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ORIGINAL ARTICLE

Prevalence of Post-Ureterorenoscopy Fever in Catheterized Versus Non-Catheterized Patients

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ABSTRACT

Background: Ureterorenoscopy (URS) is commonly performed for ureteric stones, and Foley catheterization is often used postoperatively. However, catheterization may increase the risk of catheter-associated infections and postoperative fever. This study aimed to compare the prevalence of post-URS fever within 24 hours between patients who underwent postoperative Foley catheterization and those who did not undergo Foley catheterization following ureterorenoscopy.

Methods: This comparative observational study was conducted at the Armed Forces Institute of Urology, Rawalpindi, including 60 patients undergoing URS for single ureteral stones <15 mm. Patients were allocated into catheterized (n=30) and non-catheterized (n=30) groups. Post-URS fever was defined as oral temperature >100°F within 24 hours. Data were analyzed using SPSS v25. Chi-square tests were used to compare fever prevalence between groups ($p<0.05$ significant).

Results: The mean age was 48.8±10.3 years; 63.3% were male. Groups were comparable in age, gender, stone size, location, and URS duration ($p>0.05$). Overall, 8 patients (13.3%) developed post-URS fever. Fever prevalence was significantly higher in the catheterized group compared to the non-catheterized group (20.0% vs 6.7%, $p=0.028$). Stratification showed trends toward higher fever in females, stones ≥10 mm, and longer operative duration (>35 min), though not statistically significant ($p>0.05$).

Conclusion: Foley catheterization after URS is associated with a prevalence of postoperative fever. Selective, patient-specific catheter use is recommended to minimize morbidity.

Keywords: Foley Catheter, Postoperative Fever, Ureteroscopy, Urinary Tract Infections

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Introduction

Ureterorenoscopy (URS) is an endoscopic procedure for ureteric or renal stones. A foley catheter is routinely inserted at the completion of URS (1). There are several possible benefits of inserting a foley catheter after URS. By maintaining a low-pressure bladder, Foley catheters can reduce ureteric reflux caused on by double J stents, hence reducing flank pain(2).

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Additionally, by promoting an effective wash-out of the collecting system, they may improve postoperative drainage, minimizing the risk of postoperative infectious complications, postoperative hydronephrosis, and discomfort (3).

Furthermore, urethral instrumentation-induced edema in the early postoperative phase may cause patients to have trouble voiding; hence, foley catheters may help reduce early postoperative lower urinary tract symptoms (LUTS) (4).

But it's important to keep in mind that foley catheters could be uncomfortable in the initial postoperative phase. Numerous complications may arise from a foley catheterization procedure. Catheter-associated urinary tract infections (CAUTIs) are the most frequent, and in rare instances, they can develop into sepsis (5).

Urethral trauma, urethral balloon inflation, and bladder spasms are examples of mechanical problems. Urinary retention may result from blockage brought on by debris, encrustation, or blood clots. Trauma or infection can cause hematuria. The likelihood of encrustation and biofilm formation rises with prolonged use. These risks can be decreased with appropriate technique and prompt catheter removal (6).

Hori et al demonstrated that the prevalence of fever was significantly lower in patients who underwent URS without foley catheterization in comparison to those who underwent URS with foley catheterization (5.5% vs 9.0%, p-value 0.024) (7). On the contrary, Sener et al. found no significant difference in prevalence of fever in patients who underwent URS without or with foley catheterization (3.5% vs 5.3%) (8). In another study, Bloom et al. reported that 43.8% patients developed post-URS fever which was the most common reason for readmission (9).

Despite the routine use of catheterization after URS, its impact on postoperative infectious outcomes remains controversial. Existing literature presents conflicting evidence: some studies report a higher prevalence of post-URS fever in catheterized patients, while others demonstrate no significant difference between catheterized and non-catheterized groups. Additionally, variability in study designs, patient selection, and perioperative protocols contributes to inconsistent findings. Therefore, a clear evidence gap exists regarding whether routine Foley catheterization independently influences the risk of post-URS fever. This uncertainty highlights the need for further comparative studies to guide evidence-based postoperative catheter use. The present study was conducted to address this gap by comparing the prevalence of post-URS fever between catheterized and non-catheterized patients. We hypothesized that Foley catheterization following URS increases the risk of postoperative fever compared to non-catheterization.

