

## Research Article,

# “Evaluation of Urosepsis and Bacteriuria in Patients Undergoing PCNL and URS”

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### Abstract:

Urosepsis usually develops from a community or nosocomial acquired urinary tract infection (UTI) or during the procedure of various urinary disease such ureterorenoscopy (URS) and percutaneous nephrolithotomy (PCNL). Urosepsis is associated with bacteriuria, Urosepsis due to manipulation during or after percutaneous nephrolithotomy (PCNL) or ureterorenoscopy (URS) or push bang stenting can be catastrophic despite prophylactic antibiotic coverage. This cross sectional study was carried out in Dhaka Medical College Hospital, Dhaka, Bangladesh during the period of July 2011 to June 2013. Sampling technique was purposive and sample size was 70. Among them 23 patients for PCNL and 47 patients for URS were selected by selection criteria. Data were collected by interview of the patients, clinical examinations and laboratory investigations using the research instrument. Data were processed and analyzed using software SPSS (Statistical Package for Social Sciences) version 11.5. Incidence of bacteriuria and urosepsis were measured according to urine and blood culture report. Sensitivity pattern was also observed. According to this study, the incidence of bacteriuria and urosepsis were 17.1% and 5.7% respectively, Of the 70 patients, 12(17.1%) exhibited bacterial growth on urine culture, These 12 patients were then subjected to blood culture and 4(33.3%) of them were found positive. Most (83.4%) of the urine and blood infections (75%) were caused by E. coli. Some widely used antibiotics like moxycillin, Cephalexin and Ciprofloxacin were found 100% resistant in urine culture. Few sensitive antibiotics were Tobramycin (100 %), Amikacin and Ceftazidime (75%). Almost same sensitivity pattern was found in blood culture. In urosepsis, as in other types of sepsis. Urosepsis after PCNL and URS is an important and potentially catastrophic complication. Percutaneous nephrolithotomy (PCNL), Ureterorenoscopy (URS) occurs frequently in this institution. Although the incidence of urosepsis and bacteriuria with resistant organism is low, but it is a burning issue in management in urology practice. The apparent increase in ciprofloxacin resistant organisms appears to be associated with the increased rate of ciprofloxacin resistant organisms are observed in the general population.

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**Keywords:** Percutaneous Nephrolithotomy (PCNL), Ureterorenoscopy (URS), Urinary Tract Infection (UTI).

## Introduction:

Urosepsis is a potentially catastrophic complication that can follow Ureterorenoscopy (URS) or percutaneous nephrolithotomy (PCNL) despite sterile preoperative urine and prophylactic antibiotics [1]. Urosepsis accounts for approximately 25% of all sepsis cases and may develop from a community or nosocomial acquired urinary tract infection (UTI) or during the procedure of various urinary diseases, such as ureterorenoscopy (URS), percutaneous nephrolithotomy (PCNL), ESWL, push back stenting, even after perurethral catheterization. Urosepsis is associated with bacteriuria [2, 3]. Urolithiasis is one of the most common urological diseases; it can be lethal if urinary tract infection associated with obstructed uropathy due to urinary tract calculi results in bacteremia and sepsis [5]. In recent year, the incidence of sepsis and urosepsis has even increased, but the associated mortality has decreased suggesting improved management of patients [6]. It is proven that the larger the stones, the greater the chance of acquiring infection (6%-10%), as well as an increased chance of postoperative sepsis. Risk of post PCNL sepsis increased by 4 times in patients with HDN and stones >2 cm despite sterile MSU (Mid Stream Urine) and standard prophylactic antibiotics [7]. Urosepsis due to manipulation during percutaneous nephrolithotomy (PCNL) or URS can be catastrophic despite sterile preoperative urine and prophylactic antibiotic coverage [5]. Percutaneous nephrolithotomy (PCNL), Ureterorenoscopy (URS) occurs frequently in this institution. Although the incidence of urosepsis and bacteriuria with resistant organism is low, but it is a burning issue in management in urology practice. This study has been designed to evaluate the pattern of urosepsis and bacteriuria after PCNL and URS in Dhaka Medical College & Hospital, Dhaka, Bangladesh.

