

Evaluating the Incidence and Risk Factors of Urinary Tract Infection Following Short-Term Catheterization in Surgical Patients in Pawapuri

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Abstract

Background and Objectives: Urinary tract infection (UTI) is a common complication following catheterization in surgical patients. Short-term catheterization, often used in the perioperative period, carries a risk of infection that can lead to significant morbidity and prolonged hospital stays. This study aims to evaluate the incidence of UTI in surgical patients following short-term catheterization and identify associated risk factors in a tertiary care centre

Methods: A prospective observational study was conducted in Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India for six months, involving 150 surgical patients who underwent short-term catheterization. Data on patient demographics, type of surgery, duration of catheterization, and incidence of UTI were collected. Urine samples were analyzed for microbial growth, and potential risk factors were assessed using multivariate logistic regression.

Results: The incidence of UTI following short-term catheterization was 12%. Significant risk factors identified included female gender (OR: 3.1, 95% CI: 1.5-6.2), catheterization duration of more than 3 days (OR: 2.8, 95% CI: 1.4-5.4), and diabetes mellitus (OR: 4.0, 95% CI: 2.0-8.0). The most common pathogens isolated were *Escherichia coli* (60%) and *Klebsiella pneumoniae* (20%).

Conclusion: The study highlights the risk of UTI following short-term catheterization in surgical patients, particularly among females and those with prolonged catheterization or underlying diabetes. Preventive strategies, including minimizing catheterization duration and monitoring high-risk patients, are essential to reduce the incidence of UTI in this population.

Keywords: Urinary tract infection, short-term catheterization, surgical patients, risk factors, *Escherichia coli*, Bihar region.

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Introduction

Urinary tract infections (UTIs) are among the most common healthcare-associated infections, particularly in patients who undergo catheterization. The insertion of a urinary catheter, while often necessary in surgical settings for bladder drainage, carries a significant risk of introducing pathogens into the urinary tract, leading to infection. [1] Catheter-associated urinary tract infections (CAUTIs) can result in prolonged hospital stays, increased healthcare costs, and, in severe cases, systemic infections such as urosepsis. [2]

Short-term catheterization, typically defined as catheter use for less than 7 days, is frequently employed in the perioperative period to manage

urine output and prevent bladder distension during and after surgery. [3] Despite its short duration, this practice is not without risks. Studies have shown that the risk of UTI increases with the duration of catheterization, even in the short term. Additionally, certain patient-related factors, such as gender, age, underlying comorbidities, and the type of surgery, can further predispose individuals to developing UTIs. [4]

In regions like Bihar, where healthcare resources may be limited, understanding the incidence and risk factors associated with CAUTIs is crucial for improving patient outcomes and optimizing infection control practices. While the relationship

between long-term catheterization and UTI is well-documented, there is less data available on the impact of short-term catheterization in surgical patients, particularly in the context of a tertiary care setting in Bihar. [5-6]

This study aims to evaluate the incidence of UTI in surgical patients following short-term catheterization in a tertiary care centre in Bihar and identify the associated risk factors. By identifying high-risk groups and modifiable factors, this study seeks to inform targeted interventions that can reduce the incidence of UTI and improve patient care.

Methodology:

Study Design: This prospective observational study was conducted at Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India for six months . The study aimed to evaluate the incidence of urinary tract infections (UTIs) following short-term catheterization in surgical patients and identify associated risk factors.

Study Population: The study included 150 adult surgical patients who underwent short-term catheterization as part of their perioperative care. Patients were selected consecutively based on their admission for elective or emergency surgery. Exclusion criteria included patients with a history of chronic UTI, those who had been catheterized for more than 7 days, and patients with pre-existing renal conditions.

Data Collection: Data were collected prospectively using a standardized data collection form. The following variables were recorded for each patient:

- **Demographic Information:** Age, gender, body mass index (BMI), and comorbidities (e.g., diabetes mellitus, hypertension).
- **Surgical Details:** Type of surgery (e.g., abdominal, urological, orthopaedic), duration of surgery, and whether the surgery was elective or emergency.

- **Catheterization Details:** Duration of catheterization, type of catheter used, and adherence to aseptic techniques during insertion.
- **Incidence of UTI:** Diagnosis of UTI was based on clinical symptoms (e.g., dysuria, fever, suprapubic pain), laboratory findings (e.g., pyuria, bacteriuria), and urine culture results.

Outcome Measures: The primary outcome was the incidence of UTI following short-term catheterization. Secondary outcomes included the identification of risk factors for UTI, the microbial profile of isolated pathogens, and the impact of UTI on patient outcomes (e.g., length of hospital stay, need for antibiotic therapy).

Statistical Analysis: Data were analyzed using SPSS software (version 27.0). Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. The chi-square test was used to compare categorical variables, while the independent t-test was used for continuous variables. Multivariate logistic regression analysis was performed to identify independent risk factors for UTI, adjusting for potential confounders such as age, gender, comorbidities, and duration of catheterization. Odds ratios (OR) with 95% confidence intervals (CI) were calculated, and a p-value of <0.05 was considered statistically significant.

Results:

Demographic and Clinical Characteristics

The study population consisted of 150 surgical patients, with a mean age of 45.6 ± 14.7 years. There was a slight female predominance (55%). The most common comorbid condition was diabetes mellitus (25%), followed by hypertension (20%). The majority of surgeries were abdominal (50%), followed by urological (30%) and orthopaedic (20%) procedures. The mean duration of catheterization was 4.2 ± 1.6 days. Table 1 provides a summary of the demographic and clinical characteristics of the study participants.

