

Research Article

Preoperative Prediction of Urosepsis Following Decompression of Obstructed Infected Upper Urinary Tract: A Cross Sectional Study

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ABSTRACT

Objectives: To determine the preoperative clinical and laboratory predictors of urosepsis following decompression of an obstructed infected upper urinary tract.

Materials and Methods: Ethical approval was obtained from Shaheed Saif ur Rehman Government Teaching Hospital Gilgit and Regional Headquarter Hospital, Skardu. After informed consent, eligible patients were enrolled and demographic, clinical, laboratory, imaging, decompression, and culture data were recorded using a structured questionnaire. Patients were subsequently monitored after decompression for development of urosepsis. Data were entered and analyzed using SPSS.

Results: Among 130 patients, mean age was 48.6 ± 14.2 years, with 58.5% males and 41.5% females. Diabetes was present in 30.0% and CKD in 13.8%. Fever, tachycardia, pyuria, and positive urine culture were present in 64.6%, 43.8%, 72.3%, and 46.9%, respectively. Hydronephrosis was present in all patients, mainly due to ureteric stones (80.8%), and 68.5% underwent DJ stenting. Urosepsis developed in 32 (24.6%) patients. Those with urosepsis were older and had significantly higher rates of female sex, diabetes, fever, tachycardia, pyuria, leukocytosis, elevated creatinine, and positive urine cultures.

Conclusion: It was concluded that Urosepsis developed in 24.6% of patients after decompression. Older age, female sex, diabetes, fever, tachycardia, elevated leukocyte and creatinine levels, pyuria, and positive urine cultures were significant predictors, enabling early identification and closer monitoring of high-risk patients.

Keywords: Urosepsis, Upper Urinary Tract, Decompression.

INTRODUCTION

Upper urinary tract obstruction combined with infection such as occurs in infected Hydronephrosis constitutes a urological emergency requiring immediate decompression of the urinary tract and early, appropriate antibiotic therapy (1). Delayed treatment can lead to rapid spread of the infection, bacteremia, sepsis, and, in the worst-case scenario, septic shock with multi-organ failure (2). Even with timely intervention, the risk of infectious complications particularly the development of urosepsis following decompression remains clinically significant. Urosepsis is a life-threatening condition characterized by organ dysfunction resulting

from an uncontrolled host response to an infection originating in the urinary tract or male genital organs (3). It represents a severe complication of urinary tract infection that requires rapid diagnosis and immediate therapeutic intervention (4). Early recognition and prompt treatment are essential to prevent progression to septic shock and multiple organ failure (5, 6). Obstruction of the upper urinary tract, particularly due to urinary calculi, is an important underlying cause of urosepsis (7). Urosepsis is associated with substantial morbidity and mortality and can lead to an adverse clinical outcome, especially in patients with pre-existing comorbidities, impaired renal function, or diabetes mellitus (8, 9). Therefore,

early identification of risk factors, rapid initiation of targeted therapy, and close clinical monitoring are essential components of patient management.

Although immediate decompression of the obstructed urinary tract is recognized as the primary therapeutic measure, the individual risk of developing urosepsis varies considerably among affected patients (10). Factors such as advanced age, female gender, diabetes mellitus, pronounced clinical signs of infection, elevated leukocyte count, rising serum creatinine levels, pyuria, and positive urine cultures can indicate an increased risk of infection (11). Furthermore, the severity of the urinary tract obstruction, the underlying cause, and the patient's general health status can influence the clinical course. Systematically assessing these preoperative characteristics could help identify high-risk patients early and allow for the tailoring of diagnostic and therapeutic measures to the individual. However, in routine clinical practice, there is often a lack of sufficiently validated and readily available preoperative parameters that allow for the reliable prediction of urosepsis following decompression. A structured assessment of clinical and laboratory findings could improve risk stratification and facilitate the allocation of high-risk patients to intensive monitoring, timely microbiological diagnostics, and targeted antimicrobial therapy. It must be noted that individual parameters alone may lack sufficient predictive accuracy, and their diagnostic value may depend on a combination of multiple clinical and laboratory characteristics.

Against this background, the present cross-sectional study aims to determine the incidence of urosepsis following decompression of an obstructed and infected upper urinary tract and to investigate potential preoperative risk factors. By analyzing demographic characteristics, clinical presentations, laboratory parameters, urinalysis findings, and microbiological results, the study seeks to identify factors associated with the development of urosepsis. The findings could contribute to improving preoperative risk assessment and provide a foundation for future prospective studies aimed at developing and validating standardized predictive models. Ultimately, the early identification of at-risk patients aims to help reduce complications, improve the quality of care, and optimize clinical outcomes following decompression.