## Objectives:

### General:

- To evaluate the urosepsis and bacteriuria in patients undergoing URS and PCNL at Dhaka Medical College & Hospital, Dhaka, Bangladesh.

### Specific:

- To detect organism in urine by pre operative urine C/S for all patients.
- To detect organism in urine by post operative urine C/S for all patients before

giving antibiotic.

- To detect organism in blood by post operative blood C/S for those patients, who had positive urine culture and sign & symptoms of urosepsis.

## Materials and Methods:

**Type of study:** Cross sectional study.

**Place of study:** Department of Urology, Dhaka Medical College & Hospital, Dhaka, Bangladesh.

**Period of study:** From July 2011 to June 2013.

**Study population:** Patients who have Stag horn calculi were decided to be treated by PCNL or Stone in lower ureter which caused obstruction undergoing URS in the urology department of Dhaka Medical College & Hospital were included in the study. All patients were enrolled after considering all selection criteria.

**Sample size (n):** 70 patients were studied.

**Sampling technique:** Purposive sampling technique.

### Selection criteria:

#### **Inclusion criteria:**

- Stag horn calculi to be treated by PCNL.
- A stone larger than 2.5cm for PCNL.
- Patient with non breakable stone by ESWL.
- Proximal ureteric stone undergoing push back stenting for PCNL or ESWL.
- Stone in mid or lower ureter which causes partial obstruction for URS.

#### **Exclusion criteria:**

- Pelvic kidney.
- Horse shoe kidney.
- Morbid obesity.
- Stone in Caliceal diverticula.
- Bleeding disorder.
- Existing urinary tract infection.
- Immunosuppressed patient.
- Presence of structural heart disease.
- Indwelling catheter in situ.
- Patients who refused to give informed consent.

**Sampling procedures:** A total of 70 subjects meeting the eligibility criteria were included in the study. Of them 23 were allocated in PCNL group and the remaining 47 in URS group.

**Methods:** Those patients who are selected by inclusion and exclusion criteria for PCNL URS at Dhaka Medical College and Hospital. Urine for C/S was done in all patients. After the procedures

urine sample was collected from each patient before institution of antibiotic therapy. The collected sample then sent for Culture and Sensitivity and observed the patient for sign and symptoms of urosepsis. If Organism found in urine culture then blood sample were sent for C/S and broad spectrum injectable antibiotic with supportive treatment were started. After that the following investigations were done.

- Blood for CBC, Hb%
- Urine for RE, M/E
- Total Platelet count,
- Serum Electrolytes.

**Laboratory findings:**

- Urine for R/E, ME & C/S.
- Features of UTI.
- Blood for CBC & Hb% and C/S:
- Change in WBC count. Initially increased but later decreased.
- A coagulopathy suggested decrease in total Platelet count.
- Serum Electrolytes: Hyperkalemia and hyponatremia.

**Counseling before operation:** Before proceeding to operative procedure, proper and detail counseling was done with the patients regarding the purpose of operation, the operative procedure, benefit and possible complications and management.

**Preparation of the patient for PCNL or URS:** Bleeding disorder and other pathology were excluded. Antithrombolytic drug was withdrawn 7

days before PCNL or URS. Urine was made sterile according to culture sensitivity report. After proper preparation, consent and counseling of the patient, PCNL or URS was done under standard procedure.

**Data collection procedure:** Data were collected by interview of the patients, clinical examination and laboratory investigations using the research instrument, a written questioners.

**Data processing and statistical analysis:** Statistical analysis of the result was performed by using window based computer software device with statistical packages for social science (SPSS-17) (SPSS Inc, Chicago, IL, USA). The results were presented in tables, figures, and diagrams. Chi square test were used for calculating the significance of difference. A p-value <0.05 was considered as level of significance.

