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SHORT COMMUNICATION

Prevalence of Urinary tract infections in children and their sensitivity to various antibiotics

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Abstract

Urinary tract infection (UTI) is one of the most common infections of childhood and its prevalence varies markedly with sex and age. In this study, urinary specimens from 200 children under 14 years of age suffering from urinary tract infections were investigated for bacterial agents. The most common bacterial agents of urinary tract infections were *Escherichia coli* (71.7% of total isolates in both sexes) followed by *Klebsiella* sp. (15.3%), *Staphylococcus aureus* (4.3%), *Proteus* sp. (4.3%) and *Pseudomonas aeruginosa* (4.3%). Infections were more commonly diagnosed in boys (62.8%) than girls (37.2%), particularly with *E. coli,* but the infection is more in females in age group 2-14 years (17.7%) when compared to boys (10.9%). The isolated bacteria were most sensitive to aminoglycosides: gentamycin, amikacin, ceftriazone, ceftizoxime and cephoperazone.

Keywords: Urinary tract infection, *Escherichia coli, Staphylococcus aureus,* gentamycin, amikacin.

Introduction

Urinary tract infection (UTI) is one of the most common infections of childhood. It distresses the child, concerns the parents, and may cause permanent kidney damage (Fisher, 2010). Urinary tract infections in children are particularly important because their occurrence may be associated with some congenital abnormality of the urinary tract or an error in management. If not corrected, these may lead to recurrent infections causing damage to the urinary tract. Infection may occur at many places along the genitourinary tract: urethra, bladder, ureter, renal pelvis, or renal parenchyma (Feld *et al.,* 1989; Kalantar *et al.,* 2008). The prevalence of urinary tract infection varies markedly with sex and age. Symptomatic UTI occur in about 1.4 per 1000 newborn infants, with a slight male preponderance (Anis-ur-Rehman *et al.*, 2008; Kalantar *et al.,* 2008). It is assumed that the short urethra in girls predisposes them to ascending infection, because, for eg. *E. coli* serotypes from bowel flora are the same as those that infect the urinary tract. However, some factors other than the proximity of gut flora to the short urethra are likely because the female to male ratio in urinary tract infection varies directly with age (Jodal and Winberg, 1987; Fischer, 2010). Microbiologically, urinary tract infection exists when pathogenic microorganisms are detected in the urinary tract. The infection is considered significant and requires treatment when more than 10^5 microorganisms per milliliter of urine are present in a properly collected specimen (Modarres and Oskoii, 1997). Gram-negative bacteria such as *E. coli*, *Proteus* sp., *Klebsiella* sp., *Enterobacter* sp., *Serratia* sp. and *Pseudomonas* sp. are usually detected in recurrent infections, especially in association with stones, obstruction, urologic manipulation and nosocomial catheter-associated infections.

Microbial sensitivity tests should be done first in order to direct therapy of the urinary tract infections. Almost all urinary tract infections are ascending in origin (Shaw *et al.,* 1998; Tolkoff, and Rubin, 1996). Disturbance of the normal periurethral flora, which is part of the host defense against colonization by pathogenic bacteria, predisposes a person to a urinary tract infection. Bacteria of the periurethral flora also inhabit the distal urethra. Urine in the proximal urethra, urinary bladder, and other proximal sites in the urinary tract is normally sterile. Uropathogens must gain access to the urinary bladder and proliferate for infection to occur. Uropathogens in the distal urethra may gain access to the bladder because of turbulent urine flow during normal voiding or because of dysfunctional voiding. Successful urinary bladder colonization is unlikely unless bladder defense mechanisms are impaired because normal voiding usually results in an essentially complete washout of contaminating bacteria (Fisher, 2010).

After birth, the periurethral area, including the distal urethra, becomes colonized with aerobic and anaerobic microorganisms that appear to function as a defense barrier against colonization by uropathogens (Anis-ur-Rehman *et al.*, 2008). In early childhood, enterobacteria and enterococci are part of the normal periurethral flora. *Escherichia coli* is the dominant gram-negative species in young girls, whereas *E. coli* and *Proteus* sp. predominate in boys. Children as old as about 5 years are predisposed to have urinary tract infections, partly because of periurethral colonization by *E. coli, enterococci,* and *Proteus* sp (Naylor, 1984; Modarres and Oskoii, 1997; Anis-ur-Rehman *et al.*, 2008; Shaikh *et al.,* 2008).

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These potential uropathogens usually diminish in the first year of life and are rarely found in children older than 5 years. Studies of girls and women prone to urinary tract infection showed that periurethral colonization occurs with the specific bacterium that causes the next infection (Fischer, 2010). Against all these backdrops, this study was aimed to identify the bacterial agents of UTI in children under 14 years of age and their sensitivity and resistance to antibiotics.

Materials and methods

Subjects: Urinary specimens were collected from 200 children under 14 years of age suffering from UTI, who were either inpatients or outpatients at R.H Patiala, between June 2010 and September 2010. Some patients had symptoms of dysuria, frequency, urgency, burning, flank pain, suprapubic pain, fever and haematuria, most patients were asymptomatic. Out of 200 children, 130 were males and 70 were females.

