2018. Similarly, Pakistan ranks third in the South Asian nation for the high incidence of cesarean section rate, which stood at 19.9% during the period from 2017 to 2018. [3,4]

Numerous non-medical indications of unnecessary C-section have been outlined in previous literature, which include: maternal request due to presumed anxiety and pain from VD, wanting to deliver the baby on a specific day, physician's bias or ease and associated financial incentives. [5] Furthermore, recent studies have also found that C-section rates were generally higher in private institutes as compared to public institutes. [6] The rate of cesarean section are also influenced by sociocultural background, as the practice of C-section is discouraged in some societies. [5]

According to the World Health Organization (WHO), a nationwide C-section rate exceeding 10% does not effectively reduce perinatal and maternal morbidity and mortality. Undue reliance on C-sections can lead to adverse outcomes for the mother and the fetus, including prolonged maternal recovery periods, the need for blood transfusions, hysterectomies, neonatal intensive care admissions, and, tragically, maternal and neonatal mortality. [2,7,8] This trend has a significant impact on healthcare systems and economies, with an estimated 6.2 billion unnecessary C-sections performed globally each year, totaling to US$ 2.3 billion spent annually. [9]

In-order to establish an effective regulatory system and reduce the rate of unnecessary C-sections, it is imperative to identify and distinguish the group of women who are undergoing these procedures unnecessarily. To address this concern, the Robson classification tool was introduced in 2001. This tool stratifies and monitors rates of unnecessary C-sections based on easily obtainable obstetric parameters including: parity, previous C-sections, gestational age, onset of labor, fetal presentation, and the number of fetuses, hence, the Robson classifications was adopted by the World Health Organization (WHO) in 2015 as a global standard for effectively monitoring unnecessary C-section rates in hospital settings. [6,10]

Robson's Ten-Group Classification allows detailed analysis, based on individual characteristics. That includes factors such as; single/multiple pregnancies, nulliparous/multiparous status, presentation of the fetus, type of labor, and term/preterm status. The Robson classification, divides women into 10 groups accordingly. [11] Studies report cesarean section frequencies of 30% in primigravidas and 70% in multigravidas, with specific distribution percentages across the Robson groups. Group 5 and Group 2 contribute most to the total cesarean section rate. While smaller groups have higher cesarean rates, their overall impact is minimal. [12]

C-section performed without any medical indication exposes the mother and the baby to short-term and long-term risks. Hence, the Robson classification is a standardized method to analyze C-section rate. This study aims to determine cesarean section rates at a tertiary care hospital in Karachi using the Robson classification. Allowing us to analyze the distribution of C-sections across different Robson groups, to identify high-risk populations, and detect the primary reason for cesarean section within each group.

This research will compare local cesarean section rates with national and international benchmarks, exploring the association between maternal, sociodemographic factors and cesarean section rates. Enabling us to assess the impact of maternal and fetal complications on cesarean section rates, and ultimately identify potential areas for intervention to reduce unnecessary C-sections.

METHODOLOGY:

This was cross-sectional study conducted in the Gynecology and Obstetrics department of Creek General Hospital, Karachi from 1st Jan 2021 to 31st Dec 2022. The samplig technique used in this study was non-probability consecutive sampling method. The sample size of the study calculated was 500, calculated through Rao software. The Inclusion criterion of the study was all women who underwent for Ceaserian section procedure in between the study timeline. Exclusion criteria include all those women who went under normal labour. All women who were involved in the study were taken informed consent to maintain the ethical grounds. The data was collected through well-structured questionnaire that was design and critically evaluated by the help of team of researchers, statisticians and OBGYN doctors. This study got ethical approval from the Institutional Review Board (IRB) of United Medical and Dental College, (UMDC/Ethics/2019/28/10/262) and the study was conducted in accordance with the Helsinki Declaration24.

Every woman enrolled in the hospital, her maternal history, socio-demographic data, symptomatology, clinical examination, management, outcomes, pregnancy-related information (gestational age, fetal presentation, number of fetus and onset of labor) and maternal and fetal outcomes (complications, APGAR score at five minutes, birth weight) were recorded on a predesigned proforma. The Robson tool incorporated six predefined obstetric variables in pregnant women: parity (categorized as nulliparous or multiparous), cesarean section history, type of onset of labor (spontaneous, induced, or pre-labor cesarean section), fetal count (singleton or multiple gestations), gestational age (stratified into preterm and term), and fetal presentation and lie (comprising cephalic, breech, or transverse positions). It classified pregnancies admitted for labor into one of ten distinctive categories.

