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## Original Research Article

# Navigating the unexpected: Insights into bladder injuries during emergency cesarean deliveries

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## ABSTRACT

**Background:** Bladder injury is a recognized complication of emergency cesarean sections, yet comprehensive studies elucidating its incidence and associated risk factors are limited.

**Materials and Methods:** This retrospective study analyzed data from emergency cesarean deliveries performed over a three-year period at a tertiary care center. Cases with documented bladder injury were identified, and relevant clinical variables including patient demographics, surgical details, various risk factors, and obstetric history were collected and analyzed.

**Results:** Among the emergency cesarean cases reviewed (n= 12218), bladder injury was identified in 22 cases making a incidence rate of 0.18%. The majority of injuries occurred during the initial phase of uterine incision. Significant risk factors associated with bladder injury included a history of previous cesarean sections, presence of adherent placenta, and intraoperative adhesions. Distribution analysis revealed varying prevalence rates across different clinical variables.

**Conclusion:** Bladder injury represents a notable complication of emergency cesarean deliveries, necessitating a comprehensive understanding of associated risk factors and preventive measures. This study contributes valuable insights into the epidemiology and clinical correlates of bladder trauma in urgent obstetric interventions, emphasizing the importance of tailored interventions to enhance patient safety and reduce maternal morbidity.

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## 1. Introduction

Cesarean section (CS) stands as a cornerstone in modern obstetric care, offering a lifeline in instances where vaginal delivery poses risks to maternal or fetal well-being.<sup>1</sup> Widely practiced across the globe, CS addresses a spectrum of obstetric complications, safeguarding the health of both mother and child.<sup>2</sup> However, akin to any surgical intervention, CS is not devoid of risks, among which bladder injury emerges as a notable concern.<sup>3</sup> As the CS rate has increased, maternal mortality and morbidity have also risen steadily over the last three decades.<sup>4</sup>

Bladder injury is associated with an increased frequency of sepsis, venous thromboembolism, peritonitis, blood transfusions and longer hospital stays.<sup>5</sup> Fortunately cesarean delivery has been associated with low rates of maternal morbidity and mortality over the past century. However, the most common complication of pelvic surgery is urologic injury, with bladder injury quoted as the most frequently injured organ during pelvic surgery.<sup>6</sup> This injury, albeit rare, demands meticulous attention, particularly in the context of emergency cesarean sections.

In this light, exploring the multifactorial dynamics surrounding bladder injury during emergency cesarean sections becomes paramount. By unraveling the intricate interplay of variables contributing to this complication,

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healthcare providers can devise tailored strategies to minimize risk, enhance surgical precision, and ultimately elevate the standard of maternal care.

## 2. Materials and Methods

This retrospective analysis focused on emergency cesarean sections (CS) performed in Dept of obstetrics and gynaecology PGIMS Rohtak over a three-year period, specifically examining instances of bladder injuries during these procedures.

### 2.1. Study design

**Retrospective Cohort Study:** This study design involved analyzing historical data from emergency cesarean sections performed over a period of three-years from Jan 2020 to Dec 2022.

### 2.2. Data source

Surgical records and patient case sheets from the hospital's medical records system were utilized.

### 2.3. Inclusion criteria

Cases of emergency cesarean sections performed during the study period were included in the analysis.

Relevant data for each case were extracted, including patient demographics (age, parity), gestational age, number of previous cesarean sections, type of placenta, timing of bladder injury during surgery, and severity of intraoperative adhesions. Bladder injuries were identified by reviewing surgical notes, operative reports, and discharge summaries for documented occurrences of bladder trauma or lacerations. The timing of bladder injury during surgery was categorized as occurring during the opening of the uterus, during uterine closure, or during other phases of the procedure. Intraoperative adhesions were graded based on the extent and density observed during surgery, ranging from mild to severe. Placental attachment was categorized as normal, placenta previa, or placenta accreta.

Descriptive statistics, including frequencies and percentages, were calculated to summarize the characteristics of bladder injuries and associated variables.

