



## Urinary Tract Infection in Pediatric Age Group: A Prospective Disease

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### Abstract

**Introduction:** Urinary tract infection (UTI) is common in children particularly girls. It usually presents with fever, rigors, urgency and increased frequency of micturition. Its diagnosis depends upon demonstration of sufficient quantity of organisms on microscopic examination and by culture sensitivity. Culture and sensitivity report not only provide with the confirmation of diagnosis but also help in managing the patients. We conducted this study to analyze clinical features and organisms involved in causing UTI in pediatric age group.

**Materials and Methods:** This was a prospective study in which patients under the age of 12 years. Urine samples from the patients suspected to be having UTI were collected from the patients and was sent for routine microscopic examination as well as for culture sensitivity. Pediatric patients with culture proven urinary tract infections were included in this study on the basis of a predefined inclusion and exclusion criteria. Presenting complaints and culture sensitivity reports were analyzed. P value less than 0.05 was taken as statistically significant.

**Results:** Out of the 30 patients who had been diagnosed with UTI there were 20 females (66.66%) and 10 males (33.33%) with a M:F ratio of 1.72. The incidence of UTI was found to be more in female as compared to males and the difference was found to be statistically significant ( $P < 0.05$ ). Most common presenting complaint was found to be fever which was present in all patients (100%). The other presenting complaints were burning micturition (70%), abdominal pain (40%), rigors (36.66%), increased frequency (36.33%), urgency (33.33%), Loin pain (33.33%) and altered urine color (30%). Most common offending organism was found to be *E. coli* (46.67%) followed by *Klebsiella* (23.33%).

**Conclusion:** Urinary tract infection is one of the common causes of fever in children and must be ruled out in any child presenting with features suggestive of UTI. It's appropriate diagnosis and prompt treatment are crucial to prevent complications such as renal scarring, pyelonephritis and sepsis.

**Keywords:** Urinary tract infection, Culture and sensitivity, *Escherichia coli*, antibiotics.

### Introduction

Urinary tract infection can be defined as infection of any part of the urinary tract and can be diagnosed on the basis of demonstration of growth of organisms in urine which usually is sterile<sup>1</sup>. It

is one of the common causes for which pediatric consultations are sought. Urinary tract infection may have a spectrum which may range from asymptomatic bactiurea to severe infection causing complications such as pyelonephritis and

septic shock. It usually presents with fever, chills and burning micturition. In infants it may also present with failure to thrive, refusal to feed and irritability<sup>2</sup>. In younger children less than 3 months of age it may present with fever without localizing signs therefore it is important to rule out urinary tract infection in infants presenting with fever without localizing signs. In older children urinary tract infections may present with signs and symptoms such as fever, abdominal pain dysuria, urgency and enuresis. Clinical examination may reveal costovertebral angle tenderness. The criteria for diagnosis of UTI as per American academy of pediatrics is presence of pyuria or bacteriuria on urine analysis and presence of at least 50,000 colony forming units per ml of urine<sup>3</sup>. Other than urine culture complete blood count, blood culture, serum electrolytes and renal functions are needed to be done to rule out complications of urinary tract infection. In selected cases imaging studies such as X-Rau KUB, ultrasonography of abdomen and pelvis and micturating cystourethrography may have to be done<sup>4</sup>. In some cases, nuclear imaging such as DTPa renogram may have to be done to know the effect of UTI on renal functions<sup>5</sup>.

The common organisms responsible for urinary tract infection include Klebsiella, proteus and enterococcus. The uncommon offending agents include pseudomonas, streptococcus B (in neonates) and fungi such as candida. The common risk factors for urinary tract infection include female gender, antibiotic therapy for other infections (by altering periurethral flora), bowel or bladder dysfunction due to any cause, constipation and vesicoureteric reflux<sup>6</sup>. It has been found that uncircumcised children are more susceptible for acquiring UTI as compared to non-circumcised children. A high index of suspicion is needed in these children who are predisposed for developing urinary tract infection because in many children urinary tract infection presents with nonspecific signs and symptoms. Undiagnosed and untreated cases may progress to complications such as renal scarring, hypertension and chronic renal failure<sup>7</sup>.