Data analysis was conducted using IBM SPSS Statistics version 26, Continuous variables were presented as means with the confidence interval of 95%, while categorical variables were reported as frequencies and percentages through figures and tables. Statistical analysis included the

utilization of the chi-square test, to show the relation between independent and dependent variables with the p-value of less than 0.005 was considered significant.

RESULTS:

During the study interval, a total of 500 cesarean deliveries occurred. Overall, mean age was 26.6±4.4 years while most of the women, 53.6% were between 18-26 years of age. Majority of the women were nulliparous or with one parity, 66.3% women were delivered between gestational age 37-42 weeks.

The Robson classification showed that group 5 (Previous cesarean section, singleton, cephalic, =37 weeks' gestation)

Table 1: Distribution of C-section according to Robson's Ten group classification system

Robson Classification	Description of Robson's Ten group classification	Frequency	Percentage
1	Nulliparous, single cephalic, =37 weeks, in spontaneous labour.	88	17.6
2	Nulliparous, single cephalic, =37 weeks, induced or caesarean section (CS) before labour.	90	18
3	Multiparous (excluding previous CS), single cephalic, =37 weeks, in spontaneous labour.	23	4.6
4	Multiparous (excluding previous CS), single cephalic, >37 weeks, induced or CS before labour.	9	1.8
5	Previous CS, single cephalic, = 37 weeks	191	38.2
6	All nulliparous breeches	34	6.8
7	All multiparous breeches	12	2.4
8	All multiple pregnancies (including previous CS).	7	1.4
9	All abnormal lies (including previous CS).	1	0.2
10	All single cephalic, <37 weeks(including previous CS)	45	9
Total		500	100

Table2 : Count and persentages according to indications of robsons ten group classification system.

Indication	Robson										P-Value
	1 (n=88)	2 (n=90)	3 (n=23)	4 (n=9)	5 (n=191)	6 (n=34)	7 (n=12)	8 (n=7)	9 (n=1)	10 (n=45)	
Anhydroamnios	0	50	0	0	0	0	0	0	0	50	
APH	50	10	10	0	0	0	0	0	0	30	
CPD	33.3	66.7	0	0	0	0	0	0	0	0	
Failed IoL	0	88.9	0	8.3	0	0	0	0	0	2.8	
Fetal Distress	64.3	14.3	12.5	0	1.8	0	0	0	0	7.1	
Fetal Mal-presentation	2.1	2.1	0	0	0	72.3	19.1	0	0	4.3	
Hypertensive Disorder of Pregnancy	0	66.7	0	0	0	0	0	0	0	33.3	
IUGR	5.6	38.9	11.1	16.7	0	0	0	0	0	27.8	0.001
Maternal Wish	0	82.4	0	5.9	0	0	0	0	0	11.8	
NPOL	57.9	22.4	15.8	0	2.6	0	0	0	0	1.3	
Placenta Previa	0	25	25	50	0	0	0	0	0	0	
Precious pregnancy	0	100	0	0	0	0	0	0	0	0	
Previous Caesarean Section	0	0	0	0	86.2	0	1.4	0.9	0.5	11.1	
Twins	0	0	0	0	16.7	0	0	83.3	0	0	
Total	17.6	18	4.6	1.8	38.2	6.8	2.4	1.4	0.2	9	

Table 3: frequency of confounders according to indications of robsons ten group classification system

