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The Current Cesarean Section Rate and Factors Associated with it among Women Attending The Tertiary Care Hospital in Hazara Division

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Abstract

The recent global upsurge in the trend of cesarean section rates presents a major health problem, especially for underdeveloped countries like Pakistan. The increasing cesarean section rate is a dilemma for the present world. This study, conducted at Ayub Teaching Hospital Abbottabad from June to November 2024, aims to analyze the C-section rate, assess contributing factors, and explore potential associations between these factors and their indications. This research seeks to provide valuable data and insights to the existing body of research on cesarean section rates and factors influencing delivery decisions. By sharing the findings, the study aims to foster a better understanding of C/S rates and promote improved practices in obstetric care in ATH and beyond.This cross-sectional study was conducted in the Department of Gynaecology at Ayub Teaching Hospital Abbottabad over a period of six months, from 1st June to 30th November 2024. It was based on a sample of 249 patients selected through a purposive non-probability sampling technique. Data were collected using a self-devised structured questionnaire. For data analysis, frequencies and percentages were calculated for categorical variables.The study reveals a 40.3% cesarean section rate, which is significantly higher than WHO recommendations, raising concerns about potential overuse and associated health risks. The most important and notable indication for cesarean section is “Previous CS” (26.9%), which shows a significant association with obstetrical hysterectomy, emphasizing the importance of previous C-section history. Malpresentation of the baby accounts for 6.0%, with associated risks in decision-making during childbirth. Placenta previa is another significant indication (2.4%), leading to a notable increase in emergency C-sections. “Fetal distress” (10.0%) and “Preeclampsia + PIH” (8.8%) also contribute to the C-section rate, with significant associations found between patient age and specific indications for C-section.“Elective C-section” is more common in cases of “Previous C-section” and “Malpresentation of the baby,” while “Emergency C-section” is more often associated with indications such as “Fetal distress,” “Preeclampsia + PIH,” “Obstructed labor,” and “Placenta previa and abruption.” Parity shows a strong association with cesarean indications, with multiparas having a higher frequency due to previous C-sections, while primiparas exhibit a higher occurrence related to breech presentation.The four main factors responsible for significant associations with cesarean indications were age ($p = 0.019$), family income ($p = 0.043$), type of cesarean section, and parity ($p = 0.006$). Positive trends are also observed in BMI, comorbidities, and lifestyle. “Previous CS” remains the major indication at 26.9%, while others include fetal distress, malpresentation, obstructed labour, etc. This study paves the way for further research to comprehensively understand and address the upsurge in C-section trends for improved maternal and neonatal health outcomes.

Keywords Cesarean section rate, Abbottabad, risk factors, mothers, tertiary

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1. Introduction

The recent global upsurge in the trend of the caesarean section rate presents a major health problem, especially for underdeveloped countries like Pakistan (1). Cesarean section, C-section, or cesarean birth is the surgical delivery of a baby through an incision in the mother's abdomen and uterus (2). A balanced approach to managing the caesarean section rate is essential, as underuse in poor populations can result in increased maternal and perinatal morbidity and mortality (3). On the other end of the spectrum, overuse of caesarean section results in the wastage of valuable resources and a preventable increase in maternal morbidity and mortality (1, 3).

According to a recent report by the World Health Organization (WHO), in 2021, the global caesarean section rate increased to more than 1 in 5 (21%) of all childbirths, and it is expected that by 2030, this rate will rise to 1 in 3 (29%) of all childbirths (4). According to WHO guidelines, the caesarean section rate, while avoiding unnecessary surgical procedures, should not exceed 10–15%. An increase in the cesarean section rate without medical justification does not reduce infant or maternal morbidity and mortality (5).

One of the goals set in the Sustainable Development Goals (SDGs) is to achieve good health and well-being. To meet that goal, reducing infant and maternal mortality is essential. There are a plethora of factors contributing to elevated cesarean section rates. These include the perception that normal vaginal birth is extremely painful, leading women to prefer cesarean section (6). Other contributing factors include the predictability of elective cesarean sections, recommendations by medical personnel, and the belief that cesarean delivery is safer (7). Additionally, the level of education and previous obstetrical history play a significant role in women's preference for cesarean section (8).