Specimen collection: The specimens were collected in sterile tubes by standard methods and transported to the laboratory for examination. Urine specimens that were not examined within 6 h of collection were stored at 4°C, because at 0-4°C the bacterial count will remain unchanged for 24-48 h.

Examination of urine for cells for bacterial growth and antibiotic sensitivity test: About 5 mL of urine was centrifuged, the supernatant was discarded and the deposits were examined under microscope for presence of pus cells, RBC, epithelial cells and bacteria. Specimens were inoculated on MacConkey's blood agar and the plates were incubated for 24 h at 37°C. Next day, the number of colonies grown were counted and total count/mL was calculated. The organism were identified by colony characters, gram staining and biochemical reactions. Antibiotic sensitivity test was performed by disk diffusion method.

Results and discussion

In this study, maximum number of patients were in the age group of 2 months to 2 years followed by 2-14 years (Table 1). The male to female ratio was 1.44:1 (Table 2). These findings are well in accordance with Kalentar *et al.* (2008) who reported male to female ratio 1.07:1 in his study. The most common complaint was fever (45%) followed by painful micturation along with increase frequency (25%) (Table 3). Fisher (2010) reported that fever was a common symptom in infants younger than 3 months with UTI. He further reported that such infants should be thoroughly evaluated for upper UTI. The most common bacterial agents of urinary tract infections were *E. coli* (71.7%), followed by *Klebsiella pneumoniae* (15.3%), followed by *Staphylococcus aureus* (4.3%), *Pseudomonas aeruginosa* (4.3%) (Table 4). It was found that 10.9% out of 46 culture positive cases were male and 17.7% were female (Table 5). The isolated bacteria were most sensitive to aminoglycosides namely gentamycin, amikacin, ceftriazone, ceftizoxime,

cephoperazone and they were 100% resistant to ampicillin, vancomycin, cloxacillin and amoxicillin (Table 6). The results of present study indicates high incidence of microbial resistance to ampicillin, nalidixic acid and cotrimoxazole which are similar to the study of Kalantar *et al.* (2008) who reported high resistance to cotrimoxazole (85.5%) and to penicillin (80%).

Table 1. Distribution according to age.

Age	No. of patients	Age (%)
<2 months	26	13
2 months to 2 years	96	48
2 to 14 years	78	36
Total	200	100

Table 2. Distribution according to sex.

Age	Male	Female
<2 months	16	10
2 months to 2 years	66	30
2 to 14 years	41	37
Total	123	77

Table 3. Clinical Presentation of cases.

Symptoms	No. of cases	Age (%)
Fever	90	45
Diarrhea	24	12
Vomiting	24	12
Lethargy	42	21
Refusal to feed	38	19
Failure to thrive	12	6
Painful micturition	50	25
Abdominal pain	10	5

Table 4. Organisms isolated in 46 culture positive cases.

Organisms	No. of cases	Age (%)
E. coli	33	71.8
K. pneumoniae	7	15.3
S. aureus	2	4.3
Proteus sp.	2	4.3
P. aeruginosa	2	4.3
Total	46	100

Table 5. Sex and age distribution out of 46 culture positive cases.

Age	Male	Age (%)	Female	Age (%)
<2 months	10	21.8	4	8.6%
2 months to 2 years	14	30.1	5	10.9%
2 to 14 years	5	10.9	8	17.7%
Total	29	62.8	17	37.2%

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Table 6. Antimicrobial sensitivity spectrum of pathogens.

Drug	*E. coli*	*K. pneumoniae*	*P. aeruginosa*	*S. aureus*	*Proteus* sp.
Gentamycin	5	1	2	1	1
Amikacin	9	2	2	-	2
Ceftriaxone	7	4	2	1	2
Cephoperazone	3	4	2	1	-
Ceftizoxime	10	2	2	1	1
Norfloxacin	2	1	2	-	1
Levofloxacin	3	1	-	2	2
Nitrofurantoin	4	3	2	1	1
Nalidixic acid	-	-	-	-	-
Chloramphenicol	-	3	-	-	-
Cotrimoxazole	-	-	-	-	-

Conclusion

This study concludes that UTI is quite common in febrile children below 2 years of age even with other clinical diagnosis. Sign and symptoms of UTI are non-specific in this age group. Absence of pyuria does not exclude UTI but culture remains the gold standard for diagnosis of UTI. It is more common in females as compare to males except during neonatal period when it is more common in males. *Escherichia coli* is the commonest organism responsible for UTI. The drug sensitivity to amikacin, ceftizoxime and ceftrioxane was more in all the culture positive cases. In case of UTI among children, the physician should be cautious about treatment with antibiotics. Regular monitoring is required to establish reliable information about resistance pattern of urinary pathogens for optimum empirical antibiotic therapy of patients with UTI. Finally, we suggest that empirical antibiotic selection should be based on the knowledge of local prevalence of bacterial organism and antibiotic sensitivities rather than on universal guidelines.

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