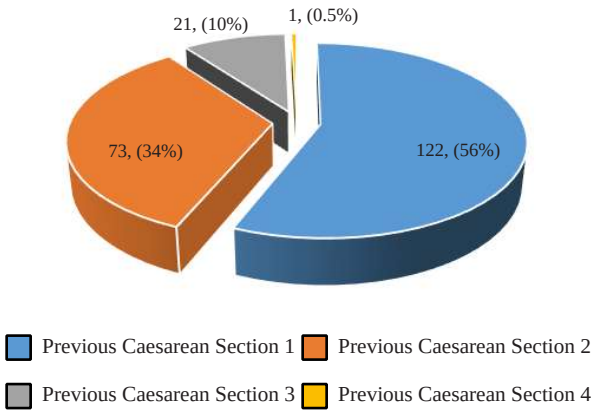
Confounder		Robson										P-Value
		1 (n=88)	2 (n=90)	3 (n=23)	4 (n=9)	5 (n=191)	6 (n=34)	7 (n=12)	8 (n=7)	9 (n=1)	10 (n=45)	
Age Group	18-26 (n= 269)	24.5	23.4	2.2	0.7	27.1	9.3	1.5	1.5	0	9.7	0.001
	> 26 (n= 232)	9.5	12.1	7.3	3	50.9	3.9	3.4	1.3	0.4	8.2	
Parity Group	0-1 (n= 367)	22.9	24.8	3.8	1.4	28.1	9	1.6	0.8	0	7.6	0.001
	2 - 4 (n= 125)	1.6	0	6.4	2.4	69.6	0	3.2	3.2	0.8	12.8	
	> 4 (n= 6)	0	0	16.7	16.7	16.7	0	33.3	0	0	16.7	
Presenting Complaints Group	26-37 (n= 168)	7.1	11.3	4.2	2.4	38.1	4.8	3	2.4	0	26.8	0.001
	> 37 (n= 333)	22.8	21.6	4.8	1.5	38.1	7.8	2.1	0.9	0.3	0	
Baby Gender	Boy (n= 277)	17.7	17.3	5.1	1.8	38.6	7.9	2.2	0.7	0	8.7	0.001
	Girl (n= 218)	17.9	19.7	4.1	1.8	38.1	5.5	2.8	0	0.5	9.6	
	Twins (n= 6)	0	0	0	0	16.7	0	0	83.3	0	0	
Baby Weight Group	1-2.5 (n= 110)	11.8	19.1	3.6	2.7	31.8	4.5	2.7	3.6	0.9	19.1	0.001
	2.6-4 (n= 387)	19.4	18.1	4.7	1.6	40.1	7.5	1.8	0.8	0	6.2	
	> 4 (n= 4)	0	0	25	0	25	0	50	0	0	0	

Table 4: Sub Groups of C-section with previous scar and grand total

Sub Groups of C-section with previous scar	Previous Caesarean Section 1		Previous Caesarean Section 2		Previous Caesarean Section 3		Previous Caesarean Section 4		Grand Total	
	Count	%	Count	%	Count	%	Count	%	Count	%
Breech	5	4.10							5	2.30
CPD	2	1.64							2	0.92
Failed IOL	3	2.46							3	1.38
Fetal Distress	7	5.74	2	2.74					9	4.15
GDM	1	0.82							1	0.46
Impending scar dehiscence	40	32.79	37	50.68	7	33.33			84	38.71
IUGR	1	0.82	2	2.74					3	1.38
Maternal Wish	8	6.56							8	3.69
NPOL	13	10.66							13	5.99
PIH	1	0.82							1	0.46
Placenta Previa	2	1.64							2	0.92
Poor Bishop	2	1.64							2	0.92
Post Dates	5	4.10							5	2.30
Post Term	3	2.46							3	1.38
Precious Pregnancy	2	1.64							2	0.92
Prom	3	2.46			1	4.76			4	1.84
Rupture Uterus	1	0.82							1	0.46
Severe Preeclampsia		0.00			1	4.76			1	0.46
Short inter pregnancy interval	1	0.82							1	0.46
Twins	1	0.82	1	1.37					2	0.92
Grand Total	101	82.79	42	57.53	9	42.86			152	70.05
(blank)	21	17.21	31	42.47	12	57.14	1	100	65	29.95
Total	122	100	73	100	21	100	1	100	217	100

was the highest contributor to the overall CS rate, contributing 43.2% of all CS. Group 2 (Nulliparous, single cephalic, =37 weeks, induced or CS before labor) was the second highest contributor, contributing 15.1% to the overall CS. The third highest contributors were group 1 (Nulliparous, single cephalic, =37 weeks, spontaneous labor) contributing 11.6% to the overall CS rate. The least contributor to the overall CS rate was group 9 (All women with a single pregnancy

Figure 1: Sub Groups of C-section with previous scar and grand total



in transverse or oblique lie (including those with previous cesarean section)), contributing 0.2 % of all CS.

The most frequent indication for C-section was previous C-section followed by non-progress of labor and fetal distress.

The pie graph shows that 56% of patients were with previous one C-section among scarred uterus, 34% were with previous two C-section, 10 % were made through previous three C-section and 0.5 % was from previous four caesarean section showing the distribution of births among women who had varied numbers of C-section prior.

The table shows that the p-value of confounder age, parity, presenting complaints, baby gender and baby weight with respect to Robson classification are less than 0.05 indicating significant relationship between the mentioned confounding variables and the Robson classification. This could imply that these confounding variables influence or are linked to the result that the Robson categorization represents.

The P-value of Robson classification with respect to indication is less than 0.05, indicating significant relation and conclude that indications are associated with or has an impact on the Robson classification.

