

# Incidence of post-operative urinary retention in patients undergoing lower limb surgeries under spinal anesthesia: A prospective study



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Submission: 19-02-2025

Revision: 02-04-2025

Publication: 01-05-2025

## ABSTRACT

**Background:** Postoperative urinary retention (POUR) is a troublesome postoperative complication in which after surgery, a patient cannot urinate even when the bladder is completely filled. Sometimes, POUR is not appropriately recognized and causes considerable distress in patients and susceptibility to urinary tract infection and subsequent increased risk of deep joint sepsis in orthopedic surgeries. **Aims and Objectives:** To determine the incidence and risk factors of POUR in lower limb surgeries under spinal anesthesia, focusing on surgical type, patient demographics, and perioperative factors. In addition, to analyze POUR's association with joint replacement and trauma-related surgeries and its impact on bladder function and catheterization needs. **Materials and Methods:** A prospective, single-center, observational study was conducted at a tertiary care referral center in North India, i.e. January–September 2022–March 2023 after approval from an institutional ethical committee. The study group enrolled 168 patients undergoing various lower limb surgeries under spinal Anesthesia. **Results:** In the present study, out of 168 patients, there was a male preponderance (96 patients were male and 72 were female). Most of the patients were in the 35–60 years age group (78) followed by 72 patients were in the >61-year age group. 21 patients (11.29%) suffered from POUR in whom catheterization was required. The incidence of POUR was higher in joint replacement surgeries 20.96% (13/62). In the present study, incidence of POUR was more in males (23 patients) as compared to females (12 patients) and more common in the elderly age group. **Conclusion:** The incidence of POUR is higher in males, elderly patients, and individuals undergoing joint replacement surgery.

**Key words:** Postoperative urinary retention; Spinal anesthesia; Bladder ultrasound; Catheterization

### Access this article online

#### Website:

<https://ajmsjournal.info/index.php/AJMS/index>

DOI: 10.71152/ajms.v16i5.4468

E-ISSN: 2091-0576

P-ISSN: 2467-9100

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## INTRODUCTION

Postoperative urinary retention (POUR) is a troublesome postoperative complication in which, after surgery, a patient cannot urinate even when the bladder is completely filled. Sometimes, POUR is not appropriately recognized and causes considerable distress in patients who undergo surgery. Failure to promptly detect and treat can lead to bladder over-distention, which in turn increases the need

for subsequent long-term catheterization and susceptibility to urinary tract infection (UTI) and subsequent increased risk of deep joint sepsis in orthopedic surgeries.<sup>1</sup> Successful micturition is still an important discharge criterion in many centers.<sup>2,3</sup> POUR has also been shown to prolong the length of hospital stay and to increase the risk of UTIs.<sup>4,5</sup> This increases the risk of infectious prosthetic joint complications.<sup>6</sup> Reported rates of POUR after lower limb total joint arthroplasty are quoted as between 10.7% and

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77.8%.<sup>7-11</sup> POUR may also have indirect sequelae, including delays in discharge from the hospital and iatrogenic UTIs, both of which can lead to increased hospital costs.<sup>12</sup> However, the occurrence of POUR depends on the specific surgical intervention where the incidence is thought to be 20-fold higher after lower limb arthroplasty.<sup>4</sup> The reported Incidence ranges from 0 to 75%,<sup>7,13</sup> implying that many factors contribute to its development among them, medical and surgical co-morbidities, type of anesthesia and analgesia, perioperative fluid management, and method so of diagnosing POUR are the most common.<sup>14</sup> Per capita utilization of total knee arthroplasty increased by 99% for primary cases and by 106% for revision TKA during the past decade.<sup>15</sup> The impact of anesthesia and analgesia techniques on the incidence of POUR after arthroplasty has been recently reviewed.<sup>16</sup> Both neuraxial blockade and systemic opioids have been shown to contribute to the delayed perception of the urgency to void, thus leading to urinary retention, bladder overdistension with subsequent atonia.<sup>17</sup> The hypothesis of the current prospective study was to study the incidence of POUR in orthopedic surgeries under spinal anesthesia.

### Aims and objectives

1. To determine the incidence and risk factors of POUR in lower limb surgeries under spinal anesthesia, focusing on surgical type, patient demographics, and perioperative factors.
2. To analyze POUR's association with joint replacement and trauma-related surgeries and
3. POURs' impact on bladder function and catheterization needs.