**Observation and Results:**

To assess the incidence of urosepsis and bacteriuria in patients undergoing PCNL and URS, a study was conducted at Dhaka Medical College Hospital, Dhaka, Bangladesh. Seventy patients were included in the study. The findings of the study derived from data analysis are presented below. **Age distribution:** Figure 1 shows the distribution of patients by age. Mean age was 36.97 years with a SD of ± 13.48 years. Age group <30 years lead the tally with about 43% representation. The next leading age group was 45-55 years (31.4%).

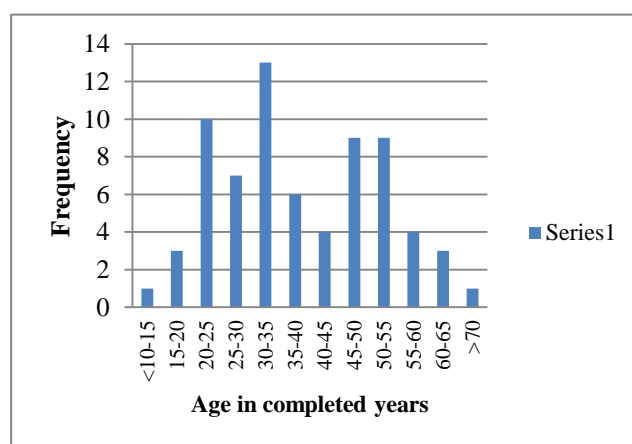


Figure1: Histogram showing the distribution of patients by age.

**Sex distribution:** The pie chart below depicts the distribution of the patients by sex. Oct of respondents 70% (49) were male and the rest 30% (21) were female (Fig. 2).

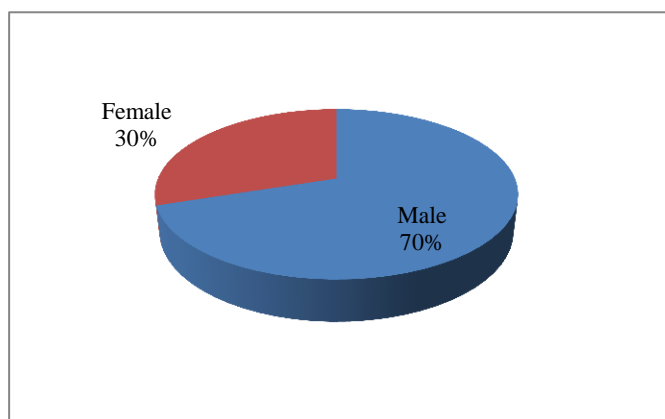


Figure2: Pie chart showing the distribution of patients by sex

**Type and location of Stone for PCNL:** There were 23 stones dealt with PCNL procedure. Almost half (47.8%) stones were Stag-horn calculi and more than 30% stones were inferior caliceal stones. About 22% stones situated at the middle calyx which were large type (Table 1).

Table 1: Type and location of Stone for PCNL

Type and location of stone for PCNL	Frequency	Percentage
Stag-horn calculi	11	47.83
Large stone present at middle calyx	4	17.39
Inferior caliceal stone	5	21.74
Proximal ureteric stone-PCNL After push bang	3	13.04
Total	23	100.0

**Type and location of Stone for URS:** There were 47 stones dealt with URS procedure. Most (70.2%) stones were lower ureteric stone and about one-fourth (25.5%) stones were presented at vesico-ureteric junction. Only 4.3% stones were middle ureteric stone (Table 2).

Table 2: Type and location of Stone for URS

Type and location of Stone for URS	Frequency	Percentage
Lower ureteric stone	33	70.2
Middle ureteric stone	2	4.3
Stone at VUJ	12	25.5
Total	47	100.0

**Clinical history:** Clinical history revealed that frequency of micturition was predominant complaint (85.7%) followed by dysuria (60%), nocturia (30%), urgency (30%), fever with chill and rigor (24.3%) and haematuria (22.9%). A small proportion of patients mentioned hesitancy and shivering (Table 3).

Table-3: Distribution of patients by clinical history.