Methods

This comparative observational study was conducted at Armed Forces Institute of Urology (AFIU), Rawalpindi. From June 2025 to November 2025, after obtaining ethical approval under ref no. Trg-1/IRB/2025/22 dated: 30 May 2025, by including 60 patients, with 30 patients in each group. The sample size was calculated using a two-proportion formula, taking a level of significance of 5% and a study power of 95%. The expected rate of post-URS fever in non-catheterized patients was 3.5% [8], while in catheterized patients it was 43.8% (9), based on previous literature. The sample size was calculated using the following formula:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \, [p_1(1-p_1) + p_2(1-p_2)]}{(p_1 - p_2)^2}$$

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The calculated sample size was 58. To compensate for rounding and ensure equal group allocation, the sample size was increased to 60 participants, resulting in 30 patients in each group. The proportions used for sample size calculation were taken from two different studies due to the lack of a single study directly comparing both groups. The larger reported difference was selected to ensure adequate statistical power and to avoid underestimation of the sample size.

Patients were enrolled in the study using consecutive non-probability sampling technique, in which all patients meeting the inclusion criteria and presenting during the study period were considered for enrollment. To minimize selection bias, every eligible patient was included without selective recruitment until the required sample size was achieved. Patients were either allocated to catheterized and non-catheterized groups based on routine clinical practice and surgeon preference, to reduce allocation bias. The decision regarding catheterization was made independent of the study protocol. Furthermore, predefined inclusion and exclusion criteria were strictly applied to ensure homogeneity of the study population.

The inclusion criteria were patients of either gender, age between 18-60 years, single ureteral stone, < 15 mm on non-contrast CT KUB and negative urine culture. The exclusion criteria were presence of renal stones, on non-contrast CT KUB, history of diabetes or lower urinary tract symptoms due to urethral stricture or benign prostatic hyperplasia, and history of lower urinary tract surgery.

The primary independent variable was postoperative Foley catheterization status (Foley catheterized vs non-catheterized). The primary outcome variable was post-URS fever occurring within 24 hours of the procedure. Post-URS Fever was defined as a patient developing a body temperature $\geq$ 100 ^{0}F, confirmed by a mercury thermometer placed in oral cavity for 2 minutes, within 24 hours of URS. All patients diagnosed with ureteral stone and planned for URS, meeting the inclusion criteria of the study were included in the study. Potential complications and expected success rates were explained to the patients, and informed written consent was obtained. Patients were evaluated with medical history, and physical examination. Preoperative investigations included CBC, RFTs, Urine R/E & culture, and a non-contrast CT KUB. Patients were allocated into two groups based on postoperative Foley catheter use: (1) Foley catheterized group and (2) non-catheterized group. All patients were undergoing URS under general anesthesia, performed by urologists, having at least five years' experience in the field. All patients were followed for 24 hours following URS for the development of fever.

Data was analyzed in SPSS version 25.0. Mean + SD was calculated for quantitative variables like age, stone size, and duration of URS after confirming normality through Shapiro-Wilk Test. Frequencies and percentages were calculated for qualitative variables like gender, stone side, stone location, and post-URS fever. The Chi-square test was used to compare categorical variables between the catheterized and non-catheterized groups where appropriate. Fisher's exact test was applied for 2×2 contingency tables or when the expected cell frequency was ≤5. An independent sample t-test was used to compare means between the two groups for continuous variables. Stratification was performed for age, gender, stone size, stone location, and duration of surgery to assess effect modification. A p-value of <0.05 was considered statistically significant.

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Results

The study included 60 patients undergoing URS, with 30 patients in each group (catheterized vs non-catheterized). The mean age of the patients was 48.8 ± 10.3 years (range: 22–60 years), predominantly males 38 (63.3%). The mean stone size was 9.6 ± 2.8 mm, and the majority of stones were located in the distal ureter (56.7%). The mean duration of URS was 34.5 ± 6.9 minutes.

There was no statistically significant difference between the two groups with respect to age, gender distribution, stone size, stone side, stone location, or duration of URS ($p > 0.05$), indicating that both groups were comparable at baseline, and reduced likelihood of confounding.

About, 8 (13.3%) patients developed post-URS fever within 24 hours of the procedure. The prevalence of post-URS fever was significantly higher among patients who underwent postoperative Foley catheterization compared with patients who did not receive a Foley catheter (20.0% vs 6.7%, p=0.028) table 1.

