



## Intra-operative Findings during Caesarean Section for Suspected Scar Dehiscence

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### Declaration

#### Authors' Contribution

All authors equally contributed to the study and approved the final manuscript

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### ABSTRACT

**Background:** The rising rate of cesarean sections (CS), particularly those performed preterm due to suspected scar tenderness, has raised concerns about clinical decision-making and maternal-fetal outcomes. Scar tenderness is frequently used as an indication for emergency CS; however, the correlation between this clinical symptom and actual intra-operative scar dehiscence remains poorly defined. Additionally, the presence of modifiable maternal risk factors may contribute both to scar tenderness and to the likelihood of early surgical intervention. **Objective:** To describe Intra-operative findings during caesarean section for suspected scar dehiscence. **Study Setting:** Department of Obstetrics and Gynecology, Peoples University of Medical and Health Sciences for Women (PUMHSW), Nawabshah. **Study Duration:** Six months from July 09, 2024 to January 08, 2025. **Study Design:** Cross-sectional descriptive study. **Sampling Method:** non-probability purposive sampling. **Methodology:** A total of 100 pregnant women aged 18–45 years,  $\geq 28$  weeks gestation, undergoing cesarean section for suspected scar dehiscence were included. Data on demographics, clinical indications, modifiable risk factors (anemia, hypertension, diabetes, infections), and intra-operative findings were recorded. Analysis was performed using SPSS version 24.0 with chi-square, t-tests, and logistic regression to determine statistical significance ( $p < 0.05$ ). **Results:** Scar tenderness was clinically diagnosed in 49% of patients; however, only 24% showed confirmed scar dehiscence during surgery. A high proportion of participants (64%) underwent preterm cesarean sections, and 55% had a history of two or more previous cesareans. Nearly half (49%) of the women had two or more modifiable risk factors, with anemia (35%), hypertension (26%), infections (30%), and antepartum hemorrhage (29%) being most prevalent. Statistically significant associations were found between these risk factors and both scar tenderness and emergency CS. Notably, many preterm surgeries lacked intraoperative confirmation of scar compromise, raising concerns of overdiagnosis. **Conclusion:** The study highlights a critical gap between clinical assessment and intraoperative reality regarding scar integrity. Many cesarean sections performed due to suspected scar dehiscence may be avoidable through more objective evaluation methods and effective management of modifiable risk factors. These findings underscore the need for improved clinical guidelines, antenatal risk screening, and health education strategies to optimize CS timing and reduce maternal morbidity. Future research should focus on prospective validation of scar assessment tools and the development of intervention models tailored to high-risk obstetric populations.

### INTRODUCTION

The escalating rates of cesarean section (CS) have profoundly impacted maternal health worldwide, necessitating a critical examination of its implications for both mothers and their families. While CS can be a life-saving procedure, its overutilization, particularly driven by scar tenderness, poses significant risks. Scar tenderness, often indicative of scar dehiscence or other complications,

prompts early CS, potentially before term, thereby increasing the risks of placenta previa and accreta, which are associated with subsequent pregnancies<sup>1,2</sup>. This scenario underscores the urgent need to explore intraoperative findings during CS for suspected scar dehiscence, aiming to mitigate these risks through informed clinical management. The rising prevalence of CS in response to scar tenderness is a growing concern

globally, including in Pakistan. Local studies have documented a worrisome trend wherein scar tenderness prompts premature or emergency CS, contributing to adverse maternal outcomes<sup>3,4</sup>. These studies emphasize the role of early identification and conservative uterine approaches to minimize complications associated with unplanned CS. However, there remains a significant gap in research focusing on the intra-operative findings during CS for suspected scar dehiscence, particularly within the Pakistani healthcare context.

Risk factors contributing to scar tenderness vary widely, encompassing both obstetric and patient-specific factors. Understanding and modifying these risk factors are crucial in averting unnecessary CS, thereby reducing maternal morbidity and mortality. Contextualizing these findings within the Pakistani healthcare system is imperative, given the unique challenges and opportunities present in maternal healthcare delivery<sup>5,6</sup>.