Objective: To determine the preoperative clinical and laboratory predictors of urosepsis following decompression of an obstructed infected upper urinary tract.

MATERIALS AND METHODS

Study Design: Cross sectional Study

Study Setting: Multi centre study conducted simultaneously at Regional Headquarter Hospital, Skardu and Shaheed Saif ur Rehman Government Teaching Hospital, Gilgit.

Duration of the Study: The study was conducted from January 2026 to June 2026.

Sampling Technique: Non-probability Consecutive sampling.

Selection criteria

Inclusion criteria

- Patients of age range 18-80 Years.
- Patients with an obstructed and infected upper urinary tract.
- Patients undergoing urgent decompression via double-J ureteral stent or percutaneous nephrostomy.
- Both genders.

Exclusion Criteria

- Patients with pre-existing sepsis or septic shock prior to decompression.
- Patients with isolated lower urinary tract disease without upper urinary tract obstruction.
- Pregnant patients.

METHODS

Approval was obtained from Shaheed Saif ur Rehman Government Teaching Hospital Gilgit and Regional Headquarter Hospital, Skardu. All patients fulfilling the selection criteria were enrolled. A written informed consent was obtained from the parents/guardians. Demographic information, including age, weight, residence, and socioeconomic status, was recorded.

Following informed consent, preoperative demographic data such as age, gender and clinical parameters including body temperature, blood pressure, heart rate, and clinical signs of infection were recorded. In addition, laboratory parameters specifically leukocyte count, C-reactive protein (CRP), serum creatinine, urea, hemoglobin, platelet count, and urinalysis results were noted. Imaging findings, such as the location and cause of the obstruction and the severity of hydronephrosis, were also recorded. The method of decompression and the microbiological results from urine and blood cultures were documented. Subsequently,

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patients were clinically monitored following decompression and assessed for the development of urosepsis. A predesign structured questionnaire were used to collect data and then entered into SPSS for statistical analysis.

RESULTS

A total of 130 patients were included in the study, with a mean age of 48.6±14.2 years. Among them, 21 (16.2%) patients were aged

18–30 years, 52 (40.0%) were aged 31–50 years, 45 (34.6%) were aged 51–70 years, and 12 (9.2%) were aged >70 years. There were 76 (58.5%) males and 54 (41.5%) females. Diabetes mellitus was present in 39 (30.0%) patients, while 18 (13.8%) had chronic kidney disease. Preoperatively, 84 (64.6%) patients had fever ≥38°C, 57 (43.8%) had tachycardia (>100 beats/min), and 16 (12.3%) patients had hypotension (Table 1).

Table 1: Demographic and Preoperative Clinical Characteristics of Patients (N=130)

Variables	
Age (Years)	48.6±14.2
Age Groups	
018-30 years	21(16.2%)
31-50 years	52(40.0%)
51–70 years	45(34.6%)
>70 years	12(9.2%)
Gender	
Male	76(58.5%)
Female	54(41.5%)
Diabetes mellitus	39(30.0%)
Chronic kidney disease	18(13.8%)
Fever ≥38°C	84(64.6%)
Tachycardia (>100/min)	57(43.8%)
Hypotension	16(12.3%)

The mean WBC count was 14.2±5.1 ×10⁹/L, while the mean serum creatinine level was 2.1±1.3 mg/dL and the mean platelet count was 238±76 ×10⁹/L. A positive urine culture was observed in 61 (46.9%) patients, while pyuria was present in 94 (72.3%) and nitrite positivity in 48 (36.9%) patients.

Hydronephrosis was present in all 130 (100%) patients, with 105 (80.8%) having a ureteric stone as the cause of obstruction and 25 (19.2%) having other causes of obstruction. Decompression with a DJ ureteric stent was performed in 89 (68.5%) patients (Table 2).

