

## BLADDER INFLATION PRIOR TO CESAREAN SECTION CAN PREVENT BLADDER INJURY IN HIGH RISK PATIENTS

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**Abstract:** This study aimed to evaluate the effectiveness of inflating the urinary bladder immediately before cesarean section (CS) in reducing the chances of bladder injury in high-risk patients. This was a prospective randomized controlled trial. The study was conducted in Obstetrics and Gynecology Ward 8, Jinnah Postgraduate Medical Centre (JPMC) Karachi, from April 06, 2021 to September 30, 2021. Three hundred twenty-eight pregnant women who delivered by cesarean section and had one or more risk factors for urinary tract injury were recruited. The women were divided into two groups: Group A underwent bladder inflation using a triple-way Foley catheter before CS, while Group B served as the control group without bladder inflation with a Foley catheter before CS. In this study, urinary bladder injury was found in 5.5% of women in Group A who had bladder inflation, while 12.2% of women in Group B without bladder inflation had bladder injury. The efficacy in Group A and B was 94.5% and 87.8%, respectively. The results showed a significant association between the study group and urinary bladder injury ( $p=0.032$ ). The study significantly reduced urinary bladder injuries, surgery time, blood transfusion, and hospitalization. Inflating the urinary bladder before cesarean section should be used to prevent bladder injury in women with risk factors for dense bladder adhesion.

**Keywords:** Bladder Injury; Bladder Inflation, Cesarean Section, Urinary Tract Injury

### Introduction

The World Health Organization (WHO) reports that the cesarean section rate has increased globally, accounting for 21% of all births of children. It has been predicted to increase to 29% by 2030 (Rasool et al., 2021). Pakistan Demographic and Health Survey (PDHS) shows the rise in the rates of Cesarean Section, from 14% to 22% (Singh et al., 2022).

CS associated with maternal risks include infections, bleeding, visceral damage, anesthesia complications, blood transfusion, and fetal risks. The most frequent damage during a cesarean section is a bladder injury associated with morbidity and complications, including prolonged surgical time, urinary tract infections, and the formation of vesicouterine or vesicovaginal fistula (Safrai et al., 2022). Urinary tract injuries have been reported during obstetrical and gynecological surgeries due to the anatomical proximity (Pal et al., 2016). Gynecological surgeries have been reported to be responsible for 75% of the ureter injuries. After obstetric or gynecological procedures, urinary bladder injuries are a typical consequence, and bladder injuries are at least twice as common (Desai and Sunil Kumar, 2016; Pascal et al., 2014). The incidence of bladder injury was reported to be about 0.08 to 0.94% during cesarean section (Phipps et al., 2005). Risk factors involved were age, previous pelvic surgery, adhesions, parity, and cesarean section (Yaquab et al.). Mostly, bladder injuries occur when they enter the peritoneal cavity and when they separate. Different studies reported the incidence of bladder injury at 0.44%, 0.46%, and 0.67% in Saudi Arabia, Pakistan, and Mumbai, respectively, and 0.08–0.94% in other international studies (Morris et al., 2016).

There is a lack of local studies available for the prevention of such injuries; since we have a very high rate of Cesarean sections in our society, It is important to find a preventive measure, thus improving health and reducing the financial burden on families in a developing country. This study aims to assess the effectiveness of bladder inflation before cesarean section to prevent bladder injury in high-risk patients.

### Methodology

A prospective randomized controlled research was carried out after approval from the institutional ethical review board from April 06, 2021, to September 30, 2021 at Obstetrics and Gynecology Ward 8, Jinnah Postgraduate Medical Centre (JPMC) Karachi. The total calculated sample size is 328 patients, with 164 in each group, with the assistance of WHO software using consecutive sampling techniques (Lee et al., 2012).

