

Bacteriological Spectrum and Sensitivity Pattern in Culture Proven Urinary Tract Infection in Children

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Abstract

Background: To determine the different types of organisms causing urinary tract infections in children and their sensitivity to antibiotics.

Methods: This cross sectional study was conducted at Children Hospital, PIMS Islamabad and consisted of 117 patients of either gender between age of 03 months to 12 years.

Results: Mean age of children enrolled in our study was 4.4 (\pm 2.6) years. Out of 117 patients, 63 (54 %) were girls. The most common isolate was *E. coli* (57.3%) percent, followed by *Klebsiella* (18.8 %), *Staphylococcus aureus* (13.7 %), *Pseudomonas* (5.1 %) and *Proteus* (3.4 %) children. All isolates were sensitive to ciprofloxacin, ofloxacin, amikacin, cefixime and imipenem. Only 38.5% *E coli* and 37.5% *Klebsiella* were sensitive to Ampicillin, and 14.3% *E coli* and 9.1% *Klebsiella* were sensitive to Trimethoprim-sulphamethoxazole.

Conclusion: The most common isolate was *E. coli*, followed by *Klebsiella*, *Staphylococcus aureus*, *Pseudomonas* and *Proteus*. Most antibiotics tested for the *E. coli*, *Klebsiella*, *Staphylococcus*, *Pseudomonas* and *Proteus* are effective except Cotrimoxazole, Ampicillin, and Gentamicin which show high resistance.

Key Words: Urinary Tract infections, Bacteriological Spectrum, Sensitivity Pattern.

Introduction

Urinary tract infections (UTIs) are responsible for considerable morbidity and when associated with urinary obstruction or renal papillary damage. Early treatment of UTI with an effective antibiotic is essential for prevention from long-term consequences. Selection of appropriate antibiotic needs knowledge of possible pathogens and their sensitivity pattern. Girls are more susceptible because their urethra is shorter and closer to the anus. This makes it easier for the bacteria to get access to urethra and then to bladder.^{1,2} Up to 11.3% of girls and 3.6% of boys will have had a

UTI by the age of 16 years, and recurrence of infection is also common.³ The incidence of UTI varies in early infancy and childhood, being more common in boys in first three months of life with reported male to female incidence of 5:1. In later childhood the reported male to female ratio was 1:10.⁴

Imaging studies to detect anatomic abnormalities of the urinary tract should be obtained in infants and young children following a first-time diagnosis of acute pyelonephritis. The purpose of these studies is to identify those at increased risk for kidney damage and recurrent infections, namely those with obstructive malformations, renal abnormalities, or severe VUR. The risk of UTI is increased by incomplete bladder emptying secondary to anatomic obstruction or a neurogenic bladder and by voiding dysfunction.⁵

Untreated and recurrent UTIs can cause serious complications in children including renal scarring, hypertension and end-stage renal disease.¹ Early and effective treatment with carefully selected antibacterial agent can prevent most of these complications. Success of the treatment is based on and guided by results of urine culture.⁶ The choice of empiric antibiotic therapy depends on the knowledge of the expected causative organisms and their susceptibility pattern. Growing resistance to multiple antibiotics has been reported world over which poses an important challenge for clinicians.^{7,8}

Patients and Methods

This cross sectional study was carried out over a period of six months from April 1, 2009 to September 30, 2009, at inpatient department of Children Hospital, Pakistan Institute of Medical Sciences, Islamabad. In children who were admitted with clinical suspicion of urinary tract infection (fever, dysuria, pain abdomen, vomiting, unusual crying, poor weight gain, malodorous urine etc.), a urine sample was carefully collected. In case of infants a sterile, adhesive urine collection bag was applied after disinfecting the skin of genitals, whereas in toilet trained children a mid stream sample was obtained. When it was not possible

to collect the urine by non-invasive methods a catheterized sample was collected. A routine urinalysis including microscopy and culture and sensitivity were done on all specimens. A colony count of >100,000 per cmm of a single organism or >10,000 per cmm in symptomatic children was considered as a positive culture. Antibiotic sensitivity was tested to different antibiotics.

Results

Out of 117 children 54% were girls. Age of children ranged between 3 months and 12 years with a mean of 4.4 (± 2.6) years.