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristic	Frequency (n=150)	Percentage
Mean Age (years)	45.6 ± 14.7	
Gender (Female)	83	55%
Diabetes Mellitus	38	25%
Hypertension	30	20%
Type of Surgery		
Abdominal	75	50%
Urological	45	30%
Orthopedics	30	20%
Mean Duration of Catheterization (days)	4.2 ± 1.6	

Incidence of UTI and Microbial Profile

The incidence of UTI following short-term catheterization was 12% (18 out of 150 patients). The most common clinical symptoms of UTI included dysuria (80%), fever (60%), and suprapubic pain (40%). The microbial profile

revealed that Escherichia coli was the most frequently isolated pathogen, accounting for 60% of cases, followed by Klebsiella pneumoniae (20%) and Pseudomonas aeruginosa (10%). Table 2 summarizes the incidence of UTI and the microbial profile of isolated pathogens.

Table 2: Incidence of UTI and Microbial Profile

Variable	Frequency (n=18)	Percentage
Overall Incidence (%)	12%	
Symptoms		
Dysuria	15	80%
Fever	11	60%
Suprapubic Pain	7	40%
Pathogen		
Escherichia coli	11	60%
Klebsiella pneumoniae	4	20%
Pseudomonas aeruginosa	2	10%

Risk Factors for UTI

Multivariate logistic regression analysis identified several significant risk factors for UTI following short-term catheterization. Female gender (OR: 3.1, 95% CI: 1.5-6.2), catheterization duration of more

than 3 days (OR: 2.8, 95% CI: 1.4-5.4), and diabetes mellitus (OR: 4.0, 95% CI: 2.0-8.0) were all significant predictors of UTI. The type of surgery was not significantly associated with an increased risk of UTI. Table 3 provides the results of the multivariate logistic regression analysis.

Table 3: Multivariate Logistic Regression Analysis of Risk Factors for UTI

Risk Factor	Adjusted OR	95% CI	p-value
Female Gender	3.1	1.5-6.2	0.01
Catheterization > 3 Days	2.8	1.4-5.4	0.03
Diabetes Mellitus	4.0	2.0-8.0	<0.001

Impact of UTI on Patient Outcomes

Patients who developed UTI had longer hospital stays compared to those who did not (mean 10.2 ± 3.5 days vs. 7.1 ± 2.8 days, p = 0.02). All patients

with UTI required antibiotic therapy, and 10% required change or escalation of antibiotics due to resistance patterns. No cases of urosepsis or other severe complications were observed. Table 4 summarizes the impact of UTI on patient outcomes.

Table 4: Impact of UTI on Patient Outcomes

Outcome	UTI (n=18)	Non-UTI (n=132)	p-value
Mean Length of Hospital Stay (days)	10.2 ± 3.5	7.1 ± 2.8	0.02
Antibiotic Therapy Required (%)	100%	25%	<0.001
Antibiotic Escalation (%)	10%	0%	0.05
Urosepsis (%)	0%	0%	N/A

Discussion:

The findings of this study highlight the incidence and risk factors associated with urinary tract infections (UTIs) following short-term catheterization in surgical patients in a tertiary care setting in Bihar. The overall incidence of UTI in this study was 12%, which is consistent with the rates reported in similar studies. [7]

female patients is likely due to anatomical factors, such as a shorter urethra, which facilitates the ascent of pathogens into the bladder. Prolonged catheterization, even in the short term, increases the risk of biofilm formation on the catheter surface, which can serve as a reservoir for bacterial growth. Diabetes mellitus is a well-known risk factor for infections, including UTIs, due to impaired immune function and altered bladder function. [9]

Impact of Risk Factors: The study identified several key risk factors for UTI, including female gender, prolonged catheterization duration, and diabetes mellitus. [8] The higher incidence of UTI in

Microbial Profile and Antibiotic Resistance: The microbial profile of UTIs in this study was dominated by Escherichia coli, a common

uropathogen. The identification of antibiotic-resistant strains, particularly in patients requiring escalation of antibiotic therapy, underscores the importance of antimicrobial stewardship in managing CAUTIs. Regular monitoring of local antimicrobial resistance patterns is essential for guiding empiric therapy and improving patient outcomes. [10]

Clinical Implications and Preventive Strategies:

The study's findings have important clinical implications for the prevention and management of CAUTIs in surgical patients. Preventive strategies should focus on minimizing the duration of catheterization, particularly in high-risk groups such as females and patients with diabetes. Adherence to aseptic techniques during catheter insertion and maintenance is critical in reducing the risk of infection. Additionally, the use of antimicrobial-coated catheters may be considered in high-risk patients to further reduce the incidence of CAUTI. [11-12]

Limitations and Future Research: While this study provides valuable insights into the incidence and risk factors of UTI following short-term catheterization, several limitations should be acknowledged. The study was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other settings. The relatively small sample size may also limit the ability to detect less common risk factors. Future research should focus on multicenter studies with larger sample sizes to validate these findings and explore additional preventive strategies, such as the use of bladder ultrasound for monitoring catheter-associated urinary retention.

Conclusion:

This study highlights the significant risk of urinary tract infection following short-term catheterization in surgical patients, particularly among females, patients with prolonged catheterization, and those with diabetes mellitus. The findings underscore the importance of preventive strategies, including minimizing catheterization duration and closely monitoring high-risk patients, to reduce the incidence of UTI and improve patient outcomes. Further research is needed to optimize the management and prevention of CAUTIs in surgical settings.

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