The cesarean section rate—both primary cesarean sections and those secondary to previous procedures—has shown an increasing trend over the past quarter-century. It increased by 60% from 1996 to 2009 (from 20.7% to 32.9%), with a slight dip in 2019, followed by a continuous rise in recent years (9, 10).

There are many medical indications for cesarean section, which are generally divided into two categories: maternal and fetal. Maternal indications include a prior cesarean section, pelvic deformity or cephalopelvic disproportion, previous perineal trauma, prior pelvic or anal/rectal reconstructive surgery, herpes simplex or HIV infection, cardiac or pulmonary disease, cerebral aneurysm or arteriovenous malformation, and concurrent pathology requiring intra-abdominal surgery (5, 6). Fetal indications include fetal distress, cord around the neck, umbilical cord prolapse, malpresentation, macrosomia, congenital anomaly, thrombocytopenia, and prior neonatal birth trauma (11, 12).

Though cesarean section is an important life-saving surgical procedure, its overuse has not been shown to reduce maternal or neonatal mortality (4). In comparison with normal vaginal delivery, cesarean section increases the risk of post-surgical complications such as infections, clot formation, and post-anesthesia issues (9). There is also a strong association between the number of previous cesarean deliveries and placenta previa (13). Moreover, infants born via cesarean section have been found to have a higher rate of eczema development than those born through normal vaginal delivery (14).

As there was no recent work on this subject in the locality of Ayub Teaching Hospital (ATH), the objective of this study was to determine the current cesarean section rate and the association of factors with indications for cesarean section in Ayub Teaching Hospital.

2. Materials and Method

This cross-sectional study was conducted from 1st June to 30th November 2024 in Department of Gynaecology, Ayub Teaching Hospital Abbottabad after obtaining ethical approval from Institutional Ethical Review Committee and informed consent from the patients. The study included a sample of 249 patients selected through purposive non-probability sampling. Data was collected using a self-structured, non-validated questionnaire. Only admitted patients who underwent a caesarean section, either elective or emergency, collected using a self-structured, non-validated questionnaire.

The sample size was calculated using EPI Info, resulting in 249 participants, with a 95% confidence level and a 5% margin of precision. The anticipated frequency of the cesarean section rate was assumed to be 221. A total of 3,989 patients were included during the study period, of which 2,378 had a normal delivery and 1,611 underwent a cesarean section. The data was collected on structured questionnaires after obtaining informed consent from the Patients who were admitted to the post-operative wards of the Gynecology and Obstetrics Department at Ayub Teaching Hospital, Abbottabad, and who had undergone

Table 1: Descriptive Statistics of the Patient

	N	Min	Max	Mean	Std.
Age	249	17	44	28.52	5.766
Weight (Kg)	249	43	120	62.94	10.849
Height (cm)	249	130	190	156.37	7.207
Body mass index	249	15	38	20.31	3.653
Total Family Income	249	10,000	150,000	37,955.82	23,146.841
No. of antenatal visits	249	0	12	4.52	2.476
Period of gestation	249	28	42	37.44	1.825
Total normal delivery	3989				
Total c section	1611				
Total normal vaginal delivery	2378				
%age of C section	40.38				

cesarean section were included in the study. The height of each patient was measured using a measuring tape, and weight was recorded using a standard weighing scale to calculate Body Mass Index (BMI). Data was collected using a structured, closed-ended questionnaire, which was administered through direct interviews with the patients. To ensure confidentiality, each questionnaire was assigned a unique identification number rather than patient names.

Secondary data, used to calculate the overall cesarean section rate, was obtained from hospital records.

Data analysis was performed using SPSS version 22. Descriptive statistics for continuous variables (age, height, weight, and BMI) were presented as mean ± standard deviation. For categorical variables (residence, education, occupation, socio-economic status, comorbidities, and indications for cesarean section), frequencies and percentages were calculated. To assess associations between variables, the Chi-square test was applied, and a p-value of ≤ 0.05 was considered statistically significant..

