ORIGINAL ARTICLE

FREQUENCY AND ANTIBIOTIC SENSITIVITY OF MOST COMMON ORGANISMS CAUSING URINARY TRACT INFECTIONS IN CHILDREN

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Background: Urinary tract infections (UTIs) are common and significant clinical condition in children. This study was conducted to determine the frequency of most common organisms causing urinary tract infections (UTI) and their sensitivity to various antibiotics in children admitted in a tertiary care health facility. **Methods:** In this retrospective study, 225 patients of both genders, aged 1–15 years and diagnosed as a case of UTI of any duration were included. Relevant data was collected from hospital electronic patients' record section. The data was analysed using SPSS-16. **Results:** There were 38% male and 62% female patients in the study. Mean age of the patients was 6±1.26 years. Mean duration of symptoms was 3±2.21 days. *Escherichia coli* was found in 45%, *Klebsiella pneumoniae* in 20%, *Staphylococcus aureus* in 18%, *Pseudomonas aeruginosa* in 11%, *Proteus mirabilis* in 3%, and *Enterococcus* in 3% of patients. All organisms were sensitive to most of the commonly used antimicrobial agents. **Conclusion:** The most common organism causing UTIs in our setup was *Escherichia coli*, followed by *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus mirabilis*, and these pathogens were sensitive to Ceftriaxone, Amikacin, Tetracycline, Ciprofloxacin, Augmentin, Ceftazidime and Nitrofurantoin. Resistance to these antibioticd was low in our setup.

Keywords: Micro-organisms, Children, Antibiotics, Urinary tract infection, Sensitivity, Resistance

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INTRODUCTION

Urinary tract infection (UTI) is a combination of upper (infection of kidneys known as pyelonephritis) and lowers (infection of urinary bladder known as cystitis) urinary tract.[1] Urinary tract infection is defined as the growth of a single pathogen of $\geq 10^5$ colony forming units/ml of clean catch midstream urine.[2] UTIs are among the very prevalent infections which are diagnosed in infants and children presenting in outpatient department or admitted in the ward.[3] Throughout the world nearly 150 million cases of UTIs are diagnosed each year[4] and it causes about 6 billion US dollar cost yearly to the world economy.[5]

UTIs are a specially common infections in infant and children throughout world[6,7] but its frequency, sign and symptoms and the etiologic agents can varies depending upon the age and sex of the patients.[8] Urinary tract infections are usually asymptomatic. In young infants, symptoms include fever, vomiting, lethargy, nausea, decreased feeding and decreased urinary output.[9] in neonates the sign and symptoms of UTIs can be very non-specific as compared to other age groups.[10] The collective incidence of UTI shown by studies in children of up to 6 years of age is 3–7% in girls while its 1–2% in boys.[9]

According to the previous studies the commonest pathogen is *Escherichia coli* (*E. coli*), which is responsible for approximately 85% of UTIs.[11] According to one study, *E. coli* was the most common pathogen responsible for urinary tract infections (74.6%), followed by *Klebsiella spp*. (11.7%)[12], *Staphylococcus saprophyticus* (6.4%), and *Proteus mirabilis* (7.02%).[13] A retrospective analysis showed Citrobacter isolates were found to be third most common organism causing UTI.[14]

E. coli is the most common pathogens causing UTIs throughout childhood from day 1 to 16 years age group followed by *Klebsiella* and *Pseudomonas aeroginosa*.[12] Results of a study on antimicrobial susceptibility analysis of *E. coli*, to commonly used antibiotics as the most common cause of UTI, showed amikacin sensitivity in 97.8% of cases, gentamicin in 97%, ciprofloxacin 94%, nitrofurantoin 87.1%, nalidixic acid 93.7%, trimethoprim-sulfamethoxazole 48.2%, cephalexin 76%, and ampicillin in 6.9% cases.[13] However, there are several recent studies which suggest that there is an emerging pattern of resistance toward the empirical antibiotics[15,16] particularly to ampicillin[17,18].

This study aimed at finding out bacterial etiologic agents responsible for urinary tract infection and assessing their pattern of *in vitro* susceptibility to most commonly used antimicrobial agents.

MATERIAL AND METHODS

This was a retrospective study conducted at Paediatric Department of King Abdullah Teaching Hospital

Mansehra from 15 June to 15 August 2019 after approval from Hospital Ethical Committee. Sample size with WHO sample size calculator came out to be 225 patients. Non-probability convenience sampling method was used for sample collection. Patients from both genders with age range 1–15 years, and diagnosed cases of urinary tract infection of any duration were included in this study. Patients aged more than 15 years, or having renal stones on ultrasonography were excluded. Relevant data was collected from hospital electronic patients' record section. The results were recorded on a proforma.

Data was analysed on SPSS-16. Mean±SD was calculated for age, duration, and type of urinary tract infection. Frequency and percentage were computed for qualitative variables like gender, identified organisms and antibiotics sensitivity.

RESULTS

In 225 patients 79 (35%) children were aged 1–5 years, 108 (48%) were 6–10 years, and 38 (17%) children were 11–15 years old. Mean age was 6±1.26 years. Out of 225 children, 85 (38%) were male and 140 (62%) were female. Duration of symptoms among 255 patients showed that 72 (32%) children had symptoms for 2 day, 90 (40%) had symptoms for 3 days and 63 (28%) children had symptoms for 4 days. Mean duration of symptoms was 3±2.21 days. Percentages of common microorganisms causing UTI in children is given in Table-1. The antibiotic sensitivity of these common uropathogens is shown in Table-2.

