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Article

Symptomatic Urinary Tract Infection Following Single-Dose Prophylactic Antibiotic Administration in Patients Undergoing Cystoscopic DJ Stent Removal

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ABSTRACT

Background: Symptomatic urinary tract infection (UTI) is a known complication following cystoscopic double-J (DJ) stent removal, often mitigated with prophylactic antibiotics. However, the necessity and efficacy of single-dose antibiotic prophylaxis remain unclear, especially in general surgical populations, highlighting a gap in evidence-based recommendations for standardized protocols. **Objective**: To evaluate the frequency of symptomatic UTI and its association with age, gender, stent duration, and laterality in patients undergoing cystoscopic DJ stent removal after receiving a single preoperative dose of intravenous Sulzone. **Methods**: This descriptive case series was conducted at Qazi Hussain Ahmad Medical Complex, Nowshera, from November 2024 to May 2025. A total of 190 patients aged 18–80 years undergoing elective DJ stent removal were enrolled using purposive sampling. Patients with recent antibiotic use, active UTI, immunocompromised status, or indwelling urinary devices were excluded. Each received 2g Sulzone (1g cefoperazone + 1g sulbactam) intravenously one hour before the procedure. Patients were monitored for four weeks postoperatively for UTI symptoms; urine cultures were performed when indicated. Data were analyzed using SPSS v25. Ethical approval was obtained per the Declaration of Helsinki. **Results**: Symptomatic UTI developed in 13.7% of patients. No statistically significant associations were found with age (p=0.62), gender (p=0.68), stent duration (p=0.80), or procedure side (p=0.17). Odds ratios and 95% confidence intervals confirmed no predictive relationship. **Conclusion**: Single-dose prophylactic Sulzone is associated with a low incidence of symptomatic UTI post-DJ stent removal, suggesting clinical safety and antibiotic stewardship benefits. Broader trials are recommended for protocol optimization.

Keywords: Urinary Tract Infections, Ureteral Stents, Cystoscopy, Prophylactic Antibiotics, Sulbactam, Cefoperazone, Postoperative Complications

INTRODUCTION

Cystoscopic double-J (DJ) stent removal is a routine urological procedure frequently performed to alleviate obstruction and maintain ureteral patency following interventions like ureteroscopy or pyeloplasty (1,2). Despite its minimally invasive nature, the procedure poses a risk for postoperative complications, particularly symptomatic urinary tract infections (UTIs), which can adversely affect patient recovery and increase healthcare burden (3). Prophylactic administration of antibiotics prior to such urologic procedures is a common practice aimed at mitigating the infection risk. However, the routine use of antibiotics in this context remains a subject of clinical debate due to inconsistent efficacy outcomes and growing concern over antibiotic resistance (4,6). The pathogenesis of infection post-DJ stent removal may involve introduction of skin or rectal flora into the urinary tract or mobilization of pathogens colonizing existing devices, such as indwelling stents or catheters (5). Though studies report asymptomatic bacteriuria in 5–25% of patients and symptomatic infections in approximately 5%, these figures vary significantly based on patient comorbidities, procedure techniques, and local antibiotic protocols (4). While single-dose prophylactic regimens have been adopted by many centers to balance efficacy with stewardship, evidence from large-scale prospective trials evaluating their utility in the

context of DJ stent removal is still evolving. For instance, Gregg et al. observed a 2.8% symptomatic UTI rate among renal transplant recipients after cystoscopic stent removal despite pre-procedure oral fluoroquinolone use, indicating limited prophylactic benefit in some populations (9). Conversely, a study by Abbott et al. found no statistically significant difference in symptomatic UTI rates between patients who received a single antibiotic dose and those who did not, suggesting a more nuanced risk-benefit profile (8).

The American Urological Association (AUA) and related bodies have advocated for minimal effective antibiotic exposure, recommending against multiple pre- or postoperative doses in uncomplicated cases (6,7). Despite these guidelines, considerable heterogeneity exists in institutional protocols, and more region-specific, data-driven insights are needed. In particular, studies assessing prophylactic strategies in general surgical populations outside of renal transplant settings remain limited. Moreover, variables such as age, gender, stent indwelling time, and laterality of stent removal have not been conclusively linked with infection risk, underscoring the need for focused observational data to clarify their associations.