3. Results

The table 1 provides comprehensive descriptive data encompassing various parameters of the patients, including age, weight, height, BMI, income, number of antenatal visits (NOAV), and period of gestation. Notably, the age range spans from 17 to 44 years, while BMI calculations derived from height and weight reveal a spectrum ranging from 13.69 to 37.50. Additionally, the number of antenatal visits per patient varies from 0 to 12, with gestational periods observed between 28 and 42 weeks. We collected secondary data from the hospital's system, focusing on a 6 month period. Our findings indicated that out of a total of 3989 deliveries, 1611 were conducted via Cesarean section, while the remaining cases involved vaginal deliveries.

This data revealed an overall Cesarean section rate of 40.38%, surpassing our initial expectations. This higher rate could potentially be attributed to the overwhelming burden on our health system, compounded by the absence of other well-established medical centers in the vicinity. This suggests a pressing need for further investigation into the underlying factors contributing to the high rate of Cesarean sections, thereby facilitating the implementation of targeted measures to ensure optimal maternal care and delivery outcomes.

The patients have been effectively classified into distinct groups based on BMI, including underweight, normal weight, overweight, and obese categories.

In figure no 1: Pie chart shows “Indications for C-Section” and highlights various reasons for C-sections within the patient group. "Fetal distress"(1) accounts for 25 cases (10.0%) . "Mal presentation of baby" (2) is responsible for 15 cases (6.0%). "Previous CS" (3) represents 67 cases (26.9%). "Other" (4) indications contribute to 60 cases (24.1%). "Breech presentation" (5) constitutes 35 cases (14.1%). "Placenta previa and abruption" (6) are associated with 6 cases (2.4%). "Preeclampsia + PIH" (7) is the reason for 22 cases (8.8%). "Obstructed labor"(8) accounts for 19 cases (7.6%).

