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## Bacterial pathogens and antibiotic resistance patterns in children with urinary tract infection admitted at tertiary hospital in Nepal

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### ABSTRACT

**Introductions:** Urinary tract infection (UTI) is a common bacterial infection affecting children. A prompt recognition and accurate antimicrobial management are vital to prevent kidney damage. This study aims to determine the bacterial pathogens and their patterns of antimicrobial resistance in children presenting with UTI.

**Methods:** This was a cross sectional study done at Patan Hospital, Patan Academy of Health Sciences, from Nov 2012 to Oct 2016. There were 88 children between age group of 1 to 14 years with culture proven UTI. The bacterial pathogens and antibiotic resistance were analysed.

**Results:** Three most common organisms isolated were E. Coli 60 (68%), Klebsiella species 15 (17%) and Proteus 7 (8%). The resistance of E. Coli to ampicillin, ofloxacin, cefotaxime, gentamicin and amikacin were 51 (85%), 49 (82%), 45 (75%), 17 (28%) and 2 (3%) respectively. The resistance to ampicillin was Klebsiella species 13 (87%), Proteus 6 (86%) and Enterococcus 3 (60%).

**Conclusions:** The E. Coli was leading bacterial pathogen causing UTI in children, with ampicillin resistance occurring in more than half of these cases. Amikacin and gentamicin had lower antibiotic resistance and can be used for treatment of UTI in children.

**Keywords:** antibiotics resistance, bacterial pathogens, urinary tract infection, UTI in children

## INTRODUCTIONS

Urinary tract infection (UTI) is an important cause of morbidity and mortality in the first 2 years of life.<sup>1</sup> The reported incidence of UTI is 7% among girls and 2% among boys during the first six years of life.<sup>2</sup> Treating childhood urinary tract infections helps preventing complications, such as urosepsis, urolithiasis, renal abscess, and permanent renal parenchymal damage.<sup>3</sup> Empirical antibiotic prescription is often endorsed even before the culture results are available.<sup>4</sup> On the other hand, antibiotic resistance of urinary tract pathogens is increasing worldwide.<sup>5</sup> The antibiotic resistance have important clinical implications.<sup>6</sup>

Knowledge about etiology, pathogens of UTIs and antimicrobial resistance in specific geographical locations aids clinicians to choose antibiotic for empirical treatment.<sup>7</sup> Our aim is to identify the emergence of drug resistance bacterial pathogens causing UTI in children.

## METHODS

This was a hospital based cross sectional study at Patan Hospital, Patan Academy of Health Sciences. All children between 1 to 14 year of age admitted in children ward with diagnosis of culture proven UTI during 4 years, from Nov 2012 to Oct 2016, were included. Patient charts were retrieved from the hospital record section to review the information on age, sex, clinical presentation and culture sensitivity of uropathogens.

## RESULTS

There were 88 children, 47 (53%) male and 41 (47%) female treated for UTI during the 4 years study period.. The mean age was 3.7 years, 3.9 for boys and 3.3 for girls, Figure 1.

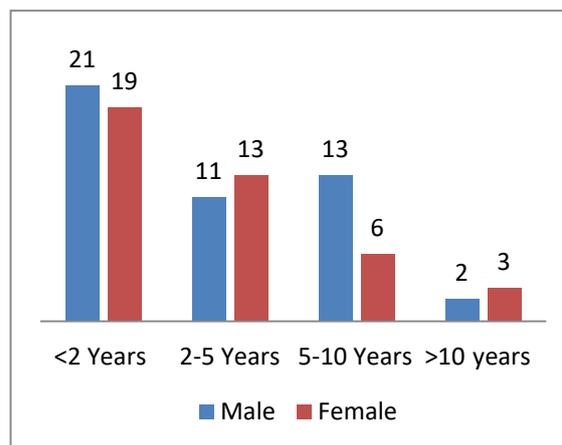


Figure 1. Age, gender of children with UTI (n=88)

Presenting symptoms of UTI were: fever in 84 (95%), vomiting 32 (36%), dysuria 27 (30%), straining at micturation 26 (29.5%) and abdominal pain 17 (19%). Hydronephrosis and vesicoureteric reflux (VUR) were 7 (7.9%) and 5 (5.6%) respectively and 6.5% children were on prophylactic antibiotics on presentation is the *E. coli* were isolated in 68%, Figure 2.