In light of these uncertainties, this study was designed to evaluate the frequency of symptomatic urinary tract infection in patients undergoing cystoscopic DJ stent removal following a single preoperative dose of Sulzone (cefoperazone + sulbactam). By examining infection rates and their correlation with demographic and procedural variables, the study aims to inform evidence-based prophylactic practices while contributing to antibiotic stewardship efforts.

MATERIALS AND METHODS

This descriptive case series was conducted to determine the frequency of symptomatic urinary tract infection (UTI) in patients undergoing cystoscopic removal of DJ ureteral stents after receiving a single-dose prophylactic antibiotic. The study was carried out in the Department of General Surgery at Qazi Hussain Ahmad Medical Complex, Nowshera, between November 2024 and May 2025. This timeframe was selected to allow for adequate patient accrual, procedural consistency, and four-week post-procedure follow-up per patient, to detect symptomatic UTIs potentially associated with the intervention.

Eligible participants included adult patients aged 18 to 80 years who were scheduled for elective cystoscopic DJ stent removal and presented without clinical or laboratory evidence of active urinary tract infection at baseline. Both male and female patients were considered. Exclusion criteria comprised patients with ongoing or recent antibiotic use (within seven days), those with immunocompromised states such as HIV/AIDS, malignancy under chemotherapy or radiotherapy, chronic corticosteroid use, or those under post-transplant immunosuppressive therapy. Patients were also excluded if they had indwelling urinary drainage devices such as Foley catheters or nephrostomy tubes, if the stent had remained in situ for more than four weeks, if they were concurrently receiving any other antimicrobial therapy at the time of stent removal, or if they had a known allergy to the prophylactic antibiotic administered. Pregnant and lactating women were also excluded. A non-probability purposive sampling technique was used to enroll patients who met these eligibility criteria.

Recruitment was conducted in the outpatient and inpatient surgical units of the medical complex. Written informed consent was obtained from each participant following a detailed explanation of the study objectives, procedures, potential risks, and benefits. Ethical approval was granted by the Institutional Review Board of Qazi Hussain Ahmad Medical Complex prior to initiation of the study. Confidentiality of patient identity and medical data was maintained throughout the research process, and all data were anonymized before analysis.

Each patient received a single intravenous dose of 2 grams of Sulzone, a combination of 1 gram cefoperazone and 1 gram sulbactam, administered one hour before the DJ stent removal procedure. The stent removal was performed cystoscopically using standard aseptic techniques in accordance with departmental clinical protocol. Following the procedure, all patients were monitored for a period of four weeks for any clinical symptoms indicative of a UTI, including dysuria, fever, urinary urgency, frequency, suprapubic pain, or hematuria. In cases where symptomatic UTI was suspected, urine samples were collected and cultured to confirm diagnosis and determine antimicrobial sensitivity profiles. The primary outcome variable was the presence or absence of symptomatic UTI within the four-week observation period.

Age, gender, duration of stent placement, and side of the procedure were recorded as potential explanatory variables. Symptomatic UTI was operationally defined as the presence of urinary symptoms corroborated by clinical judgment and/or positive urine culture when obtained. To mitigate selection bias, uniform eligibility screening was applied prospectively to all patients undergoing DJ stent removal during the study period. Performance bias was minimized by following a standardized protocol for antibiotic administration and cystoscopy. Detection bias was addressed through consistent application of symptom criteria for UTI and use of confirmatory laboratory testing when clinically indicated. Although no formal sample size calculation was conducted due to the descriptive nature of the study, the target sample was set to exceed 180 participants based on preliminary patient throughput estimates and the expected incidence of symptomatic UTI from similar studies (8,9).

