

## Antibiotic Sensitivity Pattern of Uropathogens in B & B Hospital, Nepal

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This study was done to evaluate the pathogens causing UTI and their antibiotic sensitivity pattern against commonly used antibiotics. Retrospective data were collected for clean catch mid-stream urine samples sent for culture sensitivity at B&B Hospital from July 2016 to June 2017. Total 4937 urine samples were processed, among which 1033 (20.9%) showed significant bacterial growth. UTI was more common in young females of age group between 21-30 years. Escherichia coli (*E. coli*) was the predominant organism isolated (70.9%) followed by Klebsiella species (*sp*) (9.2%) and Pseudomonas *sp* (5.4%). The uropathogens isolated were overall most sensitive to Amikacin followed by Chloramphenicol, Gentamicin, Ofloxacin and Ceftriaxone. Amoxicillin and Ciprofloxacin had the poorest results.

**Keywords:** antibiotic resistance, antibiotic sensitivity, uropathogens, urinary tract infection, UTI.

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**U**rinary tract infections (UTI) are considered to be the most common bacterial infection causing morbidity and significant mortality.<sup>1</sup> Careful diagnosis and effective treatment can result in significant decrease in hospital stay, cost and morbidity.

Antibiotic susceptibility pattern of different pathogens vary between hospitals and no data is present for the susceptibility pattern of uropathogens found in our center. So,

this study aims to present data to guide the choice of antibiotic for judicious and effective treatment of UTI in our setting, and may help formulate tailored hospital antibiotic policy.

### Materials and Methods

Electronically stored data of all clean catch mid-stream urine samples that were submitted for urine culture and sensitivity in B&B hospital from July 2016 to June

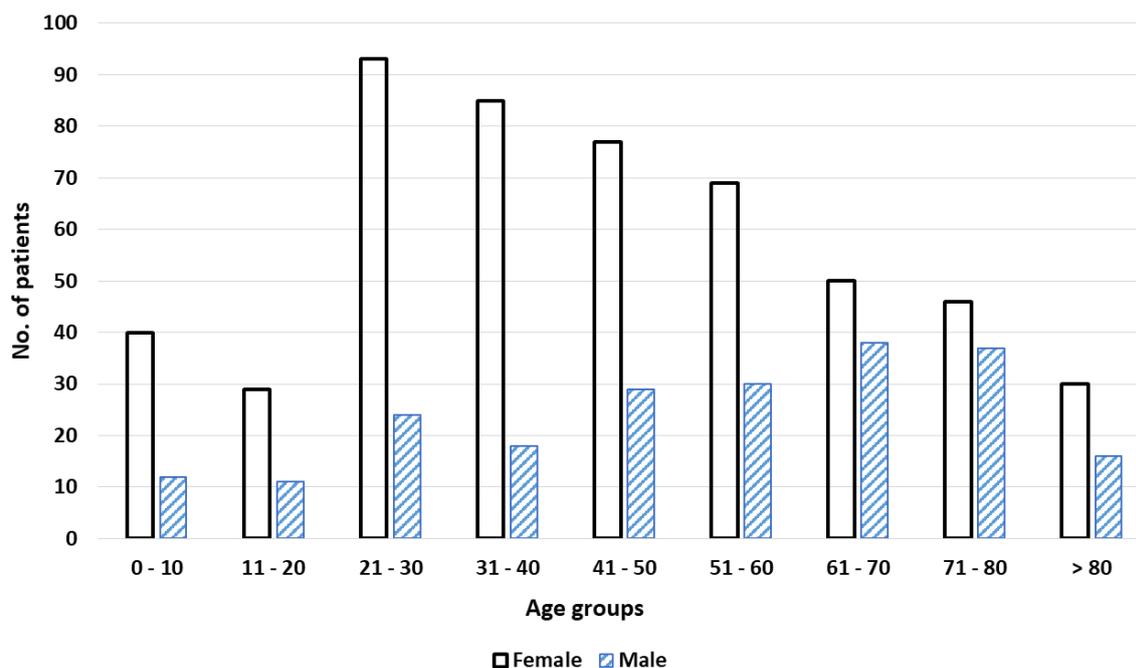


Figure 1: Incidence of UTI in different age groups

2017 were retrospectively retrieved. Data was tabulated for age, gender, type of bacteria, their colony count and antibiotic susceptibility pattern. Bacterial colony count less than  $10^5$  cfu/mL were excluded from the analysis. Descriptive data analysis was done using Microsoft Excel 2013.