DISCUSSION:

Cesarean section rates have been increasing gradually. This escalating prevalence of cesarean section (CS) in Pakistan and worldwide has emerged as a critical focus in contemporary maternal healthcare research. The upward trajectory of CS deliveries raises critical questions regarding its drivers and potential consequences, since, unnecessary C-section can lead to negative health consequences for mothers; these include hemorrhage, infection, shock, and uterine rupture. As for Children born via CS have a higher incidence of developing obesity, asthma, allergies, and non-communicable diseases (NCDs).

Our study aimed to implement the Robson classification system in-order to identify major contributing groups to the overall CS rates at our institute. Along with identifying the prevalence of CS rates in each group, we also assessed the primary indications for CS within these groups and proposed potential strategies for optimizing CS rates.

During the study period, a total of 500 cesarean deliveries were recorded. According to the data we collected, the Robson group 1, group 2, and group 5 accounted for the majority of the C-section conducted at the institute, together representing approximately 70% of the total C-section rate. With group 5 being the predominant contributor, followed by group 2 and group 1.

These groups are characterized by; nulliparous women with spontaneous or induced labor, and multiparous women with previous C-sections. These groups have consistently been identified as high-risk populations, hence, the results we obtained were in accordance with the studies conducted by Roberge S et al. in Quebec, Canada, and Robson M et al. in Ireland. [13,14] Similarly, Tahir N et al. reported that group 5 was the most frequently noted indication for CS, followed by groups 2 and 1, in a tertiary care hospital in Abbottabad, Pakistan. [15] In an audit conducted in a tertiary care hospital in Rawalpindi by Ansari et al., group 5 made the maximum contribution to the overall CS rate, followed by group 2. [16]

In contrast to our findings, Fatima S.S. et al. observed Group 1 to be the second most common group following group 5 in a cross-sectional study conducted at a tertiary care hospital in the capital city of KPK Province, Pakistan. [17] H. O. Tontus, in his report, conducted in Turkey also found Group 1 to be the second most common group contributing to overall CS rates. [18] Gilani S, in a retrospective study conducted at the Pakistan Institute of Medical Sciences, Islamabad, Pakistan, reported group 5 to be the major contributor to the overall CS rate followed by groups 1 and 2 with almost equal contributions. However, according to her report, group 9 made the least contribution to the overall CS rate, which is in agreement with our results. [19]

Since our study found that Robson group 1, group 2, and group 5 were the primary contributors, it was crucial to investigate the underlying factors contributing to the rates of cesarean section at our institute. Hence, our analysis revealed that previous cesarean delivery, non-progression of labor, and fetal distress were the most commonly mentioned causes for surgical intervention in these groups. These findings align with previous literature, for instance, Abdo et al. found that Group 1 and Group 5 were major contributors towards CS rates, the reasons behind their contributions were; fetal compromise and previous cesarean delivery. [20] Similarly, Khan et al. concluded that majority of CS rates are driven by the role of previous cesarean delivery and poor labor progress in driving cesarean section rates, further validating our findings. [21] These studies collectively highlight the complex interplay of factors that often necessitate cesarean section in these specific patient

populations.

Through this study we have determined that, all multiparous women with previous CS must be encouraged to have vaginal birth after cesarean section (VBAC) and should undergo a trial of labor (TOL) in the presence of a senior obstetrician. Robson, M. et al state that a higher percentage of women in Group 5 reflects a high CS rate in past years, specifically in Groups 1 and 2 (both containing nulliparous women). Therefore, to reduce the percentage of multiparous women requiring CS due to previous CS (Group 5), the rate of CS must be reduced in nulliparous women (i.e., Groups 1 and 2). [22]

This highlights that the key to lowering overall CS rates is to decrease the number of primary CS procedures. In addition to previous CS, our study reported non-progress of labor (NPOL) as the second most common indication contributing to the overall CS rate and as the most common indication for CS in nulliparous women. Antenatal consultations regarding weight gain during pregnancy and smoking may also be helpful. Birth preparation classes and guidelines should be provided to reduce anxiety and fear of delivery and childcare. At the time of labor, the presence of a birthing companion should be facilitated, and the environment should be arranged according to the mother's request to make labor more comfortable for her. However, if interventions are needed, they should be performed according to the guidelines to facilitate vaginal delivery, ensuring the safety of both the mother and the fetus. [23] The right to vaginal delivery should be discussed, and an agenda should be created. Mothers are the only person to decide the mode of delivery. However, they should be counseled about the pros and cons of CS and encouraged for vaginal delivery, as a maternal wish for CS is also an indication for CS, especially in group 2.