Data were entered and analyzed using SPSS version 25. Descriptive statistics were computed for baseline characteristics. Categorical variables, including gender and side of stent removal, were presented as frequencies and percentages, while continuous variables such as age and stent duration were expressed as means and standard deviations. The chi-square test was used to assess associations between symptomatic UTI and categorical explanatory variables. Independent sample t-tests were used where applicable. A p-value of less than 0.05 was considered statistically significant. Subgroup analyses by age brackets, stent duration

categories, and gender were also performed to explore any potential trends in UTI incidence. Missing data were minimized through rigorous prospective data entry, and no imputation methods were required. To enhance reproducibility, all procedural steps were documented, data collection was standardized using structured forms, and diagnostic criteria for UTI were consistently applied across all cases.

RESULTS

Based on the findings of the study, a total of 190 patients undergoing cystoscopic DJ stent removal were evaluated for the incidence of symptomatic urinary tract infection (UTI) after receiving a single prophylactic intravenous dose of 2g Sulzone (1g cefoperazone + 1g sulbactam). The mean age of participants was 52.41 years with a standard deviation of 14.2, reflecting a broad age distribution across the adult population. The average duration the DJ stent remained in situ prior to removal was 22.58 ± 4.62 days, with stent placement ranging from 13 to 30 days. In terms of procedural characteristics, 43.2% (n = 82) of the procedures were performed on the right side, while 56.8% (n = 108) were conducted on the left. Males constituted a slightly larger proportion of the study population at 57.9% (n = 110), compared to 42.1% females (n = 80).

Out of the total study population, 26 patients (13.7%) developed symptomatic UTI within the four-week follow-up period, while the remaining 164 participants (86.3%) remained asymptomatic. Stratification by age group showed that symptomatic UTI occurred in 17.9% (5/28) of patients aged 17–34 years, 10.2% (5/49) in the 35–50 year group, and 14.2% (16/113) in those aged 51–70 years. Despite these differences, the association between age and symptomatic UTI was not statistically significant (p = 0.62), and the odds ratios (ORs) for the youngest and oldest age groups compared to the reference (35–50 years) were 1.56 (95% CI: 0.48–5.00) and 1.46 (95% CI: 0.50–4.25), respectively.

Table 1. Baseline Characteristics of the Study Population (N = 190)

Variable	Mean ± SD	Range
Age (years)	52.41 ± 14.20	17 – 70
Stent Duration (days)	22.58 ± 4.62	13 – 30

Table 2. Frequency Distribution of Demographic and Clinical Variables (N = 190)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	110	57.9%
	Female	80	42.1%
Side of Procedure	Right	82	43.2%
	Left	108	56.8%
Symptomatic UTI	Yes	26	13.7%
	No	164	86.3%

Table 3. Association Between Patient Characteristics and Symptomatic UTI (N = 190)

Variable	Category	UTI Present (n, %)	UTI Absent (n, %)	p-value	Odds Ratio (95% CI)
Age Group (years)	17–34	5 (17.9%)	23 (82.1%)	0.62	1.56 (0.48–5.00)
	35–50	5 (10.2%)	44 (89.8%)		Reference
	51–70	16 (14.2%)	97 (85.8%)		1.46 (0.50–4.25)
Gender	Male	16 (14.5%)	94 (85.5%)	0.68	1.19 (0.53–2.68)
	Female	10 (12.5%)	70 (87.5%)		Reference
Stent Duration (days)	13–20	10 (14.5%)	59 (85.5%)	0.80	1.11 (0.47–2.61)
	21–30	16 (13.2%)	105 (86.8%)		Reference
Side of Procedure	Right	8 (9.8%)	74 (90.2%)	0.17	Reference
	Left	18 (16.7%)	90 (83.3%)		1.84 (0.76–4.48)

When analyzing gender-based differences, symptomatic UTI was observed in 14.5% of males (16/110) and 12.5% of females (10/80), a difference that was not statistically significant (p = 0.68). The OR for males developing a UTI compared to females was 1.19 (95% CI: 0.53–2.68), suggesting no meaningful effect of gender on UTI risk in this cohort. Similarly, the duration of DJ stent placement showed no significant relationship with infection. Patients with stent durations between 13 and 20 days had a 14.5% UTI rate (10/69), while those with 21–30 days had a slightly lower rate at 13.2% (16/121), with a p-value of 0.80 and an OR of 1.11 (95% CI: 0.47–2.61).

