



# Bacteriological Profile and Antibiotic Resistance Pattern in Children with Urinary Tract Infection in a Tertiary Care Hospital

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## Key words:

Urinary tract infection, uropathogen, Antimicrobial resistance.

## Abstract:

**Introduction:** Urinary tract infection (UTI) is one of the most common bacterial infections seen in children. The knowledge of bacterial causes of UTIs and their antimicrobial resistance patterns may help clinicians in choosing the appropriate antimicrobials.

**Objectives:** The present study was designed to find out the bacteriological profile of urinary tract infection and their antibiotic resistance pattern in children.

**Methodology:** A cross sectional study was done in the department of Microbiology, Sir Salimullah Medical College from January to December 2019. Midstream urine samples were collected from clinically suspected cases of UTI in the age group of 0 to 18 years from various indoor and outdoor patients of Mitford hospital for this study.

**Results:** Out of 2763 cases, 363 were culture positives, where females were 202(55.65%) with highest number of cases within the age group of 0 to 4 years (63.36%). Most common isolate identified was *Escherichia coli*, followed by *Pseudomonas*, *Proteus*, *Morganella* and only Gram positive bacteria was *S. aureus*. Organisms show highest resistance to Amoxiclav, Cefixime, Cotrimoxazole, Ciprofloxacin and highest sensitivity to Amikacin.

**Conclusion:** This study revealed that UTI was more common in female & under five children. *Escherichia coli* were the commonest isolated organism and all isolates show high resistance to common antimicrobial agents.

## Introduction:

Urinary tract infection (UTI) is one of the commonest cause of febrile illness in pediatric population with a worldwide prevalence of 2–20%.<sup>1</sup> The incidence of UTI is 1%-2% in boys and 3%-7% in girls in the US.<sup>2</sup> Recurrent UTI may lead to severe complications like renal scarring, hypertension, renal failure and reflux nephropathy in pediatric age group.<sup>3,4</sup> Therefore, early diagnosis of UTI and appropriate antimicrobial

treatment will help in minimizing complications like renal scarring and kidney damage. The etiologic agents and their antimicrobial resistance pattern has been continuously changing over the years, both in community and in hospitals.<sup>5</sup> Among the micro-organisms responsible for UTI in pediatric age group, Gram-negative bacilli are the common organisms grown in urine culture.<sup>6,7</sup> Most of UTI in children are caused by *Escherichia coli*, followed by *Proteus spp.*, *Enterobacter spp* and

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*Klebsiella spp.*<sup>8</sup> UTIs are being treated on an empirical basis, which has led to antibiotic resistance.<sup>9,10</sup> Therefore, treatment should be targeted and based on the available local data, regarding the sensitivity of the organisms.<sup>11</sup> The timely diagnosis and treatment of the microorganisms involved in complicated UTIs can help in preventing permanent renal damage.<sup>12,13</sup> In the underdeveloped and developing countries, due to inappropriate use, antibiotic resistance is increasing and treatment of urinary tract infection is becoming more difficult. Therefore, the objectives of this study were to investigate the common bacterial pathogen causing UTI and to identify the status of their antibiotic susceptibility in those children in a tertiary care hospital.

### Materials and method:

This cross sectional study was done in the department of Microbiology, Sir Salimullah Medical College from January 2019 to December 2019. Urine samples were collected from various indoor and outdoor patient, in the age group of 0 to 18 years. Total 2763 midstream or catheterized urine samples were collected in a sterile test tube by standard procedure. For culture, urine samples were inoculated in 5% sheep blood agar, Mac Conkey agar and CLED agar media using calibrated loop following standard bacteriological method and incubated at 37<sup>0</sup> C for 24 hours. After the incubation period, plate was examined for pathogens. Culture colony of 10 CFU/ml were considered as significant. Identification was done by studying colony character and biochemical test.<sup>14</sup> Antimicrobial susceptibility was done by modified Kirby bauer's disk diffusion method following the CLSI guidelines, 2018.<sup>15</sup> Inoculum were inoculated on Muller- Hinton agar media and incubated at 37<sup>0</sup> C for 24 hours. Antimicrobial agents were used for the susceptibility of Amoxiclav, Amikacin, Cefuroxime, Cefotaxime, Ceftriaxone, Ciprofloxacin, Colistin, Gentamicin, Imipenem, Meropenem, Nalidixic acid, Nitrofurantoin, Erythromycin and Vancomycin which were obtained from oxoid Ltd.

