

Original Research Article

Clinical profile of pediatric patients with urinary tract infection in a tertiary care centre in Kashmir, India

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ABSTRACT

Background: The urinary tract is a common site of infection in pediatric patients. Author studied the clinical and microbiological profile along with the antibiotic resistance in children with UTI attending centre.

Methods: It was a prospective study was conducted in the Department of Pediatrics, Sheri-Kashmir Institute of Medical Sciences, Srinagar, Jammu and Kashmir, India over a period of one year from August 2017 to August 2018.

A total of 250 children aged 1-36 months were included in the study. A proper history and examination were done in each case. A clean catch mid-stream urine sample was obtained from each child. Quantitative microscopy and urine culture were performed. Standard biochemical tests were done to identify the isolates and for determination of antibiotic sensitivity.

Results: Out of the 250 children studied, a total of 216 children were diagnosed as UTI by positive urine culture. 102 were males and 114 were females. Significant pyuria was detected in 85% patients. Fever with irritability was the most common presenting symptom (71%) followed by vomiting (63%) and abdominal pain (52%). The most common uropathogen detected was *E. coli* (57%) followed by *Klebsiella spp.* (20%), *proteus* (16%), *pseudomonas* (5%), and *candida* (2%). Majority of the patients responded to treatment with ceftriaxone followed by cefixime. Antibiotic resistance in vitro was least seen with amikacin (25%) followed by nitrofurantoin (11%). 91.3% of UTI detected was nosocomial. Vesicoureteral reflux was found in 49% of patients while 13% were diagnosed with posterior urethral valve.

Conclusions: Urinary tract infection should be considered as one of the most important differential diagnosis in patients with fever attending pediatric OPD. Urine microscopy and culture should be a part of routine diagnostic evaluation in all febrile children. Early treatment of UTI is important to prevent later sequelae including pyelonephritis and renal scarring.

Keywords: *Escherichia coli*, *Klebsiella spp.*, Posterior urethral valve, Urinary tract infection, Uropathogen, Vesicoureteral reflux

INTRODUCTION

A UTI is defined as colonization of a pathogen occurring anywhere along the urinary tract like kidney, ureter,

bladder and urethra.^{1,2} UTI is one of the most common infections encountered during childhood with outcome many a times leading to renal scarring (in 10% to 30%) of children after UTI) hypertension and chronic renal

failure.^{3,4} UTIs are mainly caused by colonic bacteria, *E. coli* and *Klebsiella* being the commonest organisms found in 75 to 90% of all infections especially girls. However, in recent years newer pathogen including *Enterococcus spp.*, yeasts and staph aureus have emerged as prominent causative agents in paediatric UTIs.^{5,6} Hence, there is a need for urine culture and antibiotic sensitivity testing for proper identification of the pathogens. A proper evaluation of the associated risk factors including presence of VUR, PUV and recent history of hospitalization for any other illness is also important to prevent recurrence of UTI in these patients.

This study reports the clinical, microbiological and antibiotic resistance profile of pediatric patients attending the Department of Pediatrics in SKIMS, Bemina, Srinagar, Jammu and Kashmir, India -the major tertiary care centre in Srinagar over a period of 1 year.

METHODS

A total of 250 patients were included in the study.

Inclusion criteria

- Age group of 1 to 36 months,
- Axillary temperature of at least 38.3°C at presentation or within 24 hours and if a urinary tract infection is suspected,
- Patients already diagnosed with UTI outside by positive urine microscopy and culture.

Exclusion criteria

- Age group above 36 months.

The study was conducted in the Department of Pediatrics, Sheri-Kashmir Institute of Medical Sciences, Bemina, Srinagar, Jammu and Kashmir, India over a period of one year from August 2017 to August 2018.

A detailed history physical examination along with routine investigations including blood counts renal function tests and serum electrolytes were performed in each case renal ultrasound and contrast voiding cystourethrography (VCUG) were done if required. The children were followed for six months.

All patients 1-36 months coming with first febrile UTI either admitted or on out-patient department basis during one year who satisfy the inclusion criteria.

SPSS (version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data. Continuous variables were summarized as mean and standard deviation and categorical variables as percentage. Data was presented by pie charts.

UTI was defined by

- The presence of pyuria (10 or more white cells per cubic millimeter in uncentrifuged urine).
- Bacteriuria (1 or more gram-negative rods per 10 oil-immersion fields in a Gram's-stained smear of uncentrifuged urine).

