OPEN ACCESS

DOI:10.59736/IJP.23.04.990

ORIGINAL ARTICLE

Frequency of urinary tract infections following flexible cystoscopy for double J stent removal in post-transplant patients and characterization of causative agent

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ABSTRACT

Background: After a cystoscopy, the incidence of asymptomatic bacteriuria ranges from 2.8% to 21%. Since our hospital performs flexible cystoscopy, the purpose of this study is to ascertain the frequency and prevalence of UTIs after cystoscopy with stent removal, identify the primary causative agents, and identify areas for care improvement.

Methods: This descriptive case series study was conducted from July 2024 to July 2025, Patients of either gender between the ages of 18 and 70, have had kidney transplantation and Double J stent in situ with negative urine culture were included. Excluded were any history of urethral instrumentation within the previous week, fever and dysuria on the day of the cystoscopy, diabetes mellitus, and antibiotic use within the previous week. A consultant urologist with at least five years of expertise in the field, performed flexible cystoscopy on all individuals under local anesthesia for the removal of DJS and to maintain sterility. Urine microscopy and urine dipsticks were used to confirm the presence of a urinary tract infections in the collected midstream urine sample, and urine culture was used to determine the causative agent.

Results: The study's participants ranged in age from 18 to 70, with a mean age of 35.99 ± 11.48 years. With a male to female ratio of 1.4:1, 62 (57.94%) of the 107 patients were men and 45 (42.06%) were women. Urinary tract infections following flexible cystoscopy for double j stent (DJS) removal in post-transplant patients was found in 10 (9.35%) patients. The most common uropathogens encountered in UTIs after cystoscopy are *Escherichia coli* (E. Coli) (60.0%), *Proteus* (20.0%), and *Klebsiella* (20.0%).

Conclusion: We concluded that 9.35% of post-transplant patients get UTIs after flexible cystoscopy for the removal of a DJS.

Keywords: Cystoscopy, Double J Stent, Post Transplant, Urinary Tract Infection

This article may be cited as: Khan MS, Ullah I, Ali M, Khan M, Ismail I, Rahman MU. Frequency of urinary tract infections following flexible cystoscopy for double J stent removal in post-transplant patients and characterization of causative agent. Int J Pathol 23(4):290-96. https://doi.org/10.59736/IJP.23.04.990

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Introduction

Examining the bladder's inner lining is the goal of the diagnostic and therapeutic procedure known as cystoscopy. Both rigid and flexible cystoscopes, which are often used in clinical settings these days, are used in this procedure (1). In urology, flexible

cystoscopy (FC) is especially important and often preferred. This method involves visually inspecting the bladder's inner lining by passing a cystoscope through the urethra (2). It is frequently done in outpatient settings for the removal of Double J stents (DJS), hematuria, obstructive or irritative urinary symptoms, and patients with a history of urothelial cancer (3). Regular use of DJS has been shown to prevent ureteral problems following kidney transplantation, and it is typically passed during ureteric re-implantation in renal transplant recipients (4). Any surgical procedure carries some risk of infection, which is a typical occurrence. The main disadvantage of cystoscopy is the possibility of developing a UTI, which can be brought on by bacterial cross-contamination during flexible cystoscopy or by antecedent colonization (5). Among hospitalized patient populations, UTIs are among the most prevalent and extensively researched nosocomial infections. Compared to other operations, cystoscopy is generally tolerated by patients; nevertheless, as was previously mentioned, it may also result in the development of specific problems. These issues will ultimately raise patient morbidity, the budget for the health system, and the creation of more resistant bacterial species (6). One recognized side effect of cystoscopy with ureteral stent removal is a symptomatic urinary tract infection (UTI). The frequency and risk factors for post-cystoscopy UTI in patients of renal transplants, however, are little understood. According to one study, the incidence of urinary tract infections after flexible cystoscopy for the removal of DJs is 7.5% (7). *Escherichia coli* accounts for 58% of UTIs following cystoscopy, followed by *Enterococcus* (17.6%) and *Klebsiella* (8.8%). Pyuria and bacteriuria are the outcomes of the inflammation of the urothelium brought on by these bacterial infections. Both symptomatic and asymptomatic bacteriuria may continue, as indicated by the presence or absence of symptoms such as fever, dysuria, and frequency of urination. After a cystoscopy, the incidence of asymptomatic bacteriuria ranges from 2.8% to 21% (8). Since our hospital performs flexible cystoscopy, the purpose of this study was to ascertain the frequency and prevalence of UTIs after cystoscopy with stent removal, identify the primary causative agents, and identify areas for care improvement.