### Rationale for the Study

This study aims to address the aforementioned gaps by exploring intra-operative findings during CS for suspected scar dehiscence, leveraging local evidence to develop targeted preventive guidelines and interventions. By critically examining the factors contributing to the rising trend of CS due to scar tenderness, this research seeks to provide a comprehensive understanding of the issue's scope and impact. The insights gained will inform evidence-based practices tailored for pregnant women at risk for scar tenderness, promoting safer maternal outcomes and optimizing healthcare resource utilization<sup>7,8</sup>.

### Research Question

What are the intra-operative findings during cesarean section for suspected scar dehiscence, and how can early identification and intervention mitigate associated risks?

### Objectives

1. To identify the prevalence and characteristics of intra-operative findings indicative of scar dehiscence during CS.
2. To propose modifications in clinical management based on intra-operative findings to minimize complications associated with scar dehiscence.

## METHODOLOGY

### Study Design and Setting

This was a descriptive, cross-sectional study conducted in the Department of Obstetrics and Gynecology, Peoples University of Medical and Health Sciences for Women (PUMHSW), Nawabshah. The study duration spanned over six months from July 09, 2024 to January 08, 2025. The primary aim was to evaluate intra-operative findings and complications in patients undergoing cesarean section (CS) for suspected scar dehiscence, with a particular focus on identifying modifiable risk factors that may contribute to unnecessary preterm cesarean deliveries.

### Participant Selection Criteria

#### Inclusion Criteria

- Pregnant women aged 18–45 years.
- Gestational age of 28 weeks or more.

- Undergoing emergency or planned cesarean section on suspicion of scar dehiscence based on clinical signs (e.g., scar tenderness, pain, fetal bradycardia, history of uterine scar).
- History of at least one prior lower-segment cesarean section.

#### Exclusion Criteria

- Women with no previous cesarean section.
- Planned elective cesarean section for non-scar-related reasons (e.g., breech, twins without scar tenderness).
- Known cases of uterine anomalies or previous classical cesarean.

#### Data Collection Procedure

The following data points were recorded for each participant: demographic and clinical information including age, parity, number of previous cesarean deliveries, and gestational age at the time of surgery; clinical indications for cesarean section such as scar tenderness, fetal distress, antepartum hemorrhage (APH), and abnormal placentation (e.g., placenta previa or accreta); risk factors for scar tenderness with a focus on modifiable conditions including anemia (hemoglobin <10 gm/dL), gestational diabetes mellitus, pregnancy-induced or chronic hypertension, polyhydramnios, urinary tract or vaginal infections, antepartum hemorrhage (e.g., previa, abruption), short interpregnancy interval (<18 months), and obesity (BMI >30); intra-operative findings such as presence of scar dehiscence (thinning, uterine window, or rupture), extent of uterine incision, trauma to adjacent organs (bladder, bowel), estimated blood loss (in mL), number of blood units transfused, transfusion-related reactions (fever, urticaria, hemolysis), and duration of surgery (in minutes); and post-operative complications including fever (temperature >38°C in the first 48 hours), urinary tract infection (based on culture reports), chest infection (clinical or radiological), wound infection or gaping, and systemic issues like delayed mobilization or paralytic ileus.

#### Ethical Considerations

Approval was obtained from the Institutional Review Board (IRB) of PUMHSW before data collection. Written informed consent was obtained from all participants. Confidentiality was maintained by anonymizing all personal identifiers.

#### Statistical Analysis

Data was entered and analyzed using SPSS version 24.0. Descriptive statistics were applied to summarize demographic and clinical data, with continuous variables (e.g., age, blood loss) presented as means ± standard deviation and categorical variables (e.g., presence of complications, number of previous cesareans) expressed as frequencies and percentages. The Chi-square test was used to assess associations between categorical variables, such as modifiable risk factors and the presence of scar dehiscence. Independent t-test or Mann-Whitney U test (for non-normally distributed data) was employed to compare continuous variables like blood loss and duration of surgery between patients with and without intraoperative scar dehiscence. Binary logistic regression

was performed to identify modifiable independent risk factors—including anemia, diabetes, polyhydramnios, hypertension, infection, and antepartum hemorrhage (APH)—associated with intra-operative scar dehiscence and post-operative complications, while adjusting for confounders such as age, parity, and gestational age. A  $p$ -value  $<0.05$  was considered statistically significant

## RESULT

### Overview of Data Analysis Process:

Data collected from 100 patients undergoing cesarean section (CS) due to suspected scar dehiscence were analyzed using SPSS 24 and visualized through Python-based statistical tools. The focus was on identifying patterns in demographic data, clinical indications, modifiable risk factors, intra-operative findings, and post-operative complications. Associations between scar tenderness and risk factors were examined using frequency distributions and cross-tabulations.