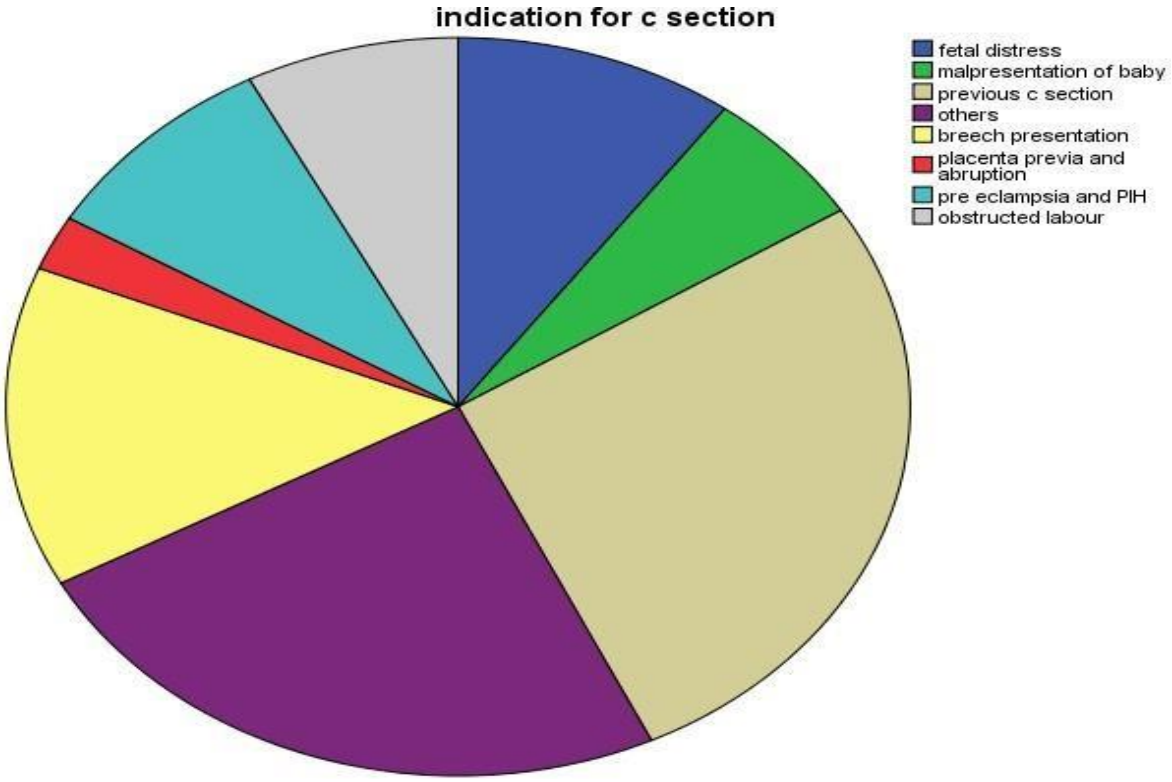

Figure 1: Pie chart showing different indication of C-section

Table 2: Association between indication of c section and age in category

	Chi square test	Age in Category				Total
		Up to 25 years	26 to 30 years	31 to 35 years	Above 35	
Indications for C-Section	Previous c section	14	28	15	10	67
	Mal presentation of baby	9	4	2	0	15
	fetal distress	14	8	2	1	25
	Preeclamps ia + PIH	6	3	10	3	22
	Obstructed labor	8	8	1	2	19
	placenta previa and abruption	2	3	1	0	6
	Breech presentation	9	12	10	4	35
	Other	23	19	8	10	60
	Total	85	85	49	30	249
	Pearson chi square					36.492
	P value					<0.02

In table 2 there was significant asscoiations (p value less than 0.05) between a patient's age group and specific C-section indication. Patients in the "31 to 35 years" age group have the highest count for "Previous CS" indications, with 15 cases, suggesting that women in their early to mid-thirties are more likely to have a C-section due to a previous caesarean section. "Mal presentation of baby" shows a higher count among patients aged "26 to 30 years," indicating that this age group may be more prone to this particular indication. "Preeclampsia + PIH" is most prevalent among patients aged "31 to 35 years," with 10 cases, suggesting a higher risk in this age group. "Breech presentation" is most common among patients aged "26 to 30 years" and "31 to 35 years," indicating a higher likelihood in women in their late twenties and early thirties. The significant Pearson chi-square value (36.492) with a p-value of less than 0.02 underscores the relationship between a patient's age and the type of C-

Table 3: Association between indication for c section and type of c section

Chi square test		Type of C-section		Total
		Elective	Emergency	
Indications for C-Section	Previous c section	45	22	67
	Mal presentation of baby	3	12	15
	fetal distress	6	19	25
	Preeclampsia + PIH	4	18	22
	Obstructed labor	7	12	19
	placenta Previa and abruption	1	5	6
	Breech presentation	12	23	35
	Other	17	43	60
Total		95	154	249
Pearson chi square				35.695
P value				<0.001

In table 3 The data showed a significant relationship between the type of C-section and the specific indications for the procedure among a total of 249 patients. "Elective C-section" (a planned Cesarean section performed before labor begins) is more common for "Previous C-section" and "Mal presentation of baby" indications, with 45 and 12 cases, respectively. "Emergency C-section"(a surgical delivery of a baby that is performed urgently due to a medical complication that threatens the safety of either the mother or the baby)is more frequent in cases of "Fetal distress" (19 cases), "Preeclampsia + PIH" (18 cases), "Obstructed labor" (12 cases) and "placenta previa and abruption"(5 cases). It's notable that "Emergency C-section" also accounts for a considerable number of cases in the "Other" category (43 cases).