## MATERIALS AND METHODS

Prospective observational study was conducted between September 2022 and March 2023 at a tertiary care hospital in northern India. The study group enrolled 168 patients undergoing lower limb surgeries including both trauma and joint replacement, under spinal anesthesia. All patients followed a uniform preoperative intake protocol. Inclusion criteria were patients aged 18 years and above and American Society of Anesthesiologists class I-II, undergoing surgery of the lower limb lasting (all trauma surgeries for lower limbs and hip and knee joint replacement surgeries), and informed consent for spinal anesthesia and surgical procedure. All patients received spinal anesthesia with 0.5% bupivacaine. Exclusion criteria were patients with contraindications to or failure of spinal anesthesia, patients having preoperative lower urinary tract symptoms including benign prostrate hyperplasia or urogenital pathologies with significant POUR. Intraoperative blood loss >200 mL, pregnancy, and patient

with incomplete data. All patients voided before transfer to the operating area and were allowed to drink clear fluids up to 2 h before spinal anesthesia. After surgery, patients were allowed to drink freely. Pain was measured on a numeric rating scale (0–10). All patients received analgesic as per the standardized protocol after the end of surgery. The study group was monitored for POUR on the basis of symptoms and with the use of bladder ultrasound scans performed by the hospital. Ultrasound scans of the bladder were performed 4 h after surgery if the spontaneous micturition had not occurred. Urinary retention was defined as a bladder volume >400 mL together with the inability to micturate. Patients were catheterized when these criteria were met.

Sample size calculation formula:

$$n = \frac{z^2 * \hat{p}(1 - \hat{p})}{\epsilon^2}$$

Where:

n=required sample size

z=z score (1.96 for 95% confidence level)

P=expected incidence of POUR (based on previous literature)

e=margin of error (precision usually set).

## RESULTS

Out of 168 patients, 96 (57.14%) were males and 72 (42.86%) were females, as shown in Table 1.

Most of the patients were in the elderly age group with the age distribution as 45.2% in 41–60 years of age group followed by 36.3% in the >61 years age group. Only 18.4% of the patients were in the younger, 18–40 years of age group. Most of the patients with POUR were male, i.e., 23 out of 35 patients.

Joint replacement or arthroplasty surgeries done for 60 Patients accounting for 35.7% of a total study group. Most of the surgeries were done for trauma hip, femur, and around knee fractures as shown in Table 2.

**Table 1: Patient characteristics**

Category	No. of patients (%)	Number of POUR patients (proportion) (%)
Gender		
Male	96 (57.14)	23 (65.71)
Female	72 (42.86)	12 (34.28)
Age group		
18–40	31 (18.4)	
41–60	76 (45.2)	
>61	61 (36.3)	

**Table 2: Association of POUR with type of surgery**

Type of surgery	No. of patients (proportion) (%)	POUR: Number of patients (proportion) (%)
Bipolar hip arthroplasty	17 (10.1)	07 (41.1)
Total hip replacement	29 (17.3)	09 (31.0)
Total knee replacement	14 (8.3)	10 (71.4)
Proximal femoral nailing	19 (11.3)	03 (15.8)
Dynamic hip screw	41 (24.4)	02 (4.9)
Interlocking nail	26 (15.5)	03 (11.5)
Proximal tibia plating	9 (5.3)	0
Distal femoral plating	7 (4.2)	0
Hybrid fixator	4 (2.3)	01 (25)
Total	168 (100)	35 (20.83)

POUR: Postoperative urinary retention

**Highest POUR incidence (most affected surgeries)**

Total knee replacement (TKR): 10 out of 14 patients (71.4%) developed POUR.

Total hip replacement (THR): 9 out of 29 patients (31.0%) developed POUR.

Bipolar hip arthroplasty: 7 out of 17 patients (41.2%) developed POUR.

TKR has the highest incidence rate (71.4%), followed by Bipolar Hip Arthroplasty (41.2%) and THR (31.0%). This suggests that joint replacement surgeries are more likely to be associated with POUR.

**Moderate POUR incidence**

- Proximal femoral nailing: 3 out of 19 patients (15.8%) had POUR
- Interlocking nail: 3 out of 26 patients (11.5%) had POUR
- Hybrid fixator: 1 out of 4 patients (25%) had POUR
- These surgeries have a moderate risk, but still lower than joint replacements.

**Lowest/no POUR incidence**

- Dynamic hip screw: Only 2 out of 41 patients (4.9%) had POUR
- Proximal tibia plating and distal femoral plating: No cases of POUR reported
- Surgeries involving plating or fixation (excluding hybrid fixators) seem to have a significantly lower risk of POUR.