Methods

This descriptive case series study was conducted from July 2024 to July 2025.Using an open Epi sample size calculator with a 95% confidence level and a 5% margin of error, the sample size for this investigation is 107, based on the previously reported incidence of 7.5% (7). Participants required to be between the ages of 18 and 70, be of either gender, have had kidney transplantation and DJS in situ, and have a negative urine culture. Excluded were any history of urethral instrumentation within the previous week, fever and dysuria on the day of the cystoscopy, diabetes mellitus, and antibiotic use within the previous week.

This study was conducted with the hospital's ethics committee's clearance letter number: URO-2023-021-1529 dated 02.5.2024. Following a transplant, after obtaining informed written agreement, patients who met all study requirements were enrolled. A thorough medical history was taken and a physical examination was conducted. All subjects underwent investigations, including urine R/E and urine culture. To reduce the bias caused by confounders, strict exclusion criteria were adhered to. A consultant urologist with at least five years of expertise in the field performed flexible cystoscopy on

all individuals under local anesthetic for the removal of DJS and to maintain sterility. For a total of four weeks, the patients were monitored weekly. Midstream urine (MSU) samples were requested from patients exhibiting UTI symptoms (fever, dysuria, and frequency of urination) during the same follow-up visit. During their final follow-up appointment in week four, the patient who did not exhibit any UTI symptoms were asked to gather MSU. Urine microscopy (10 WBCs/HPF) and urine dipsticks (positive for leucocyte esterase and nitrites) were used to confirm the presence of a UTI in the collected MSU sample, and urine culture was used to determine the causative agent. Solid agar media (Blood Agar (BA) and MacConkey Agar (MK)) was used for urine culture. In strict adherence to the research criteria (inclusion/exclusion criteria), additional patients were recruited using the same sampling technique to replace those who were lost during follow-up. Patients with symptoms of UTI (fever, dysuria) within 04 weeks of flexible cystoscopy with mid-stream urine (MSU) sample, positive for leucocyte esterase and nitrites, > 10 WBCs/HPF on urine microscopy and with a growth of bacteria on urine culture were taken as symptomatic bacteriuria while without symptoms of UTI (fever, dysuria) was considered as asymptomatic. Every piece of information was documented on a proforma. Version 20.0 of the statistical software (SPSS) was used for data entry and analysis. Age, height, and BMI were among the numerical variables for which means and standard deviations were computed. For categorical variables like gender and urine culture results (positive or negative, urinary tract infections), frequencies and percentages were computed. The frequency of UTIs was split by gender and age to observe the impact of medication. The post-stratification chi square was used, with a *P value* of less than 0.05 being considered significant. Tables and graphs were used to display each result.

Results

The study's participants ranged in age from 18 to 70, with a mean age of 35.99 ± 11.48 years. Eighty-five (79.44%) of the patients were between the age of 18 and 45. With a male to female ratio of 1.4:1, 62 (57.94%) of the 107 patients were men and 45 (42.06%) were women. A mean BMI of 27.53 ± 3.04 kg/m2 was recorded. (Table I).