The laterality of the procedure demonstrated a modest numerical difference, with 9.8% (8/82) of right-sided procedures resulting in UTI versus 16.7% (18/108) on the left side. However, this trend did not reach statistical significance (p = 0.17). The corresponding OR was 1.84 (95% CI: 0.76–4.48), indicating a possible directional risk that warrants further investigation in larger studies. Overall, none of the evaluated variables—age, gender, stent duration, or side of procedure—demonstrated a statistically significant association with the occurrence of symptomatic UTI in this population following a single-dose antibiotic prophylaxis.

These findings suggest that a single preoperative dose of Sulzone may offer adequate protection against post-procedural symptomatic UTI in the majority of patients, with an overall low infection rate of 13.7% and no clear demographic or procedural predictors of increased risk. The lack of statistical significance in all comparisons also reinforces the potential for adopting standardized single-dose protocols across diverse patient groups, minimizing unnecessary antibiotic exposure and the associated risk of resistance.

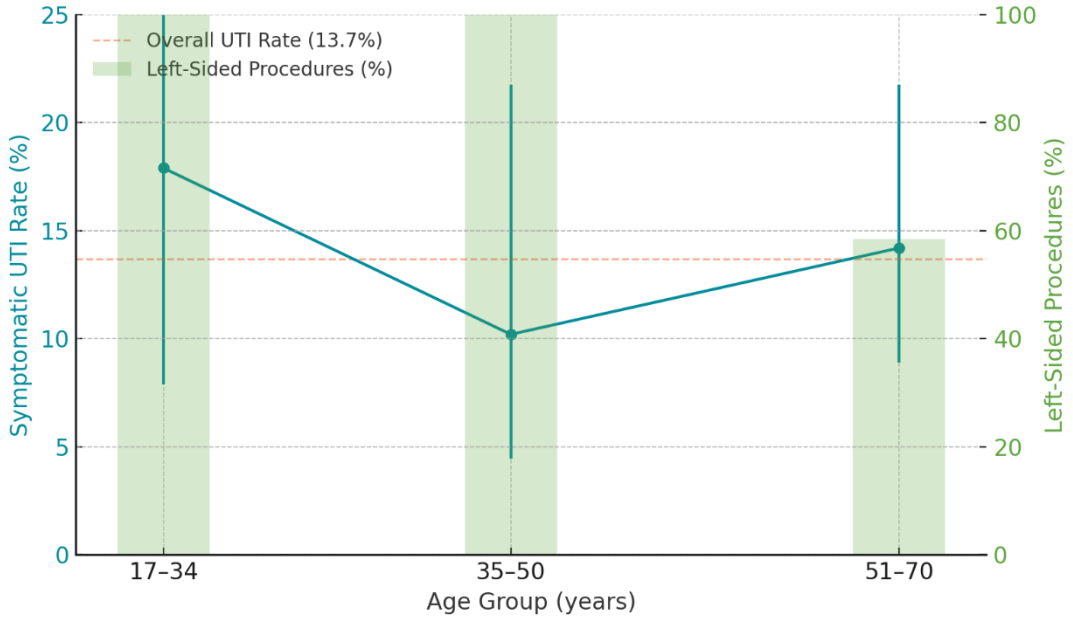

Figure 1 Age-Stratified Symptomatic UTI Rates and Left-Sided Procedure Proportions

DISCUSSION

The findings of this study reveal a relatively low incidence of symptomatic urinary tract infection (UTI) following cystoscopic DJ stent removal after administration of a single prophylactic antibiotic dose, with only 13.7% of patients developing symptoms within a four-week period. This outcome aligns with the growing body of literature suggesting that limited antibiotic exposure may be sufficient for infection prevention in select urological procedures. Previous studies have reported symptomatic UTI rates ranging between 2.5% and 6% after cystoscopic interventions, particularly in renal transplant populations, and these variations may reflect differences in patient comorbidities, procedure complexity, and prophylactic strategies (8,9). Notably, Gregg et al. found a 2.8% infection rate among transplant recipients despite routine fluoroquinolone prophylaxis, indicating that infection risk may be influenced more by host factors than by the antibiotic regimen alone (9). In contrast, Abbott et al. observed no statistically significant difference in UTI incidence between patients who received antibiotics and those who did not, reinforcing the notion that universal prophylaxis may not always yield significant benefits in uncomplicated cases (8).