After taking informed consent, we included all women between 20-45 years with Singleton pregnancy at or more than 24 weeks having any one risk factor, including the history of previous myomectomy or hysterotomy, history of bladder, ovarian, or tubal surgeries, patient undergoing Elective Cesarean section or Emergency Cesarean delivery, the patient undergoing past gynecological surgery or gynecological condition, e.g., Endometriosis or chronic pelvic inflammatory illness. In the presence of gynecologic pathologies like ovarian cysts, masses, and fibroid uterus, patients with urological injury apart from obstetric and gynecologic surgeries were excluded. Data were recorded on a predesigned Performa by the researcher. Patients were

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randomly assigned into two groups using the lottery method. Group A includes those with urinary bladder inflation with the triple-way Foley catheter before CS, and group B includes those with two two-way Foley catheter deflated urinary bladder before CS. The catheter was attached to a urinary bag. Till the end of the dissection or bladder from the anterior uterine wall, the tube of the drainage urinary bag was clamped. In group B, the 2 ways Foley's catheter was used to empty the bladder throughout the surgery. The consultant performed CS in each group under spinal or general anesthesia. The catheter in both groups was withdrawn 12 hours after CS, except in cases of urinary bladder injuries where the Foley catheter was retained for 2 weeks or more with follow-up. The clinical findings, risk factors, and outcome, i.e., bladder injury, will be noted.

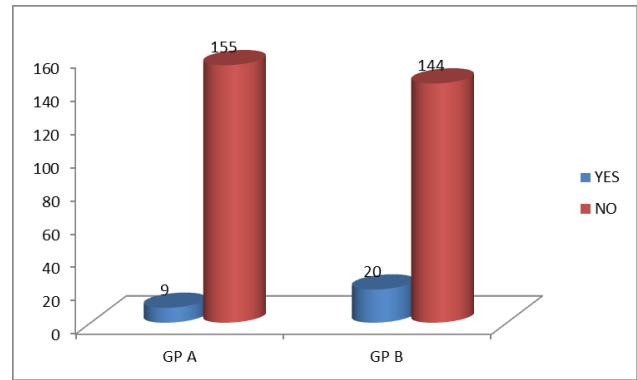
Data was calculated using SPSS 26. For risk factors, inflation status, urinary bladder injury frequency, and injury site were computed by frequency and percentage. Mean±SD calculation was made for age, gestational age, weight, height, BMI, gravida, parity, no previous C-section, blood transfusion, and hospital stay. Age, parity, gravida, and gestational age were stratified to examine how these modifiers affect outcomes using a Chi-square test with a P value less than 0.05.

**Results**

The study included 328 women between the ages of 20 and 45 years. In groups A and B, the mean age of patients was 28.61±4.06 year's and 28.76±4.27 years, respectively. The descriptive statistics of study groups are presented in Table 1. Most patients (64.6 % and 72.6 %) in both groups underwent emergency surgery while 90.9% in group A and 82.9% in group B have booked cases.

**TABLE I Frequency distribution of baseline characteristics (n=328)**

| Variables                              | Group A     | Group B     |
|--|-------------|-------------|
| Age(mean± SD)                          | 28.61± 4.06 | 28.76 ±4.27 |
| Gestation(mean± SD)                    | 36.38±1.98  | 36.67±1.76  |
| Body mass index kg/m2 (mean±SD)        | 27.86± 4.05 | 27.22± 3.90 |
| Parity(mean± SD)                       | 2.09± 1.09  | 2.20± 1.20  |
| Booking status (n/%)                   |             |             |
| Booked                                 | 149(90.9%)  | 136(82. %9) |
| Non booked                             | 15 (9.1%)   | 27(16.5%)   |
| Number of cesarean sections (mean± SD) | 1.73± 0.83  | 1.76±0.94   |
| Type of surgery (n/%)                  |             |             |
| Elective CS                            | 58(35.4%)   | 45(27.4%)   |
| Emergency CS                           | 106(64.6%)  | 148 (72.6%) |
| Hospital stay in days (mean± SD)       | 2.03±0.20   | 2.31±1.11   |
| Risk factors (n/%)                     |             |             |
| Placenta previa                        | 1(0.6%)     | 4(2.4%)     |
| Placenta accreta                       | 0 (0%)      | 1(0.6%)     |
| Placenta increta/percreta              | 1(0.6%)     | 4(2.4%)     |



**Figure 1: Frequency of urinary bladder injury among study groups (n=328)**

In our study, 5.5% of patients with urinary bladder injury belonged to group A and 12.2% to group B, respectively, as shown in Graph 1. Detailed frequency distribution of recognized urinary bladder injury and damaged bladder site are presented in Table-2 and 3, respectively.