## Results

Total urine samples that were processed for culture were 4937 out of which significant bacterial growth was seen in 1033 samples, i.e., 20.9%. Majority of the patients were females (64.5%). The young females of 21-30 years age group were diagnosed most commonly with UTI and the incidence decreased as the age progressed. On the other hand, in male population UTI was more common as the age advanced (Figure 1).

Of the 1033 positive bacterial growths, majority isolates were *E. coli* (70.9%)

followed by *Klebsiella* (9.2%), *Pseudomonas* (5.2%) and others (15.1%) (Table 1). Few samples also grew *Candida albicans* and *Yeast* which was not taken into account.

Uropathogens	Percentage
<i>E. Coli</i>	70.9
<i>Klebsiella sp</i>	9.2
<i>Pseudomonas sp</i>	5.2
<i>Enterococcus sp</i>	4.7
<i>Staphylococcus sp</i>	2.8
<i>Acinetobacter sp</i>	1.5
<i>Proteus sp</i>	1.4
<i>Streptococcus sp</i>	0.9
<i>Enterobacter sp</i>	0.7
<i>Candida albicans</i>	0.1
<i>Yeast</i>	2.7
<i>Morganella morgani</i>	0.2
<i>Citrobacter diversus</i>	0.1
<b>Total</b>	<b>100</b>

Table 1: Distribution of Uropathogens

	<b>E. Coli</b>	<b>Klebsiella</b>	<b>Pseudomonas</b>	<b>Enterococcus</b>	<b>Staphylococcus sp</b>	<b>Acinetobacter</b>	<b>Proteus</b>	<b>Streptococcus sp</b>	<b>Enterobacter sp</b>
<b>Amoxicillin</b>	13.9	1.1	0.0	38.8	3.5	0.0	7.1	77.8	0.0
<b>Ceftriaxone</b>	45.2	27.4	5.6	4.1	34.5	18.8	71.4	66.7	28.6
<b>Cefepime *</b>	4.8	9.5	9.3	NT	3.5	12.5	14.3	NT	14.3
<b>Cefoperazone Sulbactam</b>	17.8	17.9	13.0	0.0	NT	31.3	42.9	NT	28.6
<b>Chloramphenicol</b>	25.4	34.7	1.9	83.7	82.8	6.3	14.3	77.8	57.1
<b>Cotrimoxazole</b>	43.3	27.4	0.0	4.1	10.3	6.3	21.4	NT	57.1
<b>Nitrofurantoin</b>	49.7	4.2	0.0	8.2	6.9	0.0	0.0	11.1	0.0
<b>Ciprofloxacin</b>	36.7	23.2	18.5	8.2	58.6	18.8	14.3	44.4	42.9
<b>Norfloxacin</b>	40.7	32.6	18.5	6.1	10.3	25.0	14.3	NT	42.9
<b>Ofloxacin</b>	44.4	41.1	24.1	10.2	79.3	25.0	21.4	66.7	42.9
<b>Amikacin</b>	84.6	52.6	27.8	0.0	93.1	62.5	71.4	NT	71.4
<b>Gentamicin</b>	67.5	47.4	20.4	10.2	69.0	31.3	42.9	33.3	57.1
<b>Piperacillin Tazobactam*</b>	13.9	10.5	16.7	NT	NT	37.5	42.9	NT	14.3
<b>Imipenem*</b>	26.5	30.5	13.0	2.0	58.6	50.0	50.0	NT	28.6
<b>Meropenem*</b>	16.5	16.8	13.0	NT	51.7	31.3	28.6	NT	42.9
<b>Colistin*</b>	NT	48.4	87.0	NT	NT	62.5	NT	NT	57.1
<b>Linezolid*</b>	NT	NT	NT	95.9	93.1	NT	NT	88.9	NT
<b>Vancomycin*</b>	NT	NT	NT	77.6	NT	NT	NT	55.6	NT