This study adds to the current discourse by focusing on a general surgical population undergoing elective DJ stent removal, offering insights beyond the highly controlled transplant settings often represented in earlier research. The absence of statistically significant associations between symptomatic UTI and variables such as age, gender, stent duration, or procedural side further emphasizes the likely multifactorial and stochastic nature of post-procedural infection. These findings suggest that a single-dose antibiotic approach may effectively balance infection control with antimicrobial stewardship goals, echoing recommendations from the American Urological Association that endorse the lowest effective dose for minimizing resistance development (6,7). The slight numerical increase in infection among younger patients and those undergoing left-sided procedures, although not statistically significant, warrants further investigation to assess whether these trends may be clinically meaningful in larger cohorts. Potential biological explanations for the infection pattern include transient mucosal trauma during stent removal, latent colonization of stents, or urethral instrumentation disrupting the natural defense mechanisms of the lower urinary tract. The fact that UTI incidence did not escalate with longer stent duration within the allowed range suggests that colonization beyond the 30-day threshold, which was excluded by study design, may be more relevant in promoting infection risk. Additionally, the lack of gender-based significance contrasts with earlier reports where female gender was associated with increased UTI susceptibility, possibly due to anatomical differences (9). This discrepancy might reflect the predominance of male patients in the current study and highlights the importance of sample balance in interpreting such associations.

From a clinical standpoint, the study supports a more conservative antibiotic approach in stent removal procedures, potentially reducing unnecessary exposure, cost, and risk of adverse effects. However, the results must be interpreted within the context of certain limitations. The sample size, while adequate for preliminary evaluation, may have lacked power to detect subtle associations between risk factors and infection outcomes. The use of a single-center setting with purposive sampling restricts generalizability, and the absence of routine urine cultures in asymptomatic patients precludes assessment of subclinical bacteriuria. Moreover,

reliance on symptom-based diagnosis, although practical, introduces the risk of misclassification and under-detection, especially in individuals with mild or atypical presentations. Despite these limitations, the study's strengths include prospective data collection, clearly defined eligibility criteria, and standardized procedural and follow-up protocols, which enhance internal validity. The observed infection rate, though slightly higher than in some previous trials, may reflect a real-world clinical setting where patient heterogeneity and practice variability are inherent. Future research should involve multicenter randomized trials with larger sample sizes to validate these findings and explore predictive biomarkers, host susceptibility factors, and procedural nuances that may influence UTI risk. Inclusion of long-term follow-up and microbiological profiling would further clarify the interaction between prophylactic strategies and pathogen resistance patterns. Ultimately, tailoring antibiotic prophylaxis to individual patient risk profiles, guided by robust evidence, represents a rational path forward in enhancing procedural safety while curbing antimicrobial overuse.

CONCLUSION

This study concludes that the incidence of symptomatic urinary tract infection following single-dose prophylactic antibiotic administration in patients undergoing cystoscopic DJ stent removal was relatively low, with no significant associations observed between infection and patient age, gender, stent duration, or procedural laterality. These findings support the clinical utility of a single preoperative dose of Sulzone as a potentially effective and streamlined approach for infection prevention in elective urological interventions. The results underscore the importance of evidence-based antibiotic stewardship in minimizing unnecessary exposure and resisting the rise of antimicrobial resistance. For human healthcare, this approach offers a safe, cost-effective strategy that can enhance procedural outcomes without compromising patient safety. Future research should focus on larger, multicenter trials to confirm these findings and explore additional patient or procedural factors that may influence infection risk, thereby refining prophylaxis protocols for broader clinical application.

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