Table-1: Frequencies and percentages of common bacteria causing UTIs

Common Bacteria	Frequency	Percentage
Escherichia coli	101	45
Klebsiella pneumoniae	45	20
Staphylococcus epidermidis	40	18
Pseudomonas aeruginosa	25	11
Proteus mirabilis	7	3
Enterococcus	7	3
Total	225	100

Table-2: Antibiotic sensitivity of isolated pathogens causing UTIs [n (%)]

Organism Identified	Sensitivity/ Resistance	Antibiotics						
		Ceftriaxone	Amikacin	Tetracycline	Ciprofloxacin	Augmentin	Ceftazidime	Nitrofurantoin
E. coli	**S**	91 (90)	86 (85.1)	89 (88.1)	83 (82.1)	89 (88.1)	84 (83.1)	85 (84.1)
(n=101)	**R**	10 (9.9)	15 (14.8)	12 (11.8)	18 (17.8)	12 (11.8)	17 (16.8)	16 (15.8)
Staphylococcus	**S**	33 (82.5))	32 (80)	33 (82.5)	34 (85)	31 (77.5)	23 (57.5)	34 (85)
(n=40)	**R**	7 (17.5)	8 (20)	7 (17.5)	6 (15)	9 (22.5)	7 (17.5)	6 (15)
Pseudomonas	**S**	20 (80)	21 (84)	20 (8)	22 (88)	23 (92)	22 (88)	21 (84)
(n=25)	**R**	5 (20)	4 (16)	5 (20)	3 (12)	2 (8)	3 (12)	4 (16)
Klebsiella	**S**	40 (89)	41 (91)	40 (89)	39 (87)	41 (91)	40 (89)	41 (91)
(n=45)	**R**	5 (11)	4 (9)	5 (11)	6 (13)	4 (9)	5 (11)	4 (9)
Proteus	**S**	5 (71)	5 (71)	5 (71)	4 (57)	5 (71)	6 (86)	4 (57)
(n=7)	**R**	2 (28)	2 (28)	2 (28)	3 (42)	2 (28)	1 (14)	3 (42)
Enterococcus	**S**	5 (71)	5 (71)	5 (71)	4 (57)	5 (71)	6 (86)	4 (57)
(n=7)	**R**	2 (28)	2 (28)	2 (28)	3 (43)	2 (28)	1 (14)	3 (43)

DISCUSSION

In children, UTIs are a significant cause of morbidity and mortality. UTI is a combination of upper (infection of kidneys known as pyelonephritis) and lower (infection of urinary bladder known as cystitis) urinary tract.[1] Urinary tract infection is amongst the most common bacterial infection of childhood. Urinary tract infections are usually asymptomatic. Normally UTIs occur at a relatively higher frequency in girls than in boy. The estimated incidence of UTI in children by 6 years of age is 3–7% in girls and 1–2% in boys.[9]

In a study in Iran, *E. coli* was shown to be the most common cause of UTIs while *Klebsiella*, was the second most common cause which goes in agreement with our study. The reason behind *E Coli* being the commonest organism causing UTI in children may be due to faecal contamination in children which leads to *E Coli* UTI.[19] In a study by Pouladfar *et al*, *E. coli* was the most (51.5%) commonly reported uropathogens causing UTI followed by *Klebsiella* (16.8%) and *Enterococcus spp*. (9.9%).[20]

In a study in Nepal, *E. coli* was stated to be the commonest of uropathogens (53%) causing UTIs in children, while other bacteria were *Enterococcus faecalis* (22%), *Klebsiella pneumoniae* (7%) and *Staphylococcus aureus* (7%).[21] In this same study *E. coli* was extremely resistant to ampicillin, ceftriaxone and ofloxacin. Amikacin and nitrofurantoin were the maximally effective drugs for gram-negative rods while linezolid and vancomycin were active against gram-positive cocci.[21]

In a Malaysian study[22], *E. coli* was the leading (41.6%) pathogen, followed by *Klebsiella spp*. (21.2%), and *Enterococcus spp*. (11.0%). In that study *E. coli* was extremely resistant to ampicillin but sensitive to cefuroxime and gentamicin. *Klebsiella spp*. and *Enterococcus spp*. were also resistant to ampicillin. The difference between the results of this study and our study may be due to difference in ages of study populations or ethnic differences.

In a study by Sidra tul Muntaha *et al*[23], *E. coli* was the most common pathogen (72.26%) while *Klebsiella pneumoniae* (14.84%) was the second most common organism followed by *Staphylococcus saprophyticus* (10.32%); in 2.58% cases others pathogens were detected. All these uropathogens were sensitive to amoxicillin-clavulanic acid and trimethoprim-sulfamethoxazole. Mirsoleymani *et al*[24] in Iran revealed a high *E. coli* resistance rate to antibiotics which is contrary to our study.[24]

CONCLUSION

The most common organism causing UTIs in our setup was *Escherichia coli*, followed by *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Proteus mirabilis*. These pathogens were mostly sensitive to ceftriaxone, amikacin, tetracycline, ciprofloxacin, augmentin, ceftazidime and nitrofurantoin.

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