Table I: Distribution of variables (n=107)

Variables	types	Frequency(n)	%
Age (years)	18-45	85	79.44
	46-70	22	20.56
Gender	Male	62	57.94
	Female	45	42.06
BMI (kg/m^2)	≤30	83	77.57
	>30	24	22.43

Urinary tract infections following flexible cystoscopy for double j stent (DJS) removal in post-transplant (healthy kidney from either a living or deceased donor is transplanted into a recipient whose kidneys have failed or are not functioning properly) patients was found in 10 (9.35%) patients (Figure I).

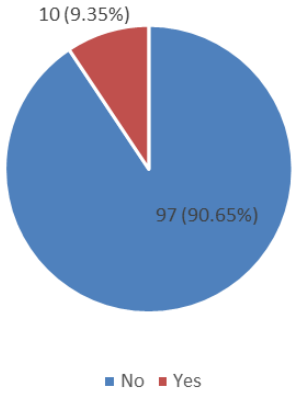

Figure I: Frequency of urinary tract infections following flexible cystoscopy for double j stent (djs) removal in post-transplant patients (n=107).

The most common uropathogens encountered in UTIs after cystoscopy were *Escherichia coli (E-coli)* (60.0%), *Proteus* (20.0%), and *Klebsiella* (20.0%) as shown in Table II. Stratification of urinary tract infections with respect to age, gender and BMI is shown in Table III.

Table-II: Causative agents (n=10).

Causative agents	No. of Patients	%
E coli	06	60.0
Proteus	02	20.0
Klebsiella	02	20.0

Table III: Stratification of urinary tract infections with respect to age, gender and BMI.

Variables		Yes (n=10)	No (n=97)	P-value
Age (years)	**18-45**	08 (9.41%)	77 (90.59%)	**0.963**
	46-70	02 (9.09%)	20 (90.91%)	
Gender	**Male**	04 (6.45%)	58 (93.55%)	**0.227**
	Female	06 (13.33%)	39 (86.67%)	
BMI (kg/m²)	**≤30**	06 (7.23%)	77 (92.77%)	**0.162**
	>30	04 (16.67%)	20 (83.33%)	

Discussion

In recipients of renal transplants, prophylactic ureteric stenting is still debatable (9). While the ureteric stent itself is linked to issues like UTI, hematuria, stent migration, stent encrustation, and forgotten stents, it also prevents serious surgical complications such as ureteric leak and obstruction (10). UTI is the most frequent stent-related complication among recipients of renal transplants, and it has been observed that its frequency is higher both immediately following surgery and after the stents are removed (11).

Seven of the twelve patients who experienced urological problems in a case series of stented kidney transplant recipients had UTIs (12). UTI rates in stented versus non-stented renal transplant recipients, however, differ significantly. According to Ranganathan et al., stented participants had a considerably greater incidence of UTI (71% vs. 39%; P = 0.02) than non-stented subjects (13).

Additionally, according to Yasser Ossman et al., 36% of patients with stented kidney transplants experienced UTIs, compared to 18% of patients without stenting. However, Mathe et al. discovered a comparable incidence of UTI in stented (43.3%) and non-stented (40.1%) patients in a single-center analysis that included 310 renal transplant recipients (14). According to Derouich et al., post-operative UTIs occurred 47.2% more frequently in stented kidney transplant recipients than in non-stented ones (48.7%) (15).

Stent-related problems may be avoided in part by removing the DJ stent early (16). After 30 days of stent implantation, Tavakoli et al. found a markedly elevated incidence of UTI in recipients of renal transplants and recommended removing the DJ stent within 28 days (16).

According to Kehinde et al (17)., 42% of patients experienced stent colonization, and roughly 17% of patients with indwelled DJ stents experienced severe bacteriuria. They demonstrated that the urine complete was sterile in roughly 60% of their patients who had colonized DJ stents. Similarly, 15% of patients with colonized DJ stents had bacteriuria, according to Lifschitz et al (18). However, in a previous investigation, Reid et al (19). reported a 90% stent colonization rate in their series of 30 patients.