Once the diagnosis is confirmed the mainstay of treatment is administration of appropriate antibiotics. In uncomplicated UTI where patient is not toxic oral antibiotics and plenty of oral fluids may be advised. Majority of patients with uncomplicated UTI will respond to oral antibiotics dramatically. In cases of complicated UTI and when the patient is toxic an aggressive treatment with parental antibiotics is essential. After the patient responds to parenteral antibiotics patient can be switched to oral antibiotics. A close follow up is required during antibiotic therapy so as to be able to evaluate the response to antibiotics<sup>8</sup>.

We conducted this study to analyze presenting complaints and predisposing factors for development of urinary tract infection in children up to 12 years of age.

### Materials and Methods

This was a prospective study in which children below the age of 12 years were included on the basis of a predefined inclusion and exclusion criteria. The parents or guardian of the patients gave informed written consent to be part of the study. Patients presenting with fever and signs and symptoms suggestive of urinary tract infections were included in this study. A detailed history was taken particularly for the presence of signs and symptoms which could suggest UTI. History of fever, chills and burning micturition was asked and noted down. Urine samples were collected from the patients and was sent for routine microscopic examination as well as for culture sensitivity. In infants urine was collected from sterile urine bag attached to genitalia whereas in older children mid-stream clean catch urine sample was collected after washing the genitalia with soap and water. Suprapubic aspiration, being an invasive procedure, was not attempted in any of the children presenting with signs and symptoms suggestive of urinary tract infection. Presence of more than  $10^5$  colony forming units of a single organism was taken as urinary tract infection. Complete blood count and renal function tests were also sent. Patients were treated

by appropriate oral or parenteral antibiotics depending upon the severity of the urinary tract infection. In cases where urine culture turned out to be positive antibiotics were switched on the basis of susceptibility pattern of the culture sensitivity report. In patients who had been started with parenteral antibiotics the switch over to oral antibiotics was done once the fever has subsided and signs and symptoms of UTI is reduced. For the purpose of statistical analysis SSPS 21.0 software was used. Microsoft excel and word was used for statistics and graphs preparation. P value less than 0.05 was taken as statistically significant.

**Inclusion Criteria**

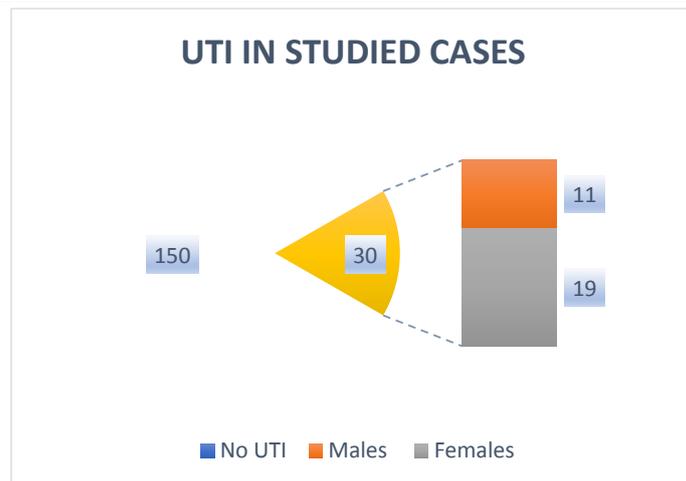
- 1- Patients presenting with signs and symptoms suggestive of urinary tract infection and diagnosed to be having UTI on the basis of positive culture report.
- 2- Age of the patient below 12 years.
- 3- Parents or guardians gave informed written consent

**Exclusion Criteria**

- 1- Those who refused consent.
- 2- Age more than 12 years.
- 3- Patients with pre-existing renal diseases such as nephrotic syndrome, renal failure of obstructive uropathy.

**Results**

During the study period 180 patients presented to pediatric Outpatient department with history of fever and signs and symptoms on the basis of which UTI was suspected. Out of these 180 patients the diagnosis of urinary tract infection was confirmed in 30 patients on the basis of culture and sensitivity test. Out of the 30 patients who had been diagnosed with UTI there were 20 females (66.66%) and 10 males (33.33%) with a M:F ratio of 1.72.