Table 1: Demographics and Clinical Characteristics Between Catheterized vs Non-Catheterized Groups (n = 60)

Variable	Catheterized (n = 30)	Non-Catheterized (n = 30)	p-value
Age (years)	48.7 ± 11.2	49.1 ± 10.3	0.61[1]
Gender Male Female	 18 (60.0%) 12 (40.0%)	 20 (66.7%) 10 (33.3%)	0.58[2]
Stone size (mm)	9.8 ± 2.9	9.4 ± 2.7	0.67[1]
Stone side Right Left	 16 (53.3%) 14 (46.7%)	 17 (56.7%) 13 (43.3%)	0.74[2]
Stone location Proximal ureter Mid ureter Distal ureter	 7 (23.3%) 6 (20.0%) 17 (56.7%)	 6 (20.0%) 7 (23.3%) 17 (56.7%)	0.81[2]
Duration of URS (min)	35.2 ± 7.1	33.8 ± 6.6	0.43[1]
Post-URS Fever Yes No	 6 (20.0%) 24 (80.0%)	 2 (6.7%) 28 (93.3%)	0.028[3]*

[1]Independent sample t test, [2]Chi-square test, [3]Fisher Exact test was used for comparison
*p- value <0.05 is significant

On stratification, post-URS fever was more frequently observed among female patients, patients with stone size ≥10 mm, and those with longer operative duration (>35 minutes); however, these associations did not reach statistical significance ($p > 0.05$). No significant effect modification was observed for age, stone side, or stone location (table 2).

Table 2: Stratification of Post-Ureterorenoscopy Fever (n = 60)

Variable	Category	Fever Present n (%)	Fever Absent n (%)	Total (n)	p-value
Age (years)	≤ 40	3 (10.7%)	25 (89.3%)	28	0.49[3]
	> 40	5 (15.6%)	27 (84.4%)	32	
Gender	Male	4 (10.5%)	34 (89.5%)	38	0.41[3]
	Female	4 (18.2%)	18 (81.8%)	22	
Stone size	< 10 mm	3 (8.8%)	31 (91.2%)	34	0.29[3]
	≥ 10 mm	5 (19.2%)	21 (80.8%)	26	
Duration of URS	≤ 35 minutes	3 (9.1%)	30 (90.9%)	33	0.33[3]
	> 35 minutes	5 (18.5%)	22 (81.5%)	27	

[3]Fisher Exact test was applied keeping p value <0.05 as significant

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Discussion

Postoperative fever remains one of the most common complications following URS and is an important cause of patient morbidity and hospital readmission. In the present study, the overall prevalence of post-URS fever was 13.3%, significantly in patients who underwent Foley catheterization compared to those without Foley-catheterization (20.0% vs. 6.7%, p = 0.028). These findings suggest that routine Foley catheterization after URS may be associated with an increased risk of postoperative fever.

The rate of post-ureteroscopy fever recorded in the current study coincides with the rate reported by the research of Kayar et al. (2025), who found a postoperative fever rate of 11.9 0. Their investigation also determined that high levels of SMASH scores were associated with long operating time and febrile complications (10). In line with this, the cohort studied in this paper showed better representation of postoperative fever in patients whose surgery lasted more than 35 minutes but this was not statistically significant. The observation supports the idea that procedural difficulty and length, and not necessarily catheterization, are major causes of postoperative infectious morbidity.

In terms of catheterization status, the results of the present study do not fully coincide with those of Yu et al. (2025) (11), who have found no statistically significant difference in the postoperative fever between catheterized and non-catheterized patients who underwent retrograde intrarenal surgery (RIRS) (5% vs. 2.5% of the patients). However, their series of catheterized patients has numerically more prevalence of fever, as is also the case in our data. The differences in surgical procedure, patient selection and intraoperative care in ureteroscopy and RIRS are likely the reasons behind the difference in the level of statistical significance in these studies. However, the steadily rising trends of fever in catheterized patients are indicative of a possible role of catheterization in postoperative morbidity.