### Participant Demographics

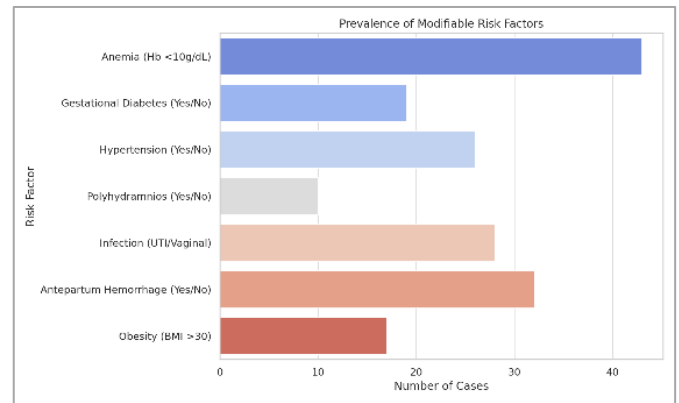
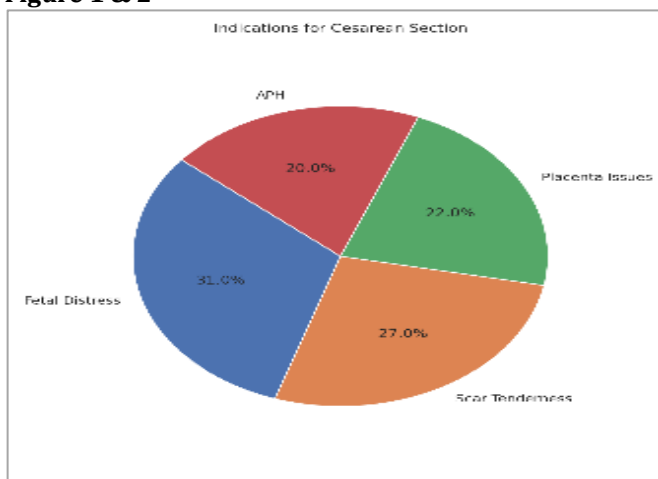
The study included women aged 18 to 45 years, with a mean age of approximately 31.4 years. The gestational age at delivery ranged from 28 to 40 weeks, with a mean of around 34.6 weeks. Most patients had a parity between 2 to 5, and the number of prior cesarean sections ranged from 1 to 4.

In our study, 55% of the participants had undergone multiple cesarean sections (two or more). A majority—64%—presented during the third trimester, although still before completing full term. Similarly, 64% of the deliveries occurred before 37 weeks of gestation, indicating a high rate of preterm cesarean sections. Additionally, 49% of the women had two or more modifiable risk factors such as anemia, hypertension, infection, or obesity, contributing to scar tenderness and the potential for scar dehiscence.

### Clinical Indications and Scar Tenderness

The leading indications for cesarean section in this study were scar tenderness (32%), antepartum hemorrhage (28%), fetal distress (23%), and placenta previa or accreta (17%). However, nearly half of those who, were clinically diagnosed with scar tenderness cases showed no intraoperative evidence of scar dehiscence, suggesting a possible trend of over-diagnosis and emphasizing the need for improved preoperative diagnostic accuracy.