A positive urine culture (at least 50,000 colony-forming units per millilitre, representing a single pathogen) from a specimen obtained by suprapubic aspiration. Urine culture was done using Himedia Hichrome UTI plates. The positive predictive value of pyuria (10 white blood cells/mm³) and bacteriuria is as high as 84.6%. Because of the low sensitivity, negative urine microscopy does not rule out UTI.³ Urine, which should be obtained before the initiation of antimicrobial therapy, can be collected by various methods. Older children can provide a clean-catch midstream urine specimen. The most commonly used technique in young children is urethral catheterization. The catheterized specimen is considered reliable provided that the initial portion of urine that may be contaminated by peri-urethral organisms is discarded. Suprapubic aspiration is considered the gold standard for accurately identifying bacteria within the bladder. The probability of a true infection with a positive culture obtained via suprapubic aspiration is approximately 99%.⁷ The AAP recommends suprapubic aspiration or urethral catheterization to establish a diagnosis of UTI in neonates and young children.⁷ In this study, urine specimen was obtained by suprapubic aspiration. The definitive diagnosis of a UTI was based on the isolation of at least one uropathogen from a urine culture.

RESULTS

The study was conducted in the Department of Pediatrics, Sher Kashmir Institute of Medical Sciences, Bemina, Srinagar, Jammu and Kashmir, India over a period of one year from August 2017 to August 2018. Out of the 250 patients included in the study a total of 216 patients were diagnosed as UTI by positive urine culture significant pyuria was detected in 185 (85%) patients.

Table 1: Age Distribution of patients with febrile UTI.

Age in months	No. of patients	Percentage
≤6	86	40
7-12	40	18
12-24	48	22
24-36	42	20
Total	216	100

Majority (40%) of the patients in this study were below 6 months of age followed by patients between 1 to 2 years age (22%) 18% patients belonged to age group of 7 to 12 months while 20% were in the age group of 24 to 36 months.

Table 2: Gender distribution of patients with first febrile UTI.

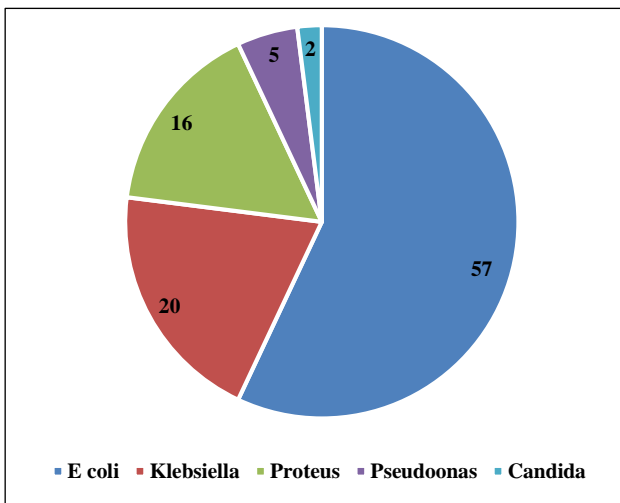
Gender	No. of patients	%
Male	102	47.2%
female	114	52.8%

In this study, 52.8% were females while 47.2% were males. Table 2 suggests that females are predisposed to UTI as compared to males.

Table 3: Frequency of symptoms.

Symptoms	Percentage
Fever with irritability	70
Abdominal pain	52
vomiting	63
Dysuria with frequency of micturition	61
Chills and rigors	30
diarrhoea	5
Nocturnal enuresis	3
haematuria	1

Fever with irritability was the most common presenting symptom in 70% patients followed by vomiting (63%), dysuria and abdominal pain (52%). Other symptoms include chills, rigors, diarrhoea, nocturnal enuresis and haematuria.

**Figure 1: Incidence of uropathogens found in urine culture in patients of UTI.**

E. coli is the most frequent organism found followed by *klebsiella* and *proteus* other organisms include *pseudomonas* and *candida* as shown in Figure 1.

Majority of the patients responded to treatment with ceftriaxone followed by cefixime. Antibiotic resistance in vitro was least seen with amikacin (25%) followed by nitrofurantoin (11%). VUR and PUV were the major risk factors. Vesicoureteral reflux was found in 30% of patients while 3% were diagnosed with posterior urethral

valve. Other major risk factors included history of recent hospitalization or catheterization cleaning perineum from back to front constipation and worm infestation.