Table 4: Association between indication of c section and parity of patient

Chi square test		Parity category			Total
		Primi-para	Multi-para	Grand-multipara	
Indications for C-Section	Previous c section	4	55	8	67
	Mal presentation of baby	7	8	0	15
	fetal distress	10	13	2	25
	Pre-eclampsia + PIH	6	12	4	22
	Obstructed labor	7	8	4	19
	placenta previa and abruption	2	4	0	6
	Breech presentation	11	22	2	35
	Other	21	34	5	60
Total		68	156	25	249
Pearson chi square					30.53
P value					<0.007

In table 4 there is a statistically significant relationship between the indication for cesarean section and the parity category of patients (p value is less than 0.05). The findings indicate that the distribution of C-section indications varies significantly based on a patient's parity category. For instance, multiparas seem to have a higher frequency of C-sections due to a previous C-section, while primiparas exhibit a comparatively higher occurrence of cesareans related to breech presentation. This underscores the nuanced relationship between parity and the diverse medical reasons influencing the choice of cesarean section, emphasizing the need for

tailored obstetric care strategies aligned with a patient's obstetric history.

The geographical distribution of the population, characterized by urban and rural residence types, is another critical factor under consideration. The study reveals a significant urban predominance, with 65.1% residing in urban areas. Regardless, no significant association was present between urban residence and C-section indications.

Occupation, specifically housewives versus working women, is another factor explored in the study. While there are clear variations in the distribution of indications among these groups, our study did not show any significant association between occupation and C-section indications.

In our study no significant association was present between BMI and specific C-section indications. The data reveals that the majority of patients in the sample have education levels below matric. However, our study shows no significant association between education level and C-section indications.

Family income is an important determinant that has been explored. The results indicate a significant association between family income categories and C-section indications. However, the Linear-by-Linear Association test indicates a weaker linear relationship between income and C-section indications. It's important to note that some cells have low expected counts, potentially affecting the reliability of these statistical tests.

4. Discussion

The most striking finding of this study is the cesarean section (C-section) rate of 40.3%, far exceeding the World Health Organization's recommended threshold of 10–15%. This highlights a significant deviation from optimal obstetric practice and raises concerns about potential overutilization. Such overuse not only imposes financial burdens on already stretched healthcare systems but also exposes mothers and neonates to avoidable risks. Elective C-sections without medical indications have been associated with maternal mortality risks 3–4 times greater than those of vaginal delivery, owing to complications such as postpartum hemorrhage, anesthesia-related issues, thromboembolism, and infections. This underscores the importance of adhering to evidence-based clinical guidelines to avoid non-indicated procedures and promote maternal safety (12,14). Additionally, cesarean delivery is associated with a fourfold increase in maternal morbidities compared to vaginal births (15). The upward trend in C-section rates, observed both globally and within Pakistan, reflects a worrying normalization of surgical birth — often driven by institutional, socio-cultural, and provider-related factors — rather than clinical necessity (16–19).

A key contributor to the high rate identified in this study is the history of previous C-section, which accounted for 26.9% of cases. This aligns with previous research at the same institution, where the Robson classification also identified prior cesarean delivery as the leading indication (20). The recurrence of this finding calls for a critical reassessment of trial of labor after cesarean (TOLAC) protocols, which remain underutilized in many settings due to medico-legal concerns and institutional reluctance.

Fetal distress (10%) and hypertensive disorders such as preeclampsia and pregnancy-induced hypertension (PIH) (8.8%) were also frequent indications. These conditions reflect systemic gaps in prenatal monitoring and emergency obstetric readiness. The prevalence of fetal distress in our study mirrors findings from Ethiopia (21), suggesting that insufficient intrapartum surveillance may be a shared concern across similar health systems.

Malpresentation was another recurrent indication (6.0%), with similar proportions noted in a study from KIST Medical College, Nepal (22). While some cases of malpresentation are unavoidable, others may be amenable to early detection and external cephalic version, highlighting the need for proactive antenatal screening.

A deeper exploration of demographic variables revealed several significant associations. Age was significantly linked to C-section indications, with younger women (26–30 years) showing a higher prevalence of indications such as previous cesarean and breech presentation. This trend reflects findings from the Mutaba'ah Study (23), suggesting that younger women may have differing thresholds for risk tolerance or may be more influenced by provider recommendations.