The most frequent bacterium responsible for UTIs was E. coli. This outcome is similar to

the majority of other reports that have been published (20). This implicitly indicates that a positive microbial culture is linked to a stent.
From the stents, a number of bacteria were found. *Escherichia coli* and *Enterococci species* were reported to be prevalent in numerous investigations (21,22) *Escherichia coli (E-coli)* was identified as the most common bacterium in our investigation. In a similar vein, two recent studies identified *Staphylococcus* as the leading bacterium among gram-positive infections (23). Following DJ stenting, urethral catheterization may account for the preponderance of gram-positive bacteria in urine samples. Six out of seven patients (85.7%) who tested positive in a study had a history of urethral catheterization within 24 hours of surgery (24).
Nevo et al (25). discovered that 20.4% of their pre-stented patients had positive SC before ureteroscopic surgery. They concluded that female patients and those with comorbidities were more likely to experience post-URS sepsis if they had positive SC. Positive SC was found to be an independent predictor of sepsis following URS. It has also been demonstrated that immunosuppression, diabetes mellitus, and chronic renal insufficiency are risk factors for stent colonization and bacteriuria (26).

Conclusion

We came to the conclusion that 9.35% of post-transplant patients get urinary tract infections after flexible cystoscopy for the removal of a double J stent (DJS). Transplant patients are an at-risk group for whom pre-procedural antibiotic prophylaxis should probably continue, even if the effectiveness of full-dose prophylactic antibiotics in preventing post-procedural UTIs has not yet been established. To identify patients who are most at risk for symptomatic UTI following kidney transplantation, more prospective research is required, ideally in the form of a randomized clinical trial.

Funding Sources: Nil
Conflict of Interest: Nil

References

1. Bharuka V, Meshram R, Munjewar PK. Comprehensive review of urinary tract infections in renal transplant recipients: clinical insights and management strategies. Cureus. 2024;16(2): e53882.
2. Burke DM, Shackley DC, O'reilly PH. The community-based morbidity of flexible cystoscopy. BJUI. 2002; 89(4):347-9.
3. Safiullah S, Lama DJ, Patel R, Clayman R V. Procedural module: flexible cystoscopy. J Endourol. 2018;32(S1) :S-2.
4. Solanki N, Dash SC, Handa A, Singh G, Mahajan P, Khandelwal S. Clinical Significance of DJ stent culture in patients with indwelling ureteral stents prior to endourological intervention- a single centre prospective cohort study. J Clin Diagnos Res. 2021;15(4): PC01-PC05.
5. Cusumano JA, Hermenau M, Gaitanis M, Travis M, LaPlante KL, Tran TY, et al. Evaluation of post–flexible cystoscopy urinary tract infection rates. AJHP. 2020; 77(22):1852-8.
6. Yang X, Chen H, Zheng Y, Qu S, Wang H, Yi F. Disease burden and long-term trends of urinary tract infections: a worldwide report. Front Public Health. 2022; 10:888205.
7. Gregg JR, Kang CL, Talbot TR, Moore D, Herrell SD, Dmochowski R, et al. Symptomatic urinary tract infections in renal transplant recipients after cystoscopy for ureteral stent removal. Urol Pract. 2017;4(5):405–11.

