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Clinical and bacteriological profile of urinary tract infection in children at a tertiary care hospital

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ABSTRACT

Background: Urinary tract infection (UTI) is common in children and is an important cause of morbidity. UTI at young age can lead to renal injury and scarring, and ultimately lead to end stage renal disease in adulthood. Aim of the study The objectives of this study were to study the clinical and bacteriological profile of UTI in children.

Methods: This prospective study was done in Sher-E-Bangla medical college hospital, Barishal from January 2018 to July 2019. A urine sample was included in our dataset if it demonstrated pure growth of a single organism and accompanying antimicrobial susceptibility and subject demographic data were available.

Result: UTI was more common in female (70.0%) than in male (33.0%). Half were in the age group 1-5 years. Fever was the most common presentation (64.0%) followed by abdominal pain (42.0%), dysuria /increased frequency (34%), decreased appetite (28%). *Escherichia coli* was the most common (64%) bacterial isolate followed by *Klebsiella* sp. (20.0%) and *Proteus* sp. (14.0%). *E. coli* was highly sensitive to ofloxacin, cefotaxime and amikacin (94.0%). *Klebsiella* was 100% sensitive to ciprofloxacin and amikacin. Greater degree of resistance was seen to ampicillin, cotrimoxazole and nalidixic acid.

Conclusions: Though various microorganisms are responsible for UTI in children, *E. coli* is the most common causative agent. Antimicrobial resistance has already emerged against many antibiotics, making empiric treatment of these infections challenging.

Keywords: UTI, Bacterial isolates, Antibiotic susceptibility

INTRODUCTION

Urinary tract infection (UTI) is one of the most common bacterial infections seen in children.¹ It is estimated that at least 1% of boys and 3% of girls develop UTI during first ten years of life. 1 UTI is mainly due to the ascending infection from the urethra. The diagnosis of UTI in young children is important as it may be the marker of urinary tract abnormalities. Early diagnosis is important to preserve renal function of the growing kidney.² *E. coli*, a gram-negative bacterium belonging to

family *Enterobacteriaceae* is the main causative agent of UTI but other *Enterobacteriaceae* like *Klebsiella* pneumoniae, *Proteus mirabilis* and others as well as *Staphylococcus saprophyticus* are also commonly involved.^{3,4} With the introduction of antimicrobial therapy, management of UTI s has been improved; however antimicrobial resistance is a growing problem and a cause of major concern in many countries.⁵⁻⁷ Over the past several decades, resistance to most of the commonly prescribed UTI antibiotics-ampicillin, cotrimoxazole, nitrofurantoin, and fluoroquinolones has

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emerged. UTI is one of the most important risk factors in development of renal insufficiency or end stage renal disease. This study was undertaken to know the clinical profile of UTI in children as well as to find out the frequency of different types of microorganisms along with their antimicrobial susceptibility pattern causing UTI in paediatric patient in Sher-E-Bangla medical college hospital, Barishal, Bangladesh.

METHODS

This was a prospective study done in Sher-E-Bangla medical college hospital, Barishal from January 2018 to July 2019. Children aged 2 months to 12 years attending pediatric inpatient and outpatient department with symptoms like fever, abdominal pain, dysuria, smelly urine was subjected for urine routine and microscopic examination. Verbal consent was taken from the parents or guardians before enrolling them in the study. Those with WBC more than 5 per high power field were then sent for urine culture and sensitivity. Specimen was collected by clean catch mid-stream technique after cleaning the perineal area and sent to the clinical laboratory. Samples with mixed growth were excluded from the study. History and clinical examination and findings of culture sensitivity were recorded in a preformed chart and then analyzed. Statistical analysis was performed using the statistical package for social sciences (SPSS, Chicago, IL) version 22 software for Windows. The results of the study were presented in Tables, Figures and diagrams.

RESULTS

Out of 289 samples fifty were culture positive and were included in the study. Out of the 50 culture positive cases, 15 (30.0%) were male and 35 (70.0%) were female making male to female ratio of 1:2.3 (Figure 1). Age