### Results:

In this study, Out of 2763 urine samples in the age group 0 to 18 years, 363 (13.14 %) were culture positive. Among them, 161(44.35%) were male and 202 (55.65%) were female. The highest prevalence of UTI was found in the age group of 0 to 4 years. (63.36%) [Table-I].

**Table I.** Age distribution of culture positive cases (n = 363)

Age in years	Culture positive cases (n %)
0 to 4years	230 (63.36%)
5 to 10 years	85 (23.42 %)
11 to 14 years	30 (8.26%)
15 to 18 years	18 (4.96%)
Total	363 (100%)

Among the 363 culture positive cases, most predominant organism was *Escherisia coli*, followed by *Pseudomonas spp*, *Proteus spp*, *Morganella spp*, *Providentia spp*, *Citrobacter spp*, *Enterobacter spp*, *S. aureus*, *Klebsiella spp*, and *Acinatobacter spp*. (Table II)

**Table II.** Organisms isolated from urine culture (n= 363)

Isolated bacteria	No. of isolates n (%)
<i>E. coli</i>	283(77.96%)
<i>Pseudomonas spp.</i>	25(6.89%)
<i>Proteus spp.</i>	16(4.40%)
<i>Morganella spp.</i>	15(4.13%)
<i>Providentia spp.</i>	7(1.93%)
<i>Citrobacter spp.</i>	7(1.93%)
<i>Enterobacter spp.</i>	5(1.38%)
<i>S. aureus</i>	3(0.82%)
<i>Klebsiella spp.</i>	1(0.27%)
<i>Acinetobacter spp.</i>	1(0.27%)
Total	363 (100%)

Antimicrobial resistance pattern of uropathogens had been shown in Table iii. *Escherisia coli* showed high frequency of resistance to Amoxiclav (67.84%), moderately high resistance to Cefixime (62.89 %) and low resistance to Amikacin (16.60%). *Proteus* showed highest resistance to Amoxiclav (50.00%), Cotrimoxazole (43.75%) and low resistance to Aztreonum (6.25%), Amikacin (12.50%), and Ceftriaxone (12.50%). *Morganella* showed highest resistance to Ciprofloxacin (86.67%), Amoxiclav (73.33%) and low resistance to Amikacin (6.67%), Livofloxacin (20%) and Nalidixic acid (20%)

**Table III.** Antimicrobial resistance pattern of uropathogens (Gram negative rods)

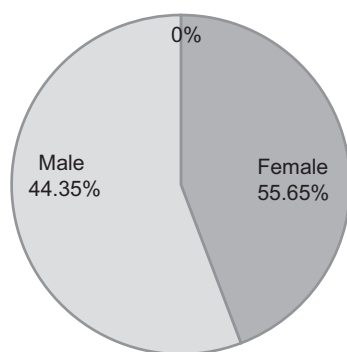
Antimicrobial agent	<i>E.coli</i> (n= 283)	<i>Proteus</i> (n= 16)	<i>Morganella</i> (n= 15)
Amoxiclav	192 (67.84%)	8 (50.00%)	11(73.33 %)
Amikacin	47 (16.60%)	2 (12.50%)	1(6.67 %)
Aztreonum	93 (32.86%)	1 (6.25%)	6 (40 %)
Ceftriaxone	142 (50.17%)	2 (12.50%)	8 (53.33 %)
Cefixime	178 (62.89%)	6 (37.50%)	10 (66.67 %)
Ciprofloxacin	162 (57.24%)	5 (31.25%)	13 (86.67 %)
Cotrimoxazole	150 (53.00%)	7 (43.75%)	10 (66.67 %)
Gentamycin	84 (29.68%)	4 (25.00%)	6 (40 %)
Levofloxacin	111 (39.22%)	5 (31.25%)	3 (20 %)
Nalidaxiac Acid	103 (36.40%)	6 (37.50%)	3 (20 %)

*Pseudomonas* showed high resistance to Amoxiclav (84%), Cefixime (68%), Ceftriaxone (68%) and low resistance to Imepenem (12%), Meropenem (20%) and Colistin (20%). [Table IV]

**Table IV.** Antimicrobial resistance pattern of *Pseudomonas spp.* (n= 25)

Antimicrobial agent	No (%) of resistance
	<i>Pseudomonas spp</i>
Ciprofloxacin	11(44%)
Cefixime	17 (68%)
Cotrimoxazole	14 (56%)
Ceftriaxone	17 (68%)
Amikacin	9 (36%)
Gentamycin	10 (40%)
*Imipenem	3 (12%)
*Meropenem	5 (20%)
Amoxiclav	21 (84%)
Nalidaxiac Acid	12 (48%)
Colistin	5 (20%)

\*[Imipenem and Meropenem antibiotic sensitivity was done in 11 sample].