Table 2: Preoperative Laboratory and Radiological Findings (N=130)

Variables	
WBC count (×10 ⁹ /L)	14.2±5.1
Serum creatinine (mg/dL)	2.1 ± 1.3
Platelet count (×10 ⁹ /L)	238±76
Positive urine culture	61 (46.9%)
Pyuria	94 (72.3%)
Nitrite positive	48 (36.9%)
Hydronephrosis	130 (100%)
Ureteric stone	105 (80.8%)
Other causes of obstruction	25 (19.2%)
DJ ureteric stent	89 (68.5%)

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Following decompression, urosepsis developed in 32 (24.6%) patients, whereas 98 (75.4%) patients (75.4%) did not develop urosepsis (Table 3).

Table 3: Frequency of Urosepsis (N=130)

Variables	no (%)
Urosepsis	
Yes	32(24.6%)
No	98(75.4%)

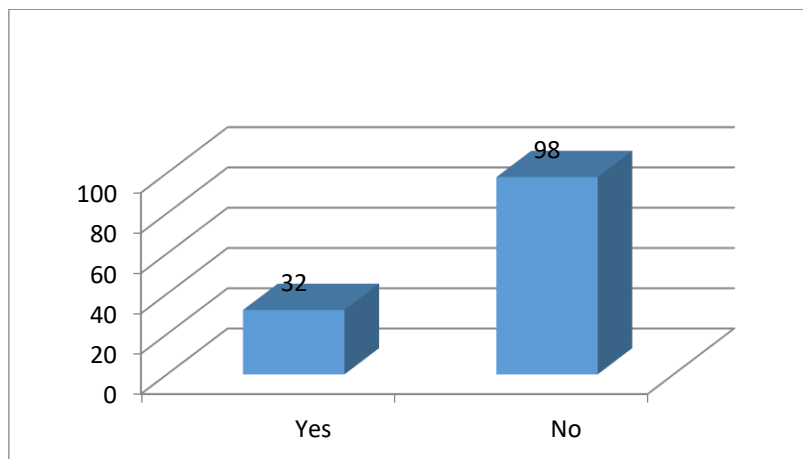


Fig 1: Frequency of Patients on the Basis of Urosepsis

Patients with urosepsis were significantly older (54.8 vs 46.6 years, $p=0.00$) and had a higher proportion of females (56.3% vs 36.7%, $p=0.04$) and individuals with diabetes mellitus (46.9% vs 24.5%, $p=0.01$). Additionally, the urosepsis group showed statistically significant elevations in clinical signs of infection and laboratory markers, including a higher prevalence of fever $\geq 38^{\circ}\text{C}$ (87.5% vs. 57.1%),

tachycardia (65.6% vs. 36.7%), and pyuria (90.6% vs. 66.3%). Furthermore, the urosepsis group had higher mean white blood cell counts (17.1 vs. $13.2 \times 10^9/\text{L}$) and serum creatinine levels (2.7 vs. 1.9 mg/dL). Positive urine cultures were also more frequent among patients with urosepsis (68.8% vs. 39.8%) (Table 4).

Table 4: Comparison of Preoperative Predictors Between Patients with and without Urosepsis (N=130)

Variables	Urosepsis		P-Value
	YES	NO	
Age	54.8 $\pm$ 13.1	46.6 $\pm$ 14.1	0.00
Female gender	18 (56.3%)	36 (36.7%)	0.04
Diabetes mellitus	15 (46.9%)	24 (24.5%)	0.01
Fever $\geq 38^{\circ}\text{C}$	28 (87.5%)	56 (57.1%)	0.00
Tachycardia ($>100/\text{min}$)	21 (65.6%)	36 (36.7%)	0.00
WBC ($\times 10^9/\text{L}$)	17.1 $\pm$ 5.6	13.2 $\pm$ 4.5	0.00
Creatinine (mg/dL)	2.7 $\pm$ 1.4	1.9 $\pm$ 1.2	0.00
Pyuria	29 (90.6%)	65 (66.3%)	0.00
Positive urine culture	22 (68.8%)	39 (39.8%)	0.00

DISCUSSION

Urosepsis is associated with significant morbidity and mortality; therefore, its prevention, early recognition, and prompt management are essential (12). It is a major cause of death among patients with kidney stone disease (KSD), particularly those with comorbidities, a high stone burden, obesity,

spinal cord injury, or neurogenic bladder (13, 14). Few clinical studies assessed the probability of patients with upper urinary calculi developing urosepsis (15, 16).