8. Sharma S, Sharma N. Urinary tract infection in renal transplant recipients: Incidence, microbiological profile and predisposing factors in India. Transplant Proc. 2023; 55:1310–1311.
9. Suárez Fernández ML, Ridao Cano N, Álvarez Santamarta L, Gago Fraile M, Blake O, Díaz Corte C. A current review of the etiology, clinical features, and diagnosis of urinary tract infection in renal transplant patients. Diagnostics (Basel) 2021; 11:1456.
10. Boeykens M, Keller EX, Bosio A, Wiseman OJ, Contreras P, Ventimiglia E, et al. Impact of ureteral stent material on stent-related symptoms: a systematic review of the literature. Eur Urol Open Sci. 2022; 45:108–17.
11. Abu S, Asaolu SO, Igbokwe MC, Olatise OO, Obiatuegwu K, Onwuasoanya UE, et al. Bacterial Colonization in Double J Stent and Bacteriuria in Post-Renal Transplant Patients. Cureus. 2022;14(7): e27508.
12. Ranganathan M, Akbar M, Ilham MA, Chavez R, Kumar N, Asderakis A. Infective complications associated with ureteral stents in renal transplant recipients. Transplant Proc 2009; 41:162-4.
13. Ashraf HS, Khan MU, Hussain I, Hyder I. Urological complications in ureteric stenting live related renal transplantation. J Coll Physicians Surg Pak 2011; 21:34-6.
14. Mathe Z, Treckmann JW, Heuer M. Stented ureterovesical anastomosis in renal transplantation: Does it influence the rate of urinary tract infections? Eur J Med Res 2010; 15:297-302.
15. Derouich A, Hajri M, Pacha K, Ben Hassine L, Chebil M, Ayed M. Impact of the use of double J stents in renal transplantation on incidence of urologic complications and urinary infection. Prog Urol 2002; 12:1209-12.
16. Tavakoli A, Surange RS, Pearson RC, Parrott NR, Augustine T, Riad HN. Impact of stents on urolo- gical complications and health care expenditure in renal transplant recipients: Results of a pros- pective, randomized clinical trial. J Urol 2007;177: 2260-4.
17. Kehinde EO, Rotimi VO, Al-Hunayan A, Abdul-Halim H, Boland F, Al-Awadi K. Bacteriology of urinary tract infection associated with indwelling J ureteral stents. J Endourol. 2004; 18:891–6.
18. Joshi HB, Stainthorpe A, Keeley FX, MacDonagh R, Timoney AG. Indwelling ureteral stents: evaluation of quality of life to aid outcome analysis. J Endourol 2001; 15:151-4.
19. Reid G, Denstedt JD, Kang YS, Lam D, Nause C. Microbial adhesion and biofilm formation on ureteral stents in vitro and in vivo. J Urol 1992; 148:1592- 4.
20. Reddy VVV, Repaka AK, Ramadugu RV, Vasa AK. A study on correlation of microbial culture of stent and symptomatology in patients with lower urinary tract symptoms (luts) after dj stenting. Int J Acad Med Pharm 2023;5(5):1201-7.
21. Wood SJ, Kuzel TM, Shafikhani SH. Pseudomonas aeruginosa: infections, animalmodeling, andtherapeutics.Cells.2023; 12:199. doi: 10.3390/cells12010199.
22. Krawczyk B, Wysocka M, Michalik M, Gołębiewska J. Urinary tract infections caused by K. pneumoniae in kidney transplant recipients - epidemiology, virulence and antibiotic resistance. Front Cell Infect Microbiol. 2022; 12:861374.
23. Govindarajan DK, Kandaswamy K. Virulence factors of uropathogens and their role in host pathogen interactions. Cell Surf. 2022; 8:100075.

24. Hosseinpour M, Pezeshgi A, Mahdiabadi MZ, Sabzghabaei F, Hajishah H, Mahdavynia S. Prevalence and risk factors of urinary tract infection in kidney recipients: a meta-analysis study. BMC Nephrol. 2023; 24:284.

25. Nevo A, Mano R, Schreter E, Lifshitz DA. Clinical implications of stent culture in patients with indwelling ureteral stents prior to ureteroscopy. J Urol 2017; 198:116-21.

HISTORY	
Date received:	05-09-2025
Date sent for review:	16-09-2025
Date received reviewers' comments:	24-09-2025
Date received revised manuscript:	12-10-2025
Date accepted:	20-10-2025

CONTRIBUTION OF AUTHORS	
AUTHOR	**CONTRIBUTION**
Conception/Design	MSK, IU
Data acquisition, analysis and interpretation	MSK, MA, MK
Manuscript writing and approval	MSK, IU, II, MUR
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.	