**Key associations**

- Joint replacement surgeries (TKR, THR, and bipolar hip arthroplasty) are strongly associated with a higher risk of POUR
- Trauma-related surgeries like proximal femoral nailing and interlocking nails have a moderate risk

- Plating procedures (Proximal Tibia Plating, Distal Femoral Plating) show the least association with POUR.

**DISCUSSION**

POUR remains a common cause of postoperative morbidity and discomfort for patients undergoing lower limb trauma and total joint arthroplasty surgeries. The incidence in joint arthroplasty surgeries varies widely (10.7–84%)<sup>3,4</sup> and the entire surgical population quoted between 4% and 6%.<sup>10,18,19</sup> Several factors have been indicated for giving an increased incidence of POUR such as increased prostate-specific antigen, previous history of POUR, and a peak urinary flow of <17 mL/s.<sup>20</sup> Other factors or situations that tend to necessitate catheterization include extensive revision surgery and bilateral joint replacements.<sup>21</sup> Currently, there is no standard protocol for the implementation and maintenance of indwelling catheters for elective joint arthroplasty and various other hip and knee surgeries. As such, a scoring system that could predict those patients at risk of POUR that is easy to use and reliable would be a vital tool for predicting those patients most at risk. Indwelling urinary catheters are utilized routinely for patients undergoing spinal anesthesia because of the presumptive risk of development of a neurogenic bladder.<sup>2</sup> In the present study, out of 168 patients with a median age of 64 years (range: 18–78 years), 96 (57.14%) were male and 72 (42.86 %) were female. Most common surgeries performed were joint arthroplasty (35.7%), proximal and shaft of femur nailing (27.8%), and dynamic hip screw fixation (24.4%). The mean time required for surgeries was approximately 1 h (range 40–95 min). In our study, all patients were monitored for POUR on the basis of symptoms and with the use of bladder ultrasound scans.

Bladder volumes of 400 to 600 mL have been used as a criterion for the diagnosis of POUR.<sup>1,22–24</sup> Patients who had not voided within 4 h and had a urine volume of >400 mL as measured with ultrasound were managed with catheterization. If the patient had a volume of <400 mL as measured with ultrasound, the USG scan was repeated within 2 h. Out of 168 patients, 35 patients (11.29%) suffered with POUR in whom catheterization was done. 27 patients required catheterization after 4–6 h of surgery when patients complained of urine retention signs and symptoms, 8 patients had urine overflow on the first night so required catheterization. The mean volume of urine in these patients was 600 mL (range, 450–800 mL). In a retrospective study by Davis et al.,<sup>9</sup> incidence of POUR in 62 patients undergoing total hip arthroplasty, reported that the incidence of POUR retention following spinal anesthesia was 21.8% after epidural anesthesia compared

with 46.7%. The incidence of POUR in the current study, 20.96% is comparable to the study performed by Davis *et al.*,<sup>9</sup> on the patients undergoing the joint replacement surgeries. In the present study, incidence of POUR was more in males (23 patients) as compared to females (12 patients). POUR was more common in the elderly age group. POUR has been shown to increase with age, with the risk increasing by 2.4 times in patients over 50 years of age. A higher incidence of POUR has been reported in men (23.96%) compared to women (16.6%). Possible reasons for such age and gender influences include age-related progressive neuronal degeneration leading to bladder dysfunction and gender-specific pathologies such as benign prostatic hypertrophy among others.<sup>13,14</sup>

### Limitations of the study

The main limitation of this study is the relatively low number of patients and the overall low number of catheterizations (n=35). Therefore, the findings of this study require prospective validation in a larger study population. Ultrasound bladder scan enabled reliable assessment of urinary volume and have the potential to become the standard of care in the postoperative care unit, but further prospective studies are required.

## CONCLUSION

The incidence of POUR is higher in males, elderly patients, and those undergoing joint replacement surgeries under spinal anesthesia. Early identification of high-risk patients, perioperative bladder monitoring, and appropriate anesthetic management can help reduce POUR-related complications and hospital stay.

## ACKNOWLEDGMENT

We are highly grateful to every patient for their valuable consent and time to participate in this study; without their cooperation, this study would not have been possible. We also thank our senior and junior faculty members and colleagues for their suggestions and support.

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**RJ**- Concept of the study, validation, manuscript preparation, editing, final approval; **SM and MF**- Data analysis, data acquisition, investigation; **MN, Ap**- Drafting of manuscript, reviewing and editing; **MK**- Visualization and supervision.

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**Source of Support:** Nil, **Conflicts of Interest:** None declared.