**TABLE II Frequency distribution of urinary bladder injury recognized (n=29)**

| Urinary bladder injury                    | Group A        | Group B          |
|---|----------------|------------------|
| Extravasation of Urine                    | 3(33.3%)       | 4(20%)           |
| Visualization of Foley catheter           | 3(33.3%)       | 5(25%)           |
| Gross hematuria in Foleys catheter        | 1(11.1%)       | 5(25%)           |
| Visible Laceration of the detrusor muscle | 2(22.2%)       | 6(30%)           |
| <b>TOTAL</b>                              | <b>9(5.5%)</b> | <b>20(12.2%)</b> |

**TABLE-III Frequency distribution of damaged bladder site (n=29)**

| Site of injury | Group A n (%) | Group B n (%) |
|----------------|---------------|---------------|
| Dome           | 6(66.7%)      | 13(65%)       |
| Body           | 3(33.3%)      | 7(35%)        |
| <b>TOTAL</b>   | <b>9</b>      | <b>20</b>     |

The results showed a significant association of study group urinary bladder injury with maternal age, parity, and gestational age (p=0.032). There is no statistically significant association of study group urinary bladder injury with BMI (P value <0.079).

**Discussion**

In most developed states and many underdeveloped nations, the cesarean section and hospital delivery rate has significantly increased during the past few decades. The most frequent complication of pelvic surgery is urinary tract damage, particularly urinary bladder injury; up to 1.5% of patients with previous cesarean incisions result in urinary tract injuries. A study conducted in Egypt reported that Obstetric procedures had a higher prevalence of urological injuries than gynecological procedures (63.6% vs. 36.1%) (M El-Mogy et al., 2021).

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Pelvic adhesions resulting in distortion of normal anatomy are the most common risk factors for bladder injury, making dissection of the urinary bladder more challenging (Arulkumaran et al., 1986). Another Korean study reported that bladder injuries occur during hysterectomy (22%) and cesarean section (1.5%) (Tae et al., 2022). Our study showed urinary tract injuries in a few cases of group A with urinary bladder inflation just before cesarean section. Theoretically, this result stated and in the past research supported this finding differently from other studies. It could occur because the study was done on patients with placenta percreta (Özcan et al., 2018).

The chances of urinary bladder injury ranged from 15% - to 43% reported in placenta accrete, and it was considerably higher in placenta percreta. Studies with women who underwent cesarean hysterectomy showed an increased prevalence of urinary tract injuries (Silver et al., 2015). In two-thirds of cases, injuries were seen at the bladder dome, while one-third occurred in the posterior wall of the urinary bladder. Most injuries occurred at the peritoneal entrance (22.0%) during cesarean section (Chill et al., 2021). Massive bleeding from bladder trauma might put the surgeon under stress to stop the bleeding quickly enough to avoid endangering the urinary tract. However, compared to other risk factors, the number of placenta percreta was low in our study. In this study, group A underwent surgery for a shorter period and hospital stay than group B, resulting in low costs and fast recovery (Özcan et al., 2018). Similar to Ozcan et al. blood loss during surgery between the two groups was insignificant in this study, while Matsubara et al. supported that it reduced blood transfusion, similar to bladder inflation (Matsubara, 2018; Özcan et al., 2018). As far as our knowledge, this is the first study carried out in the largest tertiary care hospital in the city on bladder inflation before surgery in high-risk patients. One of the limitations of our study is the small sample size.

## Conclusion

Intraoperative bladder injuries are rare but can lead to severe and long-lasting morbidity. A thorough anatomical knowledge and appropriate surgical techniques are necessary to avoid such injuries and if an injury occurs, prompt diagnosis and repair can prevent delayed urologic complications. Thus, bladder inflation before cesarean section can be beneficial in such cases.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department Concerned.

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared absence of conflict of interest.

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