wise, 24 (48.0%) cases were in the age group 1 to 5 years (Table 1). Majority of these patients had fever (64.0%). Other clinical features were abdominal pain 21 (42%), dysuria /increased frequency 17 (34%), decreased appetite 14 (28%) (Table 2). Out of the 50 cases, E. coli was isolated in 32 (64.0%) followed by Klebsiella spp in 10 (20.0%), Proteus spp in 7 (14.0%) and Pseudomonas spp in 1 (2.0%) (Figure 2). Most of the organisms were sensitive to cefotaxime 20 (94.11%), highly nitrofurantoin 19 (61.29%) and amikacin 32 (86.4%). Sensitivity to quinolones varied according to the organism (Table 3). E. coli was sensitive to ofloxacin, cefotaxime and amikacin in 95.2%, 94.11% and 94.7%, respectively. E. coli was resistant to ampicillin in 12 (85.71%), cotrimoxazole in 13 (72.2%) and nalidixic acid in 14 (60.9%) (Table 4). Klebsiella spp was 100% sensitive to ciprofloxacin and amikacin where as 100 % resistant to ampicillin. Proteus sps was 100% sensitive to ofloxacin, norfloxacin, nitrofurantoin and amikacin where as it was 100% resistant to nalidixic acid.

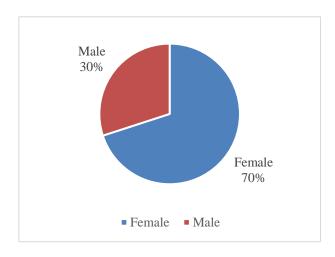


Figure 1: Gender distribution of UTI.

Table 1: Age and sex distribution of UTI.

Gender	Age (Years)							
	2-12 months		1-5		6-10		>10	
	N	%	N	%	N	%	N	%
Male	4	50	10	41.7	1	9.09	0	0
Female	4	50	14	58.3	10	90.9	7	100
Total	8	16	24	48	11	22	7	14

Table 2: Clinical features of UTI in children.

Clinical features	Numbers	Percentage (%)
Fever	32	64
Abdominal pain	21	42
Dysuria/increased frequency	17	34
Decreased appetite	14	28
Nausea/vomiting	13	26
Smelly urine	9	18
Constipation	7	14
Irritability	3	6

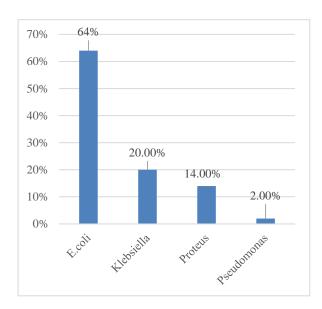


Figure 2: Bacterial isolates in UTI.

Table 3: Antimicrobial susceptibility pattern of microorganisms, (n=50).

Antibiotic	No. of isolates tested	No. of sensitive isolates		No. of resistant isolates	
	N	N	%	N	%
Nitrofurantoin	46	36	78.2	10	21.7
Nalidixic acid	38	10	26.31	28	73.7
Amikacin	37	32	86.4	5	13.5
Ampicillin	22	3	13.6	19	86.4
Ciprofloxacin	35	25	71.42	10	28.5
Ofloxacin	39	24	61.5	15	38.5
Norfloxacin	31	19	61.29	12	38.7
Cefotaxime	25	20	94.11	5	20
Cotrimoxazole	43	11	25.58	32	74.4

Table 4: Antibiotic susceptibility pattern of *E. coli*, (n=27).

Antibiotic	No. of isolates tested	sens	No. of sensitive isolates		No. of resistant isolates	
	N	N	%	N	%	
Nitrofurantoin	18	15	83.3	3	16.6	
Nalidixic acid	23	9	39.1	14	60.9	
Amikacin	19	18	94.7	1	5.2	
Ampicillin	14	2	14.2	12	85.7	
Ciprofloxacin	22	19	86.4	3	13.6	
Ofloxacin	21	20	95.2	1	4.7	
Norfloxacin	19	14	73.6	5	26.3	
Cefotaxime	17	16	94.1	1	5.88	
Cotrimoxazole	18	5	27.7	13	72.2	

DISCUSSION

The urinary culture positive rate was 17.3% in this study which was similar to rates of 19.3% and 22.2% in