Interestingly, while urban residence was predominant in our sample (65.1%), it was not significantly associated with specific indications — a finding that contrasts with the study by Lily Kang, which documented clear rural–urban disparities in cesarean rates (24). This discrepancy may reflect regional differences in health infrastructure or patient access to care.

Contrary to prior literature (25), no significant association was found between occupation and C-section indications in our sample. This may be due to the overwhelming representation of housewives in the dataset, limiting the statistical power to detect differences.

Body mass index (BMI) showed no significant association with specific indications, though "previous C-section" was the most common across all BMI ranges. This aligns with findings from the Matlab, Bangladesh study (26), which also did not observe a direct link between BMI and C-section justification, suggesting that obesity alone may not be a reliable predictor of surgical birth when controlled for other factors.

Educational attainment also did not show a significant association with indications, although most participants had education levels below matric. This could reflect uniform patterns of clinical decision-making regardless of patient education or a broader lack of patient agency in mode-of-delivery decisions.

In contrast, family income was significantly associated with C-section indications. Lower-income groups more frequently had indications related to prior cesarean or malpresentation, whereas higher-income groups may be more prone to elective procedures based on non-clinical preferences, as supported by studies on socioeconomic disparities in delivery modes (27,28). This emphasizes the complex interplay between affordability, autonomy, and clinical decision-making.

The study also identified a strong correlation between type of C-section (elective vs. emergency) and indication. Elective procedures were more likely for cases such as previous C-section and malpresentation, while emergency C-sections were more often performed for acute conditions like fetal distress, hypertensive disorders, and placental complications. The strong statistical association ($p < 0.001$) corroborates Tehmina Begum's findings on the predictive value of indication type for delivery urgency (29).

Parity showed a similarly significant relationship. Multiparous women had a higher likelihood of cesarean delivery due to prior C-section, whereas primiparous women were more likely to undergo C-sections for breech presentation. These patterns mirror the conclusions of the Saudi Arabian cohort study, which emphasized parity as a key determinant in obstetric decision-making (30).

5. Limitations and Implications

Although this study offers important insights, certain limitations must be acknowledged. The presence of small expected cell counts in chi-square analyses may affect the statistical robustness of associations. Additionally, the use of convenience sampling limits generalizability, and the single-center design may not reflect broader regional trends.

Nonetheless, the implications are significant. By identifying key demographic and clinical factors linked to cesarean indications, this study contributes to a more nuanced understanding of delivery practices in Pakistan. These findings can inform tailored interventions, such as improved antenatal education, stricter criteria for elective cesarean delivery, and structured guidelines to promote vaginal birth after cesarean (VBAC) when clinically appropriate.

Future research should expand on these findings through multi-center studies with larger, probabilistically sampled cohorts, and should explore patient preferences, provider biases, and institutional policies in greater depth.

6. Conclusion

In conclusion, this study identified a cesarean section rate of 40.3% at Ayub Teaching Hospital, significantly exceeding the World Health Organization's recommended threshold. This elevated rate signals a concerning trend toward overuse of surgical delivery, which may expose mothers and neonates to unnecessary risks without clear clinical benefits.

Key determinants associated with specific indications for C-section included maternal age, family income, parity, and the nature of the delivery (elective vs. emergency). These factors reflect broader systemic, socio-economic, and demographic dynamics that influence obstetric decision-making in the region.

The observed trends underline the need for evidence-based interventions aimed at reducing medically unwarranted C-sections. This includes improving access to quality antenatal care, reinforcing adherence to clinical guidelines, and promoting informed patient choice. Tailored public health strategies and clinician education are also essential to ensure appropriate use of cesarean delivery, with an emphasis on maternal and neonatal safety.

Ultimately, the findings offer valuable insights for healthcare policymakers, hospital administrators, and clinicians striving to optimize delivery practices and improve maternal health outcomes in similar resource-constrained settings.

Conflict of interest The author declares no conflict of interest.

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