Table 1. Patient characteristics

	Number	Percentage
Age categories (years)		
< 1	5	4.3%
1 to 5	77	65.8%
> 5	35	29.9%
Gender		
Male	54	46.1%
Female	63	53.9%

Table 2. Microorganisms isolated on urine culture

	Number	Percentage
E-coli	67	57.2%
Klebsiella	22	18.8%
Staph. Aureus	16	13.6%
Pseudomonas	6	5.1%
Proteus	4	3.4%
Others	2	1.7%

(Table 1). E. coli (57.2%) was the commonest isolate (Table 2). All organisms (100%) were sensitive to amikacin, norfloxacin, ofloxacin, ciprofloxacin and imipenem. Only 38.5% E coli and 37.5% Klebsiella were sensitive to ampicillin where as 14.3% Esch. coli and 9.1% Klebsiella were sensitive to trimethoprim-sulphamethoxazole. 100% Esch coli and 75% Klebsiella were sensitive to cefixime. 94.7% Esch coli and 83.3%

Klebsiella were sensitive to ceftriaxone. However sensitivity of ceftriaxone to staphylococcus and pseudomonas was 100% (Table 3).

Discussion

Urinary tract infections (UTIs) are one of the most frequent infections in children and a significant cause of morbidity, occurring in about 5 percent of febrile infants and 2 percent of febrile children of less than 5 years of age particularly when associated with structural abnormalities of urinary tract.⁹

The most common organism isolated in our study was Esch. Coli (57.3%). This finding is similar to most of the studies conducted around the world where E coli was isolated from 42.3% to 81.7%.¹⁰⁻¹⁴ Information obtained through these studies indicates that irrespective of hospital setting, community or country E Coli remains the most common uropathogen.

Klebsiella (18.8%) was the second most common organism isolated in our study. This finding is similar to the observations in other studies where Klebsiella was isolated in 16.7% to 25%, although, rare isolation of Klebsiella (5.5%) has also been reported in Bangladesh.¹⁵⁻¹⁷ Interestingly Staphylococcus aureus was a common isolate in our study (13.7%). This is in contrast to most of the early findings where staph aureus was an uncommon isolate although occasionally it has been reported in many studies.^{11,17} Pseudomonas aeruginosa and Proteus mirabilis were rare isolates like all other studies we could access.^{18,19}

The results of sensitivity to different antibiotics show that all organisms isolated in our study had low to poor sensitivity to the common antibiotics used in community i.e, ampicillin and Trimethoprim Sulphamethoxazole. Increasing antibiotic resistance among urinary tract isolates to Ampicillin, Trimethoprim Sulphamethoxazole, and first-generation Cephalosporins has earlier been reported by many observers.²⁰

On the other hand sensitivity to fluoroquinolones and aminoglycosides is almost 100%. Gupta and co-investigators reported in their study that resistance to

Table 3: Sensitivity Pattern

	Amp	CTX	Cef	Norfl	Amk	Gen	Ofl	Pip	Imi	Ceft	Cip
Ecoli	38.5%	14.3%	100%	100%	100%	86.7%	100%	89.5%	100%	94.7%	100%
Kleb	37.5%	9.1%	75%	100%	100%	88.9%	100%	90.9%	100%	83.3%	100%
Staph	66.7%	--	--	--	100%	100%	100%	100%	--	100%	100%
Pseud	--	--	--	100%	100%	66.7%	--	66.7%	100%	100%	100%

Amp: Ampicillin, Cef: Cefixime, CTX: Trimethoprim sulphamethoxazole, Norfl: Norfloxacin, Amk: Amikacin, Gen: Gentamicin, Ofl: Ofloxacin, Pip: Pipemidic acid, Imi: Imipenem, Ceft: Ceftriaxone, Cip: Ciprofloxacin, Kleb: Klebsiella, Staph: Staphylococcus aureus, Pseud: Pseudomonas

Fluoroquinolones was absent among gram-negative pathogens and Christiaen et al reported that only one percent of the pathogens were resistant to Fluoroquinolones.^{21,22} This low resistance of pathogens might be attributed to the fact that quinolones are relatively new antibiotics and have not been extensively used in children. Although sensitivity to gentamycin is around 90 % it is 100 % to amikacin. This is possibly due to less frequent use of amikacin in community and widespread use of gentamycin. Sensitivity to imipenem is also 100 % which is comparable to the findings of M.I.Majumder et al. from Bangladesh who have reported 98% sensitivity of uropathogens to meropenem.²³

Cefixime is a 3rd generation oral cephalosporin which has good palatability and tolerance in children due to its taste and convenient dosage regimen. This was effective against all E coli isolates though it was only 75 % effective against Klebsiella. These findings are comparable with study of Dreshaj Sh, which showed 88% effectiveness of cefixime in uncomplicated UTIs.²⁴

Conclusion

E coli and Klebsiella are common bacterial urinary pathogens in children. Cefixime, quinolones and aminoglycosides maintain good sensitivity to common pathogens. Resistance to antibiotics frequently used in community is increasing.

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