Clinical history	Frequency	Percentage
Frequency of micturition	60	85.7
Dysuria	42	60.0
Nocturia	21	30.0
Urgency	21	30.0
Fever with chill and rigor	17	24.3
Haematuria	16	22.9
Hesitancy	9	12.9
Shivering	3	4.3

Total percentage did not correspond to 100% because of multiple responses. **Findings of urine and blood culture:** Of the 70 patients, 12(17.1%) exhibited bacterial growth on urine culture. These 12 patients were then subjected to blood culture and 4(33.3%) of them were found positive. Thus a total of 4 patients (5.7%) out of 70 developed urosepsis.

**Table-4: Distribution of patients by investigations.**

Investigations		Frequency	Percentage
Bacterial growth on urine culture (n=70)	Positive	12	17.1
	Negative	58	82.9
Bacterial growth on blood culture (n=12)	Positive	04	33.3
	Negative	08	66.7

**Pathogens isolated in urine culture:** Table 6 shows that most (83.4%) of the urine infections were caused by E. coli. Only one instance of Pseudomonas aeruginosa and Proteus infection was reported (Table 5).

**Table-5: Distribution of patients by pathogens isolated (urine culture).**

Pathogens isolated	Frequency	Percentage
E. coli	10	83.4
Pseudomonas aeruginosa	1	8.3
Proteus	1	8.3

**Pathogens isolated in blood culture:** Table 6 shows that about three-fourth of the blood infections were caused by E. coli, and the remaining 25% by Pseudomonas aeruginosa.

**Table-6: Distribution of patients by pathogens isolated (blood culture).**

Pathogens isolated	Frequency	Percentage
E.coli	03	75.0
Pseudomonas aeruginosa	01	25.0

**Sensitivity Pattern in Urine Culture:** Sensitivity pattern of microorganisms demonstrates that out of 12 urine culture positive patients, 100% was sensitive to Tobramycin 75% to Amikacin and Ceftazidime. 66.7% 10 Celepime and Gentamycin 58.3% to Cotrimoxazole Ceftriaxone Cephadrine and cefixime was last sensitive (16.7% and 83% respectively). Amoxicillin Cephalixin and Ciprofloxacin were not at all sensitive.

**Table-7: Distribution of patients by Sensitivity pattern (urine culture).**

Name of antibiotics	Sensitivity pattern	Frequency	Percentage
Amikacin	Sensitive	9	75.0
	Resistance	3	25.0
Amoxycillin	Resistant	12	100.0
Cefepime	Sensitive	8	66.7
	Resistant	4	33.33
Cefixime	Sensitive	1	8.3
	Resistant	11	91.7
Ceftazidime	Sensitive	9	75.0
	Resistance	3	25.0
Ceftriaxone	Sensitive	1	8.3
	Resistant	11	91.7
Cephalexin	Resistant	12	100.0
Cephadrine	Sensitive	2	16.7
	Resistant	10	83.3
Ciprofloxacin	Resistant	12	100.0
Cotrimoxazole	Sensitive	7	58.3
	Resistant	5	41.7
Gentamycin	Sensitive	8	66.7
	Resistant	4	33.3
Nitrofurantoin	Sensitive	10	83.3
	Resistant	2	16.7
Tobramycin	Sensitive	12	100.0

**Sensitivity pattern in blood culture:** Sensitivity pattern of microorganisms demonstrates that out of 4 culture positive patients, 100% were sensitive to tobramycin, 75% to Amikacin and Gentamycin and Nitrofurantoin, 50% to Cefepime and Cotrimoxazole.

Ceftazidime, Ceftriaxone, Cephadrine were least sensitive (25% each) while Amoxycillin, Cefixime and Ciprofloxacin were 100% resistant.