Induction of labor (IOL) should only be performed if necessary, and decisions and procedures should be made by an experienced obstetrician, as failed inductions also lead to unwanted CS. Despite clear protocols and instructions for external cephalic version (ECV), offering ECV is often met with hesitation. Meanwhile, the surgical alternative remains readily available for cases involving breech presentation during labor. This reluctance could be due to insufficient training and experience in managing vaginal breech deliveries. [24] Residents should be trained to perform vaginal breech deliveries and ECV to successfully deliver breech babies vaginally. Almost four-fifths of women who underwent successful ECV gave birth vaginally. [25]

This study was conducted at Creek General Hospital in Karachi, Pakistan, which is a tertiary care hospital. The study was aimed to identify factors contributing to increasing cesarean section rates in Pakistan, while providing valuable insights, our study had several limitations. It was a single-center designed study which restricted the generalizability of findings among other healthcare settings and institutes nationally. Secondly, the time period during which the study was conducted could not be used to capture long-term trends or variations in cesarean section rates. Lastly, determining the practice of "unnecessary" C-sections can be subjective and may vary among healthcare providers. Confounding factors, such as maternal age, parity, socioeconomic status, and underlying medical conditions, were not adequately controlled for, potentially influencing the observed cesarean section rates.

Therefore, in-order to enhance the robustness of future studies on similar subject, following recommendations are made; employing a larger sample size by incorporating a multicenter design, and utilizing standardized criteria for determining "unnecessary" C-sections. The future studies must explore the relation between the C-section rates among private and public institutes in Pakistan in-order to determine whether the rate of C-sections among these institutes is variable or not.

By including these changes into the study the authors can help improve the generalizability and reliability of the findings. Additionally, to avoid two of the most profound biases; observer's bias and socioeconomic bias, the researchers must employ blind data collection and must obtain detailed socioeconomic history of all the patients. They must also use of statistical techniques to control for confounding variables and prolonging the study period to capture long-term trends, this would contribute to a more comprehensive understanding of cesarean section rates and their underlying factors.

CONCLUSION:

The rising prevalence of CS rates is a major public health concern, and interventions should be devised and implemented to counter this phenomenon. Hence, the healthcare workers can play a significant role in optimizing CS rates i.e. by influencing the decision to undergo the CS. Even though financial incentives can create conflict of interest and may hinder the details disclosed by the healthcare provider, to prevent this, public health education must be employed to provide detailed information about the short-term risks and long-term risks and benefits of CS to delivering mothers in-order to promote rational decision making.

Furthermore, to reduce cesarean section rates, interventions should be targeted at the groups identified as high contributors. Consistent use of the Robson classification for CS audit in Ob/Gyn departments throughout Pakistan can help identify these groups and guide targeted interventions such as: improving the management of spontaneous and induced labor, strengthening clinical practice around encouraging vaginal birth after cesarean, and promoting active management of labor. These interventions can potentially reduce the need for cesarean section.

Although the practice of VBAC and ECV is considered to be outdated, the obstetricians and midwives should be

thoroughly trained to perform these procedures to successfully manage fetus malpresentation to successfully deliver breech babies vaginally. Through this approach the CS rates in Robson group 5, 6, 7, and 8. Induction of labor should only be decided after accurate calculation of gestational age and indication where delivering the fetus will be more beneficial than continuation of pregnancy. Standardized fetal heart rate interpretations on CTG and their standardized management protocols will be effective in preventing and curbing the rising cesarean rate due to fetal distress in groups 1, 2,3 and 4. For groups 9 and 10, the effective fetal monitoring and specialized care by experienced obstetrician can lead to a decline in CS rate

Non-progress of labor (NPOL) is also a common indication for CS in nulliparous women. Hence, to improve CS rates in this group antenatal care should be improved, birth preparation classes to be arranged, implementing midwife-led care, and involving spouse during labor can contribute to better outcomes and potentially lower cesarean section rates.

Regular audits and external reviews can help monitor CS rates. By assessing CS rates and identifying areas of improvement, healthcare facilities can work to reduce unnecessary CS procedures and ensure that surgeries are performed only when medically necessary.

Authors Contribution:
Saba Pario: Conception of study, data collection, drafting.
Shaista Bashir Anwar: Data collection and analysis of results
Kaweeta Kumari: Design of study, supervision of work
Uzair Ahmed: Data collections and drafting
Muhammad Muhib: Data collections and drafting
Ghania Naeem: Data collections and drafting

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