**Figure 1:** Gender wise distribution of cases

Out of the total patients presenting with fever and suspected to be having UTI there were 96 males and 84 females. Out of 96 males with suspected UTI 10 patients were confirmed to be having UTI on the basis of culture and sensitivity reports whereas amongst 84 females 20 were found to have UTI on the basis of culture sensitivity report. The incidence of UTI was found to be more in female as compared to males and the difference was found to be statistically significant (P<0.05).

**Table 1:** Age Distribution of the studied cases

	Number of patients with suspected UTI	No UTI	Confirmed UTI (culture positive)
Males	96	86	10
Females	84	64	20
Total	110	150	30
<b>P=0.003 (Significant)</b>			

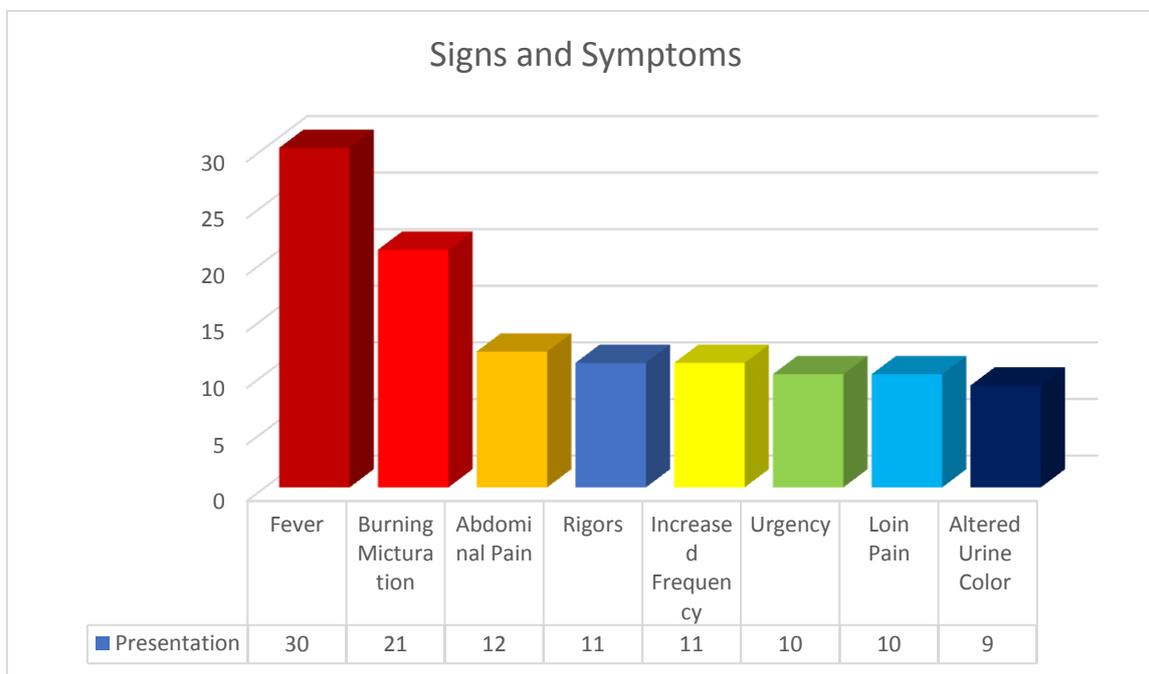
The analysis of the age groups of the culture positive UTI cases showed that the most common affected age group was between 2-5 years (43.33%) Followed by 5-8 years (23.33%) and 8-10 years (16.67%).

**Table 2:** Age group of the affected cases

Age Group	No of Cases	Percentage
< 2 Years	2	6.67%
2-5 Years	13	43.33%
5-8 Years	7	23.33%
8-10 Years	5	16.67%
> 10 years	3	10.00%
Total	30	100%

The analysis of presenting complaints of the studied cases showed that the most common presenting complaint in studied cases was fever which was present in all 30 cases (100%). The other common complaints included burning

micturition which was present in 21 (70%) patients, abdominal pain (40%), rigors (36.66%), increased frequency (36.33%), urgency (33.33%), Loin pain (33.33%) and altered urine color (30%).