The present study aim is to determine the preoperative clinical and laboratory predictors of urosepsis following decompression of an obstructed infected upper urinary tract. In the

present study among the 130 evaluated patients, 32 (24.6%) developed urosepsis following decompression. This high incidence highlights the critical need for early risk stratification and identification. Infected hydronephrosis constitutes a urological emergency that mandates immediate urinary tract decompression alongside prompt antibiotic administration. In accordance with current European Association of Urology (EAU) guidelines, cases presenting with sepsis and obstructing stones require urgent decompression via a double-J (DJ) stent or percutaneous nephrostomy while definitive stone management is deferred until the infection is successfully controlled (17). Advanced age emerged as a significant predictor of urosepsis in our cohort, with affected patients exhibiting a notably higher mean age than those without urosepsis (54.8 vs. 46.6 years, respectively). This observation aligns with a comprehensive meta-analysis of 13 studies confirming advanced age as a primary risk factor for postoperative urosepsis. The heightened susceptibility in older individuals is likely multifactorial, driven by a higher burden of comorbidities, age-related immunosenescence, and diminished renal reserve that collectively accelerate the systemic dissemination of urinary tract infections (11). Furthermore, women were significantly overrepresented in the urosepsis group (56.3% vs. 36.7%; $p=0.04$). This observation is corroborated by prior literature, including a systematic review and meta-analysis indicating that female sex is an independent risk factor for infectious complications following ureteroscopy (OR 1.95). This increased susceptibility is primarily attributed to a higher baseline prevalence of bacterial urinary tract infections in women, alongside anatomical features that facilitate the ascent of pathogens (18). Diabetes mellitus also emerged as a significant risk factor for urosepsis, being present in 46.9% of patients with urosepsis compared to 24.5% of those without ($p=0.01$). The heightened susceptibility of diabetic patients to systemic infection is driven by impaired cellular immunity, compromised glycemic control, and an inherent predisposition to urinary tract infections. These findings are strongly supported by a meta-analysis identifying diabetes mellitus as an independent predictor of postoperative urosepsis (OR 2.04) (18). Clinical signs of infection were also markedly more pronounced in patients who subsequently developed urosepsis. Fever $\geq 38^{\circ}\text{C}$ occurred in

87.5% of patients with urosepsis compared to 57.1% of those without, while tachycardia was observed in 65.6% versus 36.7%. These findings are clinically plausible, as fever and tachycardia reflect systemic responses to a progressing infection. The EAU guidelines regard fever and a clinically compromised general condition as important indicators of a systemic urinary tract infection and recommend a comprehensive diagnostic workup including laboratory tests and, where appropriate, blood cultures when such findings are present (19). Patients who developed urosepsis also exhibited significantly elevated leukocyte counts (17.1 versus $13.2 \times 10^9/\text{L}$) and serum creatinine levels (2.7 versus 1.9 mg/dL). Leukocytosis indicates a more intense systemic inflammatory response, whereas higher creatinine concentrations likely stem from compromised renal function driven by a combination of ureteral obstruction, infection, and sepsis-induced acute kidney injury. These findings align with prior research in patients with upper urinary tract calculi demonstrating that preoperative leukocytosis serves as an independent risk factor for postoperative urosepsis (20). Similarly, a positive urine culture was significantly more common in patients who subsequently developed urosepsis (68.8% vs. 39.8%). This finding is of particular clinical significance, as pre-existing bacterial colonization in the presence of urinary tract obstruction constitutes a key factor in the development of systemic infection. Several studies and meta-analyses have identified a positive preoperative urine culture as one of the most important predictors of postoperative infectious complications. A recent study also demonstrated that a positive urine culture, a positive nitrite test, and elevated urinary leukocytes are independent risk factors for urogenital sepsis (21).

These findings carry crucial clinical implications for preoperative risk stratification. Advanced age, female sex, and—most notably—the presence of diabetes mellitus, fever, tachycardia, marked leukocytosis, elevated serum creatinine, pyuria, or positive urine cultures should alert clinicians to a heightened risk of urosepsis, necessitating rigorous postoperative monitoring. Furthermore, in the setting of a systemic urinary tract infection, addressing any anatomical obstruction is imperative alongside targeted antibiotic therapy, as antimicrobial administration alone remains inadequate while the obstruction persists.

CONCLUSION

It was concluded that 24.6% developed urosepsis following decompression. Advanced age, female gender, diabetes mellitus, fever, tachycardia, elevated leukocyte and creatinine levels, pyuria, and positive urine cultures were significantly associated with the development of urosepsis. These readily available preoperative parameters can aid in the early identification of high-risk patients and facilitate close monitoring as well as early, targeted treatment.

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