**Table-8: Distribution of patients by Sensitivity pattern (blood culture).**

Name of antibiotics	Sensitivity pattern	Frequency	Percentage
Amikacin	Sensitive	3	75.0
	Resistance	1	25.0
Amoxycillin	Resistant	4	100.0
Cefepime	Sensitive	2	50.0
	Resistant	2	50.0
Cefixime	Sensitive	0	0.0
	Resistant	4	100.0
Ceftazidime	Sensitive	1	25.0
	Resistance	3	75.0
Ceftriaxone	Sensitive	1	25.0
	Resistant	3	75.0
Cephalexin	Resistant	4	100.0
Cephadrine	Sensitive	1	25.0

**Discussion:**

Urolithiasis is one of the most common urological diseases; it can be lethal if urinary tract infection associated with obstructive uropathy due to upper urinary tract calculi results in bacteremia and sepsis [8]. Urosepsis due to manipulation during percutaneous nephrolithotomy (PN) or ureterorenoscopy (URS) can catastrophic despite prophylactic antibiotic coverage [5]. Dan some chronic disease increase the rate of urosepsis. In this only one patient developed urosepsis after PCNL who was diabetic Peronneous nephrolithotomy (PCNL) is done for removal of large and complex renal calculi or sometimes proximal ureteric calculi. Ureterorenoscopy (URS) is done for removal of mid or lower ureteric one or evaluates the causes of ureteric obstruction. But sometimes URS and PCN may precede urosepsis and bacteriuria which may cause life threatening condition. This is very challenging for urologists. The prevalence of urosepsis in urological patients with nosocomial UTI was high and was in one study on average about 12%, whereas in patients with nosocomial UTI treated in other specialties the prevalence for severe sepsis was 2% and for septic shock 0.3%. Wagenlehner, Pilatz and Weidner et al., [4] patients were included in this study according to selection criteria. Meenage was 36.97 years with a SD of ±13.48 years and peak incidence was found in young adult whose age 30 or less. Out of 70 patients 23 stones dealt with PCNL and 47 patients dealt with URS. In this study there were 23 stones dealt with PCNL procedure. Almost half (47.8%) of the stones were Stag-horn calculi and

more than 30% stones were inferior caliceal stones. About 22% stones which presented at the middle calyx were large type. 3 patients (13.04%) present with proximal ureteric stone where push bang stenting was done before ESWL or PCNL. There were 47 stones dealt with URS procedure. Most (70.296) stones were lower ureteric stone and about one-fourth (25.5%) stones were presented at vesico-ureteric junction. Only 4.3% stones were middle ureteric stone. Of the 70 patients, 12 (17.1%) exhibited bacterial growth on urine culture. These 12 patients were then subjected to blood culture and 4(5.7%) of them were found positive. Thus a total of 4 patients (5.7%) out of 70 developed urosepsis. This result correlates with international study. Most (83.4%) of the urine and blood (75%) infections were caused by E. coli. This finding was identical with a lot of international studies [9, 10]. Injudicious use of anti-microbial agents is a growing concern all over the world. This was also depicted in our study findings. Some widely used antibiotics like Amoxicillin, Cephalexin and Ciprofloxacin were found 100% resistant in urine culture. Few sensitive antibiotics were Tobramycin (100 %), Amikacin and Ceftazidime (75%). Almost same sensitivity pattern was found in blood culture. These findings supported by few international studies as well [11].

**Conclusion:**

During the procedure of ureterorenoscopy (URS) and percutaneous nephrolithotomy (PCNL), urosepsis may occur. Urosepsis can be catastrophic despite prophylactic antibiotic coverage. In recent years, the incidence of sepsis

and urosepsis were increased, but the associated mortality has decreased suggesting improved management of patients. In this study, out of 70 patients, 12(17.1%) patients developed bacteriuria and among which 4(5.7%) patients developed urosepsis. This result correlates with many international studies. Surprisingly the apparent increase in ciprofloxacin resistant organisms was seen in the general population. New strain of E.coli is very alarming uropathogen and is found to be positive in many cases of urosepsis and are resistant to many conventional antibiotics.

#### **Limitations and Recommendations:**

Like any other scientific study, the present study was not without limitations. The following limitations deserve mention:

- The sample size was small.
- Operations were performed by different surgeons.
- Follow up was short.

Urosepsis following the procedure of URS and PCNL is not infrequent event and typically occurs within few days following the procedure. Urosepsis can occur despite prophylactic antibiotic coverage and despite sterile urine. Urosepsis can be reduced by careful patient selection and proper handling.

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