### 2.4. Ethical considerations

Institutional review board approval was obtained to ensure compliance with ethical standards for research involving human subjects. Patient confidentiality was strictly maintained by de-identifying and anonymizing all data during analysis and reporting.

By employing this detailed methodology, the study aimed to comprehensively investigate risk factors associated with bladder injury during emergency cesarean sections and

contribute to the optimization of patient care in obstetric practice.

## 3. Results

The retrospective analysis examined 12218 emergency cesarean sections conducted over three years, revealing a bladder injury in 22 cases making an incidence rate of 0.18%. Distribution according to clinical variables revealed higher prevalence of bladder injury in cases of placenta previa, among patients aged 20-25 years, with higher parity (> Gravida 3), and in cases with advanced gestational age (>34 weeks).(Table 1)

Notably, the majority of bladder injuries (72.7%) occurred during the opening of uterovesical pouch emphasizing the susceptibility of the bladder during this phase (Table 3). Several risk factors were identified like a history of previous cesarean sections was associated with 13.6% of bladder injuries, while 4.5% occurred during second-stage cesareans. Additionally, 31.8% of bladder injuries were observed in cases of adherent placenta, and 50% were significantly associated with dense intraoperative adhesions (Table 5) Analysis by severity of adhesions demonstrated that bladder injuries correlated with severe adhesions in 36.3% of cases. Notably, the incidence of bladder injury increased with the number of previous cesarean sections. These findings provide crucial insights into the demographic and clinical characteristics associated with bladder injury during emergency cesarean sections, enabling targeted interventions and preventive strategies.

**Table 1:** Distribution of patients according to age, Parity and gestational age

S. No.	Age group	Number of patients	Percentage
1	20-25 years	10	45.4%
2	26- 30 years	7	31.8%
3	31-35 years	3	13.6%
4	> 35 years	2	9.09%
<b>Parity</b>			
1	Gravida 1	0	
2	Gravida 2	7	31.8%
3	Gravida 3	6	27.2%
4	> Gravida 3	9	40.9%
<b>S. No Gestational age</b>			
1	< 30 wks	2	9%
2	30 - 32 wks	1	4.5%
3	32 - 34 wks	2	9%
4	> 34 wks	17	77.2%

## 4. Discussion

The retrospective analysis of emergency cesarean sections conducted over three years provided valuable insights into the incidence and risk factors associated with bladder

**Table 2:** Distribution of patients according to number of previous cesarean?

S. No	Number of previous LSCS	Number of patients	Percentage
1	Previous 1 LSCS	9	40%
2	Previous 2 LSCS	10	45.4%
3	Previous 3 LSCS	3	13.6%

**Table 3:** Risk factors associated with bladder injury in cesarean section patients

S. No.	Timing of Bladder injury	Nu of patients
1	Opening of peritoneum	1
2	Opening of uterovesical pouch	8
3	Opening of uterus	2
4	Adhesiolysis	11

**Table 4:** Distribution of patients according to site of injury at urinary bladder

S.No.	Site of injury	Nu of patients	Percentage
1	Dome	8	36.3%
2	Trigone	2	9.09%
3	Anterior wall	2	9.09%
4	Posterior wall	10	45.4%

**Table 5:** Distribution of patients according to severity of intraoperative adhesions

S. No.	Severity of adhesions	Nu of Patients	Percentage
1	Mild to moderate adhesions	3	13.6%
2	Severe adhesions	8	36.3%
3	Bladder adherent to uterus	11	50%

**Table 6:** Distribution of patients according to type of placenta

S. No.	Type of placenta	Number of patients	Percentage
1	Normal placenta	6	27.2%
2	Placenta previa	9	40.9%
3	Placenta accreta	7	31.8%

injury during such procedures. Our findings corroborate and expand upon existing literature, contributing to a deeper understanding of this complication.