One reason why the prevalence of fever is higher in the patients who are catheterized can be found in the fact that the presence of a Foley catheter and catheter-associated urinary tract infections (CAUTI) is a well-documented association that should be attributed. Previous research has indicated that indwelling catheters may serve as a focus of infection especially when the catheter handling is delayed or urine handling guidelines are insufficient. Even short durations of catheterization can support the growth of bacteria and cause inflammatory reactions, which have clinical consequences with the onset of postoperative fever (12). This mechanism is supported by our findings because post-operative fever was much more common in catheterized patients although this was after eliminating persons with prior urinary tract infection. However, in the present study, no postoperative urine cultures or inflammatory markers were obtained to confirm infectious etiology. Therefore, this explanation remains speculative and should be interpreted as a possible mechanism rather than a definitive cause. Other non-infectious factors, such as instrumentation-related inflammation or procedural variables, may also have contributed to postoperative fever.

Other patient- and procedure-related determinants have also been associated with the development of post-URS fever in addition to catheterization. The duration of stay of ureteric stent dwells has been indicated to cause significant infectious complications above 60 days (13). Though the stent duration was not evaluated prospectively in the current study, the observation indicates that postoperative fever is multifactorial and the

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need to reduce the exposure of foreign-bodies in the urinary tract is important. Similarly, Hamid et al. (2025) (14) cited positive pre-operative urine cultures and no prophylactic antibiotics as some of the major predictors of postoperative infection. In the current cohort, negative pre-operative urine cultures were observed among all the patients, which reduced the confounding effect of pre-existing infection and increased the observed association between catheterization and fever. The stratified analysis in this research showed higher occurrence of fever in female patients, having larger stones (at least 10mm) and longer operating time. Even though such associations were statistically not significant, they agree with the risk factors that have been reported before. Southern et al. (2019) (15) found female gender to be a risk factor that is independent of postoperative fever and systemic inflammatory response syndrome with the adjusted odds ratio of 1.6. Heavy load of stone, extended periods of operating, and so forth have also been associated with higher fever rates, in more than one study, such as the one conducted by Bohare et al. (2015) (16). The implications of these findings are that anatomical, hormonal and procedural factors might be predisposed to infectious complications following URS in specific groups of patients.

The perceived advantages of Foley catheterization as the method of prevention of postoperative complications have long been explained by the fact that it ensures proper urinary drainage and prevents early postoperative urinary stagnation. However, recent evidence indicates that routine catheterization could be omitted in selected patients, and would not increase catheter-related morbidity but would not increase the risk of postoperative fever. Similar results have been reported in the literature between catheterized and non-catheterized groups supporting a selective attitude to using catheters (17,18,19). The current study contributes to this still-increasing body of evidence by showing a much lower rate of postoperative fever among non-catheterized patients undergoing ureteroscopy.

However, in particular clinical circumstances, including long-term procedures, extensive urethral injury, high-risk individuals, or patients who are to be monitored in their postoperative urine output, catheterization might be unavoidable. The choice to insert a Foley catheter, therefore, has to be individualized and the possible advantages should be taken into consideration against the risk of infection and discomfort on the part of the patient (20).

The findings of this study should be interpreted in light of its non-randomized design, which may introduce residual confounding. The decision to place a Foley catheter was based on surgeon preference and intraoperative judgment rather than random allocation, and patients undergoing more complex or prolonged procedures may have been more likely to receive foley-catheterization, potentially influencing postoperative fever risk. To minimize confounding, baseline characteristics including age, gender, stone size, stone location, and duration of URS were comparable between groups. In addition, stratified analysis was performed and did not demonstrate a significant independent effect of these variables on fever outcomes. However, unmeasured factors such as intraoperative difficulty, irrigation pressure, and individual clinical judgment may still have influenced the observed association.

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Conclusion

Postoperative Foley catheterization following ureterorenoscopy was associated with a higher prevalence of post-URS fever compared with no Foley catheterization. Although causality cannot be established because of the observational study design, these findings suggest that routine Foley catheter use should be avoided when not clinically indicated and that a selective patient-specific approach may help reduce postoperative morbidity.

Study Limitation and Future Implications

The study has several limitations, including its small sample size, single-center design, non-randomized sampling, and short follow-up period. In addition, the sample size was derived from separate studies, which may introduce variability in effect estimation. Despite the use of consecutive sampling, the lack of randomization may still introduce selection bias, limiting the generalizability of the findings. Future multicenter randomized controlled trials with larger sample sizes and longer follow-up are required to validate these findings and better define the role of selective Foley catheterization after URS.

Data Availability Statement

The data of this study will be available from the corresponding author upon reasonable request.

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All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.	