**Figure 2:** Presenting Complaints in the studied cases.

The analysis of cases on the basis of culture and sensitivity reports showed that the most offending organism in cases of urinary tract infection was Escherichia coli (46.67%) followed by klebsiella (23.33%) and enterococcus faecalis (10%). The other less common organism responsible for UTI were found to be P. aeruginosa (6.67%) and coagulase negative staph aureus (3.33%). In 3 patients polymicrobial growth was seen.

**Table 3:** Organisms isolated on urine culture

Offending Organism	No Of Cases	Percentage
Escherichia coli	14	46.67%
klebsiella	7	23.33%
enterococcus faecalis	3	10.00%
P.aeruginosa	2	6.67%
coagulase negative staph aureus	1	3.33%
Polymicrobial Growth	3	10.00%
<b>Total</b>	<b>30</b>	<b>100%</b>

**Discussion**

Urinary tract infection is one of the common causes for which pediatric consultations are

sought. Since urinary tract infection presents with non-specific signs and symptoms it is important that a high index of suspicion is maintained particularly in younger children in whom UTI may manifest with non-specific signs and symptoms.

In our study females were more commonly affected than males and the difference was found to be statistically significant. Many studies have reported that urinary tract infection is more common in females than males. Mendez SV et al conducted a Retrospective review over a period of one year of children with culture positive UTI in pediatric patients. A total of 40 children were included in the study. Majority of study subjects were females in the age group of 1-5 years (60%). Most common symptoms reported in children <5 years was fever (58%) and excessive cry while passing urine (58%) whereas 50% of children >5 years had complaints of pain abdomen. Previous history of UTI was present in 22% of subjects. Urine analysis had a sensitivity of 75% and

specificity of 67%. The organism predominantly causing UTI were found to be *E. coli* (67%)<sup>9</sup>. Female predominance in cases of UTI was also reported by the authors such as Kumar A et al and et al<sup>10</sup> and Jayavarthini M et al<sup>11</sup>.

In our study the most common presenting complaint was found to be fever which was present in all patients (100%). The other common presenting complaints included burning micturition which was present in 21 (70%) patients, abdominal pain (40%), rigors (36.66%), increased frequency (36.33%), urgency (33.33%), Loin pain (33.33%) and altered urine color (30%). Zeno LF conducted a cross sectional study to know about the clinical and microbiological profile of urinary tract infection. Out of the 40 patients studied, fever (85%) was the most common presenting symptom and *Escherichia coli* (57.50%) was the most common organism isolated followed by *Klebsiella* (15%). The most sensitive antibiotic was meropenem (75%) and the most resistant antibiotic was cefazolin (87.50%). These results were found to be statistically significant<sup>12</sup>. Fever was the common presenting complaint in patients in UTI also in the studies conducted by Rowe TA et al<sup>13</sup> and Ismaili K et al<sup>14</sup>.

In our study *E. coli* was the most common offending organism (46.67%) isolated on the basis of culture and sensitivity reports. The other common organisms involved were *Klebsiella* (23.33%) and *enterococcus faecalis* (10%). The other less common organism responsible for UTI were found to be *P.aeruginosa*(6.67%) and coagulase negative staph aureus (3.33%). In 3 patients polymicrobial growth was seen. Angmo D et al conducted a cross sectional study in which urine sample from 2100 patients with clinical symptoms of UTI were collected. The authors found that *Escherichia coli* 114(57.3%) was the predominant organism followed by *Klebsiella pneumoniae* 22(11.1%) and *enterococcus faecalis* 19(9.5 %). *E. coli* resistance to various antibiotics were as follows, cotrimoxazole (67.5%), norfloxacin (66.6%), cefoperazone/sulbactam (57%), piperacillin/tazobactam

(50.8%), nitrofurantoin (35%), ertapenem (33.3%), gentamicin and meropenem (32.4%), ciprofloxacin (23.6%) imipenem (14%) and amikacin (13.1%)<sup>15</sup>.

### Conclusion

Urinary tract infection is one of the common causes for which pediatrics consultation is sought. Its early diagnosis and appropriate management is essential to prevent further complications. Gram negative organisms particularly *E.Coli* and *Klebsiella* are common offending organisms in our study.

**Conflict of Interest:** None

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