**Fig.-1:** Sex distribution of culture positive cases in urine culture

### Discussion:

Urinary tract infections are one of the commonly seen bacterial infections in pediatric age. They are more common in female children than male which could be due to short urethra in females and its close proximity to anus, leading to more chances of contamination in perianal area.<sup>16</sup> In our study, out of 363 culture positive cases, 202 (55.65%) were female and 161 (44.35%) were male and the highest prevalence of UTI was in the age group of 0 to 4 years (63.36%). Which corresponds to the study of Jitendranath *et al.* Gram-negative bacteria were the most frequently isolated microbial agents in urine culture in our study. Among them, most predominant organism was *Escherisia coli* (77.96%) followed by *Pseudomonas* (6.89%), *Proteus* (4.40%), *Morganella* (4.13%), *Providentia* (1.93%), *Citrobacter* (1.93%), *Enterobacter* (1.38%), *Klebsiella* (0.27%) and *Acinatobacter* (0.27%). Only detected Gram positive organism was *S. aureus* (0.82%). These findings were almost similar to the study done by Ganie NA *et al* who showed that most frequently isolated microbial agents in urine culture were Gram- negative bacteria with *E. coli* isolated in 74.3% of cases. The various studies performed in most parts of the world have demonstrated *E. coli* as the main uropathogen in UTI in children.<sup>17-21</sup> In our study, *Escherisia coli* showed high resistance to Amoxiclav (67.84%), moderately high resistance to Cefixime (62.89 %), Ciprofloxacin (57.24%) and low resistance to Amikacin (16.60 %). Ganie NA *et al* and Jitendranath *et al* showed resistance of *E.coli* against Amoxiclav was 71.8% and 74% in their studies. In our study, *E. coli* showed highest sensitivity to Amikacin (83.40%), Gentamycin

(70.32%). and levofloxacin (60.78%). Jitendranath *et al* showed 74% sensitivity of *E. coli* to Amikacin. In our study, *Proteus* showed highest resistance to Amoxiclav (50%) and Cotrimoxazole (43.75%) and highest sensitivity to Aztreonam (93.75%), Amikacin (87.50%) and Ceftriaxone (87.50%). Ganie NA *et al* showed almost similar sensitivity pattern of *Proteus* in their study. In our study, *Morganella* showed highest resistance to Ciprofloxacin (86.67%) and Amoxiclav (73.33%) and highest sensitivity to Amikacin (93.33%). *Pseudomonas* showed highest resistance to Amoxiclav (84%), Cefixime (68%), Ceftriaxone (68%) and highest sensitivity to Imipenem (88%), Meropenem (80%) and Colistin (80%). Badhan R. *et al* found that the most active antibiotics against all the Gram-negative isolates were Amikacin, Nitrofurantoin and Cefotaxime. Mellisa L *et al* found that, children with history of UTI were 100% sensitive to Amikacin and 98% sensitive to Gentamycin in their study. The reason for this higher resistance rates might be due to long-term use of these antibiotics in general medical practice, alteration in resistance rates with time and common people buy them without physician's prescription. Thus, suggesting that, these antibiotics should not be used for the empirical treatment of UTI in our country.

### Conclusion :

Urinary tract infections are one of common infections in pediatric age group with Gram negative bacilli predominating the infections. Among the Gram-negative bacilli, *E. coli* are the commonest causes of UTI in pediatric patients (77.96 %). Girls and children in the age group of 0-4 years were more commonly affected. *Escherisia coli* showed high frequency of resistance to Amoxiclav, Cefixime, Ciprofloxacin and Cotrimoxazole. Other bacteria shows increasing resistance to Amoxiclav. Most of the bacteria shows higher sensitivity to Amikacin. The increase in rate of resistance is due to over-the-counter use of some of these antibiotics. So, regular surveillance should be carried out to determine the local prevalence of organisms and antimicrobial susceptibilities in order to guide the proper management of children.

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