In our study, the observed bladder injury incidence rate of 0.18% falls within the range reported by Rajasekar D et al.,<sup>7</sup> indicating consistency across different cohorts and settings. The overall bladder injury incidence in a study was reported to be 0.22-0.44%. Furthermore, these rates are 0.11-0.42% for primary CS and 0.27-0.81% for repeat CS.<sup>8-11</sup> Repeat CS is the primary risk factor for bladder injury. This highlights the universal nature of the risk associated with

bladder injury during emergency cesarean sections.

The study shows higher prevalence of bladder injury in cases of placenta previa, among patients aged 20-25 years, with higher parity (> Gravida 3), and in cases with advanced gestational age (>34 weeks), reflects similar trends reported by Kaskarelis et al. (1975) and Phillips et al. (2017).<sup>12,13</sup> Additionally, the increased incidence of bladder injury with the number of previous cesarean sections (Table 2) echoes the findings of previous studies (Rahman et al 2009), highlighting the cumulative risk associated with multiple cesarean deliveries.<sup>9</sup>

A notable finding from our analysis was the timing of bladder injury, with the majority (72.7%) occurring during the adhesiolysis and opening of the uterovesical pouch. This aligns with the results of a study, who reported a similar trend, emphasizing the vulnerability of the bladder during this critical phase of the procedure.<sup>8</sup> Such consistency underscores the importance of careful dissection techniques to minimize the risk of inadvertent bladder injury.

Regarding risk factors, our study identified several significant contributors to bladder injury during emergency cesarean sections. Firstly, a history of previous cesarean sections was implicated in most of the cases of bladder injuries, consistent with the findings of Rahman et al. (2014).<sup>9</sup> Scarring from previous surgeries can alter pelvic anatomy and increase the risk of bladder injury during subsequent procedures. Similarly, our observation of bladder injury occurring during second-stage cesarean sections echoes the findings of previous studies (Rahman et al., 2014; Johnson et al., 2017), highlighting the challenges and heightened risk associated with prolonged labor.<sup>9,10</sup>

Furthermore, our study identified dense intraoperative adhesions as a significant risk factor for bladder injury, with 50% of cases demonstrating this association. This aligns with the findings of Tarney et al. (2013), who emphasized the role of adhesions in complicating cesarean sections and predisposing patients to bladder injury.<sup>6</sup>

In addition, our analysis revealed a significant association between bladder injury and adherent placenta, with 31.8% of cases demonstrating this risk factor (Table 6). This finding is consistent with the results of Mandip et al. (2020), who reported bladder injury in cases of morbidly adherent placenta, underscoring the increased risk in such scenarios.<sup>3</sup>

Further, in our study Bladder injuries during emergency cesarean sections exhibit varied distribution: dome (36.3%), trigone (9.09%), anterior wall (9.09%), and posterior wall (45.4%). (Table 4). Studies by Dodd et al., and Mandip et al. support these findings, emphasizing the significance of surgical precision to mitigate such injuries.<sup>3,14</sup>

Moreover, our distribution analysis across various clinical variables provided insights into demographic and clinical characteristics associated with bladder injury.

In summary, our study contributes to the existing body of literature by reaffirming known risk factors for bladder injury during emergency cesarean sections and providing additional insights into the timing and distribution of such injuries. By corroborating and expanding upon findings from previous studies, our research enhances understanding of this important complication and informs strategies for its prevention and management.

## 5. Conclusion

Bladder injury during emergency cesarean sections represents a significant concern for maternal health. The findings of this retrospective analysis emphasize the importance of identifying and mitigating risk factors associated with bladder injury to enhance patient safety and improve maternal outcomes in emergency CS procedures.

Strategies aimed at preventing bladder injury, such as meticulous surgical technique, careful patient selection, and intraoperative vigilance, should be prioritized. Additionally, further research is warranted to explore additional factors contributing to bladder injury during emergency CS and to develop evidence-based interventions aimed at reducing its incidence and improving patient care.

## 6. Conflict of Interest

None.

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