DISCUSSION

In this study, 40% of the patients belonged to the age group of below 6 months This is significant as any studies reveal that sequelae like renal scarring occurs more commonly in infants and young children and less frequently in older children and young adults, which suggests that younger kidneys are more susceptible to damage.³

In present study, UTI occurred ore commonly in girls (52.8%) than boys. UTIs are caused mainly by colonic bacteria. In girls, 75-90% of all infections are caused by *Escherichia coli*, followed by *Klebsiella spp.* and *Proteus spp.* Infections of the urinary tract generally resolve with adequate treatment in most children. In neonates and infants, however, they are presumed to be complicated because of the high association between urinary tract malformation and concurrent bacteremia, which predispose children to acute morbidity and long-term renal insufficiency.^{1,8} Bacterial clonal studies strongly support entry into the urinary tract by the fecal-perineal-urethral route with subsequent retrograde ascent into the bladder because of differences in anatomy, girls are at a higher risk of UTI than boys beyond the first year of life.⁹ In girls, the moist periurethral and vaginal areas promote the growth of uropathogens. The shorter urethral length increases the chance for ascending infection into the urinary tract. Once the uropathogen reaches the bladder, it may ascend to the ureters and then to the kidneys by some as-yet undefined mechanism. The main defense mechanism against UTI is constant antegrade flow of urine from the kidneys to the bladder with intermittent complete emptying of the bladder via the urethra. This washout effect of the urinary flow usually clears the urinary tract of pathogens.¹⁰ Hence, the role of vesicoureteric reflux in recurrent UTI.

Children who have UTI often do not necessarily present with the characteristic signs and symptoms seen in the adult population. The physical examination is also frequently of limited value because costovertebral angle and suprapubic tenderness are not reliable signs in the pediatric population. There are various clinical presentations for children with UTI based on age. In children younger than 2 years, the most common symptoms include fever, vomiting, anorexia, and failure to thrive.⁷ Abdominal pain and fever are the most common presenting symptoms in children between 2 and 5 years of age.⁸

Present study suggested a similar pattern with fever with irritability being the commonest symptom followed by abdominal pain. Clinical practice guidelines of the American Academy of Pediatrics for initial UTI in febrile infants and children 2-24 months old recommend renal

and bladder ultrasonography. Voiding cystourethrography (VCUG) is not recommended routinely after the first UTI.¹¹ In this study, VUR and PUV were found to be significant risk factors for recurrent UTI.

Because treatment for a suspected UTI generally starts when the causative agent is identified, empiric treatment of UTI is based on the clinical status of the child, the predominant uropathogens for the patient's age group coupled with the antimicrobial sensitivities in the community, and patient compliance and ability for follow-up.

Generally healthy young children with a presumed uncomplicated UTI who were nontoxic, taking in fluids, having reliable caretakers, and able to follow-up on a daily basis were managed as outpatients with oral antibiotics. Antimicrobial therapy was initiated promptly after a proper urine culture is obtained. In these patients, a broad-spectrum antibiotic mostly ceftriaxone followed by cefixime was used for empiric coverage as recommended. Other first-line agents include amoxicillin, trimethoprim-sulfamethoxazole (TMP-SMX and nitrofurantoin.^{12,13} *E. coli* was the causative uropathogen in most cases of UTI in infants and young children without underlying urinary tract abnormalities.

The promptness of therapy for suspected acute pyelonephritis is of paramount importance, because a delay in therapy has been associated with more severe infections and worse renal damage.^{13,14} For children aged 2 months to 2 years, the guidelines established by the AAP suggest completion of a 7 to 14 day course.¹² A 14-day course of oral cefixime has been shown to be an efficacious and cost-effective therapeutic option in children with UTI who cannot tolerate fluids.¹³ Intravenous and oral formulations of fluoroquinolones have been shown to have excellent coverage of gram-negative and -positive organisms in the urinary tract.¹⁴

It is difficult to determine whether an episode of cystitis will resolve without incident or result in more serious infection involving the kidney.^{15,16} Prompt recognition and treatment of upper tract infection are crucial to preventing potential irreversible renal damage and hence a need to look out for the cases predisposed to recurrent UTI. Children with upper UTI (i.e. pyelonephritis) are at risk for irreversible renal parenchymal damage evidenced by renal scarring.

Although the exact mechanisms responsible for renal scarring secondary to UTI are currently unclear risk factors include underlying VUR or obstructive urinary tract abnormalities and recurrent UTI and a delay in treatment of UTI.¹⁷ Long-term studies have established the causal relationship between renal damage after paediatric UTI and the subsequent development of hypertension.^{17,18} The incidence of hypertension in adulthood after urinary infection ranges from 7% to 17%, hence a need for this study.^{17,18}

CONCLUSION

UTI is an important cause of fever in children being more common in female gender, less than 1 year of age and patients with underlying causes like VUR and PUV. Nosocomial pathogens are common causes of UTI in centre. Urine culture is the gold standard of diagnosis for UTI. Febrile UTI, in particular, is a widely researched topic because of the potential to cause renal scarring resulting in hypertension, preeclampsia, renal insufficiency and end stage renal disease. The motive behind the massive research work is to standardize the diagnostic work up and alter the long-term outcome. It is the endeavour of paediatric specialists throughout the world to reach an investigation and management protocol that is highly efficacious in preventing the complications of UTI.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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