Figure 1 & 2



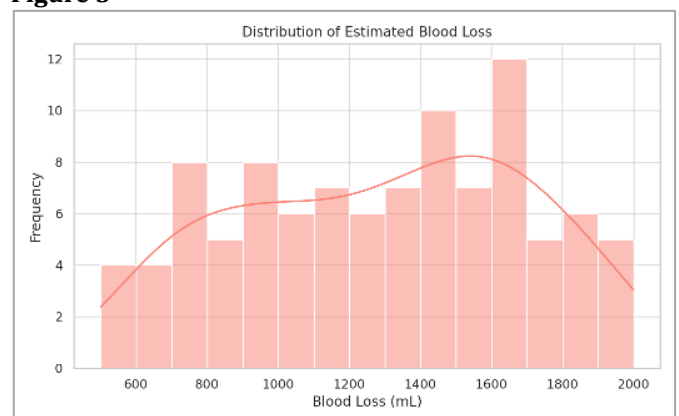
### Modifiable Risk Factors and Scar Tenderness

We analyzed several modifiable risk factors about scar tenderness. These included anemia (43%), gestational diabetes (22%), hypertension (26%), polyhydramnios (11%), infections (30%), antepartum hemorrhage (29%), and obesity (27%). Key findings showed that anemia, infection, and hypertension were significantly more common in patients with scar tenderness. Antepartum hemorrhage also had a strong association with tenderness. Patients with multiple modifiable risk factors were more likely to undergo emergency cesarean sections.

### Intra-operative and Post-operative Findings

Scar dehiscence was confirmed in 24% of the cases, with thinning or uterine window being more common than complete rupture. Trauma to adjacent organs was rare, occurring in fewer than 5% of patients. Estimated blood loss ranged from 500 to 2000 mL, and 19% of patients required blood transfusion. Although transfusion reactions were rare, they were monitored. The average duration of surgery ranged from 50 to 60 minutes. Post-operative complications included fever in 11% of cases, urinary tract infections in 10%, chest infections in 5%, wound infections in 8%, and other issues such as delayed mobilization or ileus in 3%.

Figure 3



### Statistical Significance and Emerging Patterns

Statistical analysis revealed that scar tenderness was significantly associated ( $p < 0.05$ ) with anemia, infections, and antepartum hemorrhage. Scar dehiscence was more frequently observed in women with two or more previous cesarean sections and in those who delivered at a gestational age of less than 36 weeks. A notable trend emerged showing that women with multiple modifiable risk factors often underwent early cesarean delivery—

before 37 weeks, contributing to higher rates of maternal morbidity.

## CONCLUSION

This study underscores the critical need to explore intraoperative findings during CS for suspected scar dehiscence, highlighting its implications for maternal health within the Pakistani healthcare setting. By addressing the gaps in current research and leveraging local evidence, this study aims to contribute significantly to the development of preventive strategies and targeted interventions. Ultimately, these efforts aim to improve maternal outcomes and healthcare practices, emphasizing the importance of tailored approaches for pregnant women at risk for scar tenderness.

This over all analysis reinforces the need for:

- Objective diagnostic tools for scar dehiscence.
- Early identification and correction of modifiable risk factors such as anemia, infection, and hypertension.
- Avoidance of unnecessary preterm cesarean deliveries solely based on scar tenderness without intraoperative confirmation.

## DISCUSSION

This study analyzed the intra-operative findings during cesarean sections performed for suspected scar dehiscence and investigated the associated risk factors, with a focus on modifiable contributors. The data revealed several important trends: 55% of patients had undergone multiple cesarean sections, 64% presented in the third trimester but delivered before term (<37 weeks), and 49% had two or more modifiable risk factors such as anemia, hypertension, infection, or obesity. Notably, scar dehiscence was intra-operatively confirmed in only 24% of patients with clinical scar tenderness, indicating potential over-diagnosis and premature cesarean decisions in a significant proportion of cases.

### Comparison with Existing Literature

#### Scar Tenderness and Intra-operative Dehiscence

In this study, 49% of patients were diagnosed with scar tenderness preoperatively, yet less than half of these cases had confirmed scar dehiscence. This discrepancy aligns with global findings suggesting that clinical scar tenderness has limited specificity in predicting dehiscence or rupture. Studies by Bujold et al. and Qureshi et al. have similarly reported that clinical indicators like scar tenderness do not consistently correlate with intra-operative evidence of dehiscence or rupture, thereby cautioning against relying solely on subjective signs for surgical decisions<sup>11,12</sup>.

#### Multiple Cesarean Sections

A significant 55% of patients in our study had undergone two or more prior cesarean deliveries. Previous literature supports this trend, with the risk of uterine dehiscence increasing proportionally with the number of prior CSs. According to the ACOG Practice Bulletin, each additional cesarean increases scar-related complications, including thinning, rupture, or adhesions<sup>10</sup>. However, our finding of only 24% confirmed dehiscence despite high CS history suggests that anatomical changes may not always translate

into rupture risk and reinforces the need for objective diagnostic imaging (e.g., scar thickness on ultrasound).