\* Please read limitation of the study section

NT: Not tested

*Table 2: Antimicrobial sensitivity (in %) towards specific uropathogens*

*E. coli* was the major isolate, which was most sensitive to Amikacin (84.6%) followed by Gentamicin (67.5%), Nitrofurantoin (49.7%) and Ceftriaxone (45.2%) (**Table 2**). Fluoroquinolones are often used as prophylaxis before major urological surgery, after minor urological procedures and for the empirical treatment of simple UTI (before culture sensitivity report is available) in our center. This study reveals that fluoroquinolones has less than 45% sensitivity to *E. coli*. Ciprofloxacin had disappointingly low sensitivity of only 36.7%, the high resistance of which may be attributed to its widespread use.

Overall, the uropathogens were mostly sensitive to Amikacin followed by Chloramphenicol, Gentamicin, Ofloxacin and Ceftriaxone respectively.

### Discussion

This study was done to evaluate the current antibiotic susceptibility pattern to uropathogens causing UTI in our center.

Of total 4937 urine samples processed, positive growth was found in 20.9% which is less than Chhetri et al (21.8%), Acharya et al (24.94%), Kumari et al (25.7%) and Rai et al (28.6%) from Nepal.<sup>2-5</sup> Our low rate of positive growth result may be due to the fact that we routinely send urine cultures in all elective urological cases to rule out UTI before surgery. In this study, UTI was found most commonly in females of age group 21-30 years, may be due to onset of sexual activity at this age group. On the other hand, in males, UTI occurred more as the age advanced which may be due to increase in co-morbidities such as diabetes

mellitus and bladder outlet obstruction due to benign prostatic hyperplasia (**Figure 1**).

*E. coli* was the predominant cause of UTI in our study and constituted 70.9% of positive growths. Other pathogens were found in minority, including *Klebsiella* sp (9.2%), *Pseudomonas* sp (5.2%), *Enterococcus* sp (4.7%), *Staphylococcus* sp (2.8%), *Acinetobacter* sp (1.5%), *Proteus* sp (1.4%) and others (4.7%) (**Table 1**). Similar studies have also found *E. coli* as the predominant pathogen,<sup>2-6</sup> whereas study done in India by Bajaj et al found *Klebsiella* sp as the predominant organism.<sup>7</sup>

The second commonest pathogen isolated was *Klebsiella* sp (9.2%) which was most sensitive to Amikacin (52.6%) followed closely by Colistin (48.4%) and Gentamicin (47.4%). Similarly, *Pseudomonas* sp (5.2%) was by far, most sensitive to Colistin (87%) and all other antibiotics had sensitivity of less than 30% which is very tragic.

Ceftriaxone had disappointing results against all three commonest uropathogens, while was effective against *Proteus* sp (71.4%) and *Streptococcus* sp (66.7%). Fluoroquinolones group of antibiotics showed overall sensitivity of less than 50% with Ciprofloxacin performing poorest of them all. Overall the uropathogens were most resistant to Amoxicillin followed by Ciprofloxacin.

### Limitation of the study

As this study is retrospective in nature, it fails to determine the number of asymptomatic patients with positive urine cultures.

The sensitivity result of antibiotics namely

Cefepime, Piperacillin Tazobactam, Meropenem, Imipenem, Colistin, Linezolid and Vancomycin are under-reported because these are used as second line antibiotics and their sensitivity were tested only when pathogens are found resistant to most of the first line antibiotics, or as per clinician's request.

### **Conclusion**

The study clearly shows Amikacin had the best sensitivity against the uropathogens, and in patients less than 60 years with normal creatinine clearance, Amikacin should be the first choice for empirical treatment of symptomatic UTI in hospital setting, until the culture sensitivity report is available. Ceftriaxone and Ciprofloxacin had very poor efficacy of only 45.2% and 36.7% respectively, and thus cannot be recommended as first choice of antibiotics for treatment of UTI and prophylaxis during urological procedures.

We must change our antibiotic protocols in accordance to the changing trend of antibiotic resistance for effective treatment.

### **Declaration**

The data presented in this study are accurate to the best of our knowledge without any conflict of interest. There is no affiliation, either direct or indirect with any pharmaceutical company.

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