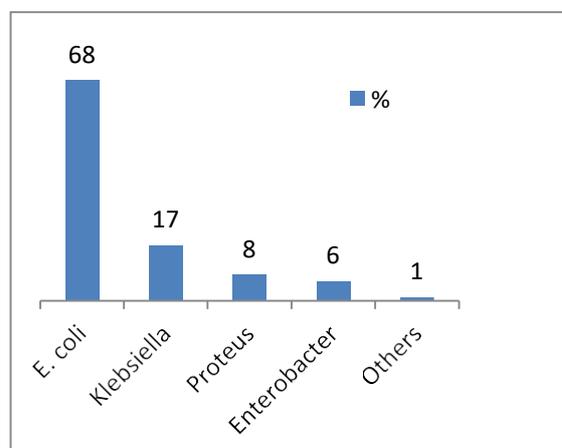


Figure 2. Bacterial isolates in UTI in children (n=88)

The antibiotics resistance of *E. Coli* to ampicillin, ofloxacin, cefotaxime, and amikacin were 85%, 82% 75%, 3% respectively, Table 1.

**Table 1. Antibiotic resistance of bacterial isolates in UTI in children (n=88)**

(n)	Ampicillin (%)	Amikacin (%)	Gentamicin (%)	Cefotaxime (%)	Ofloxacin (%)	Cotrimoxazole (%)
<b>E. coli (60)</b>	51 (85)	2 (3)	17 (28)	45 (75)	49 (82)	46 (77)
<b>Klebsiella (15)</b>	13 (87)	1 (7)	6 (40)	9 (60)	9 (60)	9 (60)
<b>Proteus (7)</b>	6 (86)	0 (0)	2 (29)	3 (43)	4 (57)	4 (57)
<b>Enterococcus (5)</b>	3 (60)	1 (2)	2 (40)	4 (80)	3 (60)	3 (60)
<b>Morgnella Morganii (1)</b>	1 (100%)	0 (0)	1 (100)	1 (100)	1 (100)	1 (100)

## DISCUSSIONS

In our study, more numbers of male child (53%) presented with UTI than female child (47%) contrary to the general observation reported in literature. Kwan et al.<sup>8</sup> reported that female child were affected in 56.3%, Sharifian et al.<sup>9</sup> reported a female preponderance, with a male: female ratio of 1:2. The slight male predominance in our study can be explained by the fact that half of the samples, 40 out of 88, were less than two years of age and infection of the urinary tract before the age of two occurs more frequently in boys than girls.<sup>10</sup>

In the present study, E. Coli was the commonest bacterial uropathogen causing UTI in children; it is consistent with other reported series.<sup>8,9,11,12-14</sup> Out of total 88 samples in our study, E. coli was isolated in 68%, which is inline with other studies reporting presence of E. coli in 57 to 92%.<sup>12,13,15,16,17,18</sup> In our study, Klebsiella (17%) were considerably higher in comparison to other studies reporting in range of 3 to 13%.<sup>12,15</sup> We had Enterococcus species isolated in 5.6% in comparison to 2 to 8% in other series.<sup>9,12</sup> Higher non- E. Coli UTI in our study could be due to previous UTI and urological anomalies, as seen in the children with hydronephrosis and vesicoureteric reflux (VUR) in 7 (7.9%) and 5 (5.6%) respectively. These children often have antibiotic resistant Proteus and Klebsiella strains.<sup>16</sup>

Our findings of uropathogens, widely resistant to ampicillin, is consistent with other studies.<sup>11,13,15,17</sup> Thus ampicillin should not be a preferred choice of first line empirical antibiotic.

In one study, E. Coli was found to be highly sensitive to ceftriaxone and cefotaxime with sensitivity rate of 97.8% and 95.2% respectively.<sup>8</sup> We had E. coli, Klebsiella species and Proteus least resistant to amikacin, gentamicin and ceftriaxone compared to ampicillin, cotrimoxazole and ofloxacin, Table 1. This finding supports the use of amikacin, gentamicin and ceftriaxone as the first line antibiotics for UTI in children. Sakran et al.<sup>13</sup> reports gentamicin is adequate in both, first and recurrent UTI. They suggests that infants and critically ill patients of all ages with community acquired UTI suspected of pyelonephritis or urosepsis should be treated with parenteral third-generation cephalosporins or aminoglycosides in combination with a beta-lactam antibiotics.<sup>18</sup>

This is a hospital based tertiary care referral centre observation and may not adequately reflect the overall antibiotic susceptibility trends across the country. A multi-centre prospective study is needed in future. The inclusion of complicated UTI due to underlying urogenital anomalies in present study may further complicate the findings.

## CONCLUSIONS

The E. Coli was leading bacterial pathogen in children presenting with UTI. Ampicillin and fluoroquinolones had high resistance. Amikacin and gentamicin had lower antibiotic resistance and can be used in treatment of UTI in children.

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