previous studies. 10,11 Though 82.6% of suspected cases were culture negative, this study did not focus for the causes (e.g., dysfunctional voiding, glomerulonephritis, Kawasaki diseases, viral cystitis, vulvovaginitis, or foreign body etc.,) as it was beyond the scope of objectives of this study. In our study, UTI was more common in female children. Male: female ratio was 1:2.3. Other such studies also showed male: female ratio of 1:1.9 and 1:2.12-14 This can be easily attributed to short urethra in female. Fever was present in two third of the patients and abdominal pain in almost half of them. Fever was one of the major presentations in other studies too. 14-¹⁶ The varied clinical features in their study could be due to inclusion of both inpatient and outpatient and also because of large sample size. E. coli was the most common organism isolated (64%) in our study. This was in accordance with other studies in which E. coli was isolated from 61.0% to 72.8%. 12,15,17-20 However, Yüksel et al and Chakupurakal et al reported a very high percentage (87.0%) and (92.0%) of E. coli in their study. 21,22 Klebsiella was isolated in 20.0% cases in our study. A study done in Aligarh, India by Akram et al showed similar data (22.0%). 12 Similar finding was also noted by different authors in studies done in various parts of the world where Klebsiella was isolated in 23.1%, 10 15.7% and 16.6%. 16,19 Proteus was the third isolate in our study occupying 14.0 % of the total isolate. Different studies have shown the growth of Proteus in urine from 5.8% to 12.4%. 13,18,19 Pseudomonas was isolated in only 1 case (2%) in our study. In our study, most of the organisms isolated were highly sensitive nitrofurantoin, amikacin, ofloxacin and cefotaxime. E. coli was sensitive to ofloxacin, cefotaxime and amikacin in 95.2%, 94.11% and 94.7%, respectively. E. coli was resistant to ampicillin in 85.71 %, cotrimoxazole in 72.2% and nalidixic acid in 60.9%. A study done in Turkey also reported highest sensitivity of nitrofurantoin (97.8%) against E. coli.²¹ Antibiotic susceptibility pattern of our study matched with other study where E. coli was more than 80% sensitive to amikacin, cefotaxime and nitrofurantoin.¹⁵ Other studies done in Greece and United Kingdom also reported 95.6% and 93.0 % sensitivity of E. coli to nitrofurantoin respectively. 17,22 In our study, E. coli was resistant to ampicillin (91.6%), cotrimoxazole (66.6%) and nalidixic acid (63.6%). Various studies have also shown resistance of this organism to ampicillin. In one study done in Poland, E. coli was resistant to ampicillin in 56.8% and to cotrimoxazole in 23.1%.24 In our study, E. coli was resistant to nalidixic acid in 60.9 %. In a former study done in the same institution in 2001, E. coli was sensitive to ciprofloxacin in 95.2% followed by nalidixic acid (60.0%). This may indicate the emerging resistance of organisms to common antibiotics. Klebsiella showed 100% sensitivity to ciprofloxacin and amikacin and 83.3% sensitive to ofloxacin and nitrofurantoin in our study. Klebsiella was 100% resistant to ampicillin. This finding was comparable to the study done in one of the tertiary centers of eastern Nepal where Klebsiella and Proteus were 96.0% and 92.1% sensitive to amikacin.²⁶ In our study, *Proteus* was 100% sensitive

to ofloxacin, norfloxacin, nitrofurantoin and amikacin where as 100% resistant to nalidixic acid. Sensitivity of Proteus to these antibiotics was much lower in one study where Proteus was sensitive to nitrofurantoin and norfloxacin in 33.1% and 25.0% respectively.²⁶ Only one case of Pseudomonas (2.0%) was isolated in our study and it was sensitive to amikacin and nitrofurantoin whereas resistant to ampicillin, nalidixic acid and cefotaxime. This was comparable to other studies where Pseudomonas was isolated in 2.1% and 3.5% respectively. 14,20 Antibiotic sensitivity and resistance pattern vary over time and places. The study showed a high resistance to antimicrobials like ampicillin, cotrimoxazole and nalidixic acid and a possible reason could be these antibiotics were in general use for a long period. Among currently used antimicrobials empirically, aminoglycoside had relatively better sensitivity pattern to the bacterial isolates especially E. coli. An increasing resistance to third generation cephalosporin and fluoroquinolones is worrisome.

Limitations

A complete antibiotic sensitivity testing was not possible in all isolates which is a major limitation of this study. However, it still provides a glimpse of emerging antimicrobial resistance pattern.

CONCLUSION

As the UTI in children usually presents with non-specific features, it demands the urine test for the diagnosis. *E. coli* being the commonest bacteria and exhibiting the changing drug resistance pattern, it is advisable to perform the antibiotic susceptibility testing as well. Though, our data is small, it suggests providing treatment only after the proper microbiological investigations. However, norfloxacin, ofloxacin and amikacin can be started as empirical therapy after sending urine culture and sensitivity. Finally, this type of study should be repeated periodically to assess the pattern of microorganisms causing UTI and them antimicrobial susceptibility which will guide in choosing antibiotics for the empiric treatment.

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Institutional Ethics Committee

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