

Original research article

## Urinary tract infection and its clinico-epidemiological profile in children: an observational study

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### Abstract

**Background:** The urinary tract infection is a significant cause for morbidity and mortality in children. The studies have shown that urinary tract infections in the early childhood are potentially dangerous, because they are the forerunners of the several renal diseases in the adulthood.

**Aim:** The aim of this study was to evaluate the clinico-epidemiological profile of children suffering from urinary tract infection.

**Material and methods:** This retrospective observational study was done the Department of Paediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India, for 1 year, Total 100 children with culture-positive UTI were included in this study. Clinical examination was done, and the findings were recorded. Blood sampling was done for all patients and sent to a laboratory to measure total count, differential count, ESR.

**Results:** Among 100 children's, 64 children's belonged to 2-5years of age constituted 64% and 36 children belonged to 5-12 years of age constituting 36%. 28 were male and 72 were female constituting 28% and 72% respectively. Most of children's 74% came from rural area and 26% from urban areas. Most of the cases were from lower classes with 70% and 27% incidence in middle class and 3% upper class paediatric patient was admitted our hospital during the study. Among 100 children fever cases up to 61% most common symptom observed in the study. Chills and rigor were present in 39 patients with fever. Burning micturition history was present in 58 children which are around 38.7%. Increased frequency of micturition with small voids every time was present in 51 children constituting 51%. The third common symptom was abdominal pain which constituted 44%. Vomiting was present in 21 patients which are around 21% of the total. *E. coli* was grown in the urine culture of 59 children which was 59% of the total.

**Conclusion:** The study group in which the risk factors were analysed had a female preponderance (may be due to the short urethra, easy ascending infection). In present study population fever and increased frequency are two important symptoms followed by abdominal pain.

**Keywords:** Abdominal pain, Microorganism pattern, Urinary infection, Vomiting

### Introduction

The urinary tract infection is a significant cause for morbidity and mortality in children. The studies have shown that urinary tract infections in the early childhood are potentially dangerous, because they are the forerunners of the several renal diseases in the adulthood.

Urinary tract infection is not isolated even but represents a complex situation which may follow a variety of courses during the life time of an individual.<sup>1</sup> If the predisposing factor is recognized early and eliminated, then one step does not necessarily lead to the other. The concept of persistent significant bacteriuria with criterion of over 1,00,000 organisms per ml of urine is excellent operational definition when the clean method is used to collect urine specimen.<sup>2</sup> Urinary tract infection is the third most common cause of febrile illness among pediatric age group, and it accounts for 0.7% of all outpatients' clinic visits.<sup>3</sup> In Emergency Department, up to 14% of children are admitted due to UTI either due to direct infection or indirectly due to its associated complications.<sup>4</sup> Knowledge of the exact incidence and prevalence of UTI among children is essential for pediatricians because the diagnosis of the diagnosis may be challenging on clinical basis, and the incidence and prevalence will determine the cost benefit effect of investigating the condition. For instance, if UTI was rare, routine diagnostic testing would not be beneficial, whilst if it was common, pediatricians will be justified to use lab and imaging investigations for screening the suspected cases.

UTI affects approximately 7% to 8% of girls and 2% of boys during the first 8 years of life. Fever and significant bacteriuria, pyuria in children with undocumented sources of infections must be presumed to be symptoms of acute pyelonephritis (APN), an invasive infection of the renal parenchyma requiring prompt treatment.<sup>5,6</sup>

High fever with temperature of 39.5°C or more is the single best predictive parameter.<sup>7,8</sup> The risk of APN increases when bladder infection occurs in patients Vesicoureteral reflux (VUR), because colonized lower tract urine then has direct retrograde access to the upper tract.<sup>9</sup> The screening of bacteriuria has contributed significantly to the understanding of the epidemiology and natural history of urinary tract infections in girls showing asymptomatic bacteriuria in the childhood remains at high risk of developing pyelonephritis at the time of pregnancy.

The awareness of the importance of early diagnosis and eradication of urinary tract infection before it settles in the kidney has led to the following advances:

1. Screening of asymptomatic but vulnerable population for significant bacteriuria (preschool children and school going girls).
2. Methods of localization of the site of infection.
3. Recognition of the cause of persistent urinary tract infection (vesico-ureteric reflux, immunological factors, host factors).
4. Various regimes of chemotherapy (short course, continuous single bed time low dosage, long term therapy). The aim of this study was to evaluate the clinico-epidemiological profile of children suffering from urinary tract infection.