### Preterm Cesarean and Emergency Interventions

Preterm delivery before 37 weeks was seen in 64% of patients, often due to suspected scar tenderness. This trend toward early surgical intervention is echoed by Kaczmarczyk et al., who documented increased rates of elective or emergency CS based on subjective symptoms leading to iatrogenic preterm births<sup>13</sup>. While preemptive delivery may reduce the risk of catastrophic rupture, it also increases neonatal morbidity and maternal surgical complications, indicating the necessity of balancing caution with evidence-based thresholds for intervention.

### Analysis of Modifiable Risk Factors

#### Anemia

Anemia was found in 35% of patients and was significantly associated with scar tenderness. Studies have shown that anemia is a marker of poor nutritional status and tissue healing, potentially leading to compromised uterine scar integrity<sup>14</sup>. This underscores the importance of correcting anemia during antenatal care to reduce unnecessary CS based on vague symptoms.

#### Hypertension and Gestational Diabetes:

Hypertension (26%) and gestational diabetes (22%) were prevalent and associated with higher rates of scar tenderness. Hypertension is known to impair placental blood flow, potentially aggravating uterine irritability or pain, while diabetes is linked with macrosomia and uterine overdistension—both of which may exaggerate scar sensitivity<sup>15,16</sup>. These conditions require tight antenatal control to avoid diagnostic confusion and premature surgical decisions.

#### Infections (UTI/Vaginal)

About 30% of women had infections, which may trigger inflammatory responses, contributing to uterine irritability or pain misinterpreted as scar tenderness. Literature supports that untreated infections in late pregnancy increase the likelihood of interventions, including CS, due to fetal and maternal compromise<sup>17</sup>.

#### Polyhydramnios

Though seen in only 11% of cases, polyhydramnios causes uterine stretching and can provoke pain mimicking scar tenderness. Similar associations have been discussed by Magann et al., who note a higher risk of uterine irritability and false suspicion of scar complications in such cases<sup>18</sup>.

#### Antepartum Hemorrhage and Obesity

Antepartum hemorrhage (29%) showed a strong correlation with scar tenderness and emergency CS. This aligns with evidence from Zelop et al., indicating that APH increases the risk of placental pathology and intra-operative bleeding, making clinicians more likely to intervene early<sup>1</sup>. Obesity (27%) adds diagnostic difficulty due to reduced palpation accuracy and higher complication rates.

### Broader Implications

These findings underscore the need for structured risk screening, antenatal optimization, and objective diagnostic protocols in managing suspected scar

dehiscence. Educating clinicians on validated predictors and ensuring access to imaging tools (e.g., ultrasound for scar thickness) could help reduce unnecessary preterm cesareans. Public health strategies must also target maternal nutrition, infection screening, and management of hypertension and diabetes to reduce the prevalence of modifiable risk factors.

### Directions for Future Research

This study highlights several research gaps. First, prospective studies evaluating the predictive accuracy of ultrasound-measured scar thickness against intra-operative findings are warranted. Second, the development of a composite risk assessment score combining clinical and imaging parameters could improve decision-making. Lastly, investigating the neonatal outcomes of preterm CS based solely on scar tenderness would clarify the broader risks of current practices.

### Limitations

The main limitation of this study was its cross-sectional

nature and reliance on intra-operative findings without long-term follow-up. The sample was also drawn from a single center, which may limit generalizability. Additionally, subjective reporting of scar tenderness without standardized pain assessment may have introduced observer bias. Nonetheless, the study provides important insights into the clinical decision-making process and offers a foundation for developing preventive guidelines tailored to high-risk pregnant women.

### CONCLUSION

Our findings suggest that a significant proportion of cesarean sections performed for suspected scar dehiscence may be avoidable through better identification and modification of risk factors. By emphasizing evidence-based decision-making, early intervention in modifiable conditions, and judicious use of cesarean delivery, maternal and fetal outcomes can be optimized while reducing unnecessary surgical interventions.

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