### **Material and methods**

This retrospective observational study was done the Department of Paediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India, for one year, after taking the approval of the protocol review committee and institutional ethics committee.

#### **Inclusion criteria**

- Age-2 to 12 years.
- Urine culture positivity

#### **Exclusion criteria**

- Age <2 years and >12 years.
- Insignificant growth in the urine culture

Total 100 children with culture-positive UTI were included in this study. Child's history was then recorded as answers to the pre-prepared questionnaire in a proforma. Clinical

examination was done, and the findings were recorded. Blood sampling was done for all patients and sent to a laboratory to measure total count, differential count, ESR. Risk factors for urinary tract infection were also asked with a questionnaire in the proforma. For boys, it was advised to wash genitalia with water then retract the prepuce gently and collect the midstream sample. For girls, it was advised to wash genitalia with water then separate both labia and collect the midstream sample. The collected sample was immediately sent to microbiology laboratory and plating did within one hour.

### Results

Table 1 shows among the 100 cases analyzed in the study 64 children belonged to 2-5 years of age constituted 64% and 36 children belonged to 5-12 years of age constituting 36%.

**Table 1: Age Distribution of patients**

Age	Number	Percentage
2-5 Years	64	64
5-12 Years	36	36
Total	100	100

Table 2 shows in the total of 100 children 28 were male and 72 were female constituting 28% and 72% respectively.

**Table 2: Gender distribution of patients**

Gender	Number	Percentage
Male	28	28
Female	72	72
Total	100	100

**Table 3: Incidence of urinary tract infection in urban and rural areas**

Area	Number of patients	Percentage
Urban	26	26
Rural	74	74
Total	100	100

74 children i.e. 74% came from rural area and 26 i.e. 26% from urban areas. (Table 3.)

**Table 4: Incidence of urinary tract infection in different social classes**

social classes	Number of patients	Percentage
lower classes	3	3
middle class	27	27
upper class	70	70

Most of the cases were from lower classes with 70% and 27% incidence in middle class and 3% upper class paediatric patient was admitted our hospital during the study. (table 4.)

Table 5 shows among 100 children 61 had fever history. 16 children had <3 days fever which is around 26.23% of total children and 3 to 5 days history was in 20 children constituting 32.79% and fever was present for >5 days in 25 children constituting 40.98%. Total fever cases summed up to 61% and are the most common symptom observed in the study. Chills and rigor were present in 39 patients with fever. Burning micturition history was present in 58 children which are around 38.7%. Children who couldn't say exactly about burning sensation complained about pain or irritation or cry during micturition.

**Table 5: Symptoms of patients**

Symptoms	Number	Percentage
Fever	61	61
<3 days	16	26.23
3-5 days	20	32.79
>5 days	25	40.98
Chills and rigor	39	39
Burning micturition	42	42
Increased frequency	51	51
High colored urine	7	7
Abdominal pain	44	44
Vomiting	21	21
Preputial bulging (males)	4	20

Increased frequency of micturition with small voids every time was present in 51 children constituting 51%. The third common symptom was abdominal pain which constituted 44%. Vomiting was present in 21 patients which are around 21% of the total. History of preputial bulging while urinating was present in 4 boys out of 20 uncircumcised boys which are around 20%.

Table 6 shows interesting fact was all children presented with urinary tract infection and had phimosis gave a history of preputial bulging. It may be because children with phimosis, had skin that was tight enough to produce preputial bulging are more prone to develop urinary tract infection.

**Table 6: Clinical finding of patients**

Findings	Number	Percentage
Phimosis (male)	6	21.42
Vaginal synechiae (female)	4	5.56
Malformations	0	0
Facial edema	1	1
Renal angle tenderness	1	1
Suprapubic tenderness	26	26

**Table 7** shows *E. coli* was grown in the urine culture of 59 children which was 59% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp.* in 21 children which are around 21%. 10 children's urine culture grew *Proteus mirabilis* which is around 10% of the total. *Pseudomonas* was grown in 4 children constituting 4%. *Staph epidermidis* growth is seen in 2 children which come around 2%. *Enterococci faecalis* was grown in 3 children which constitute 3%. *Citrobacter* growth was seen in 1 child and this constitutes 1%.

**Table 7: Etiology of patients**

Organism	Number	Percentage
<i>E. coli</i>	59	59
<i>Klebsiella</i>	21	21
<i>Proteus</i>	10	10
<i>Pseudomonas</i>	4	4
<i>Staph epidermidis</i>	2	2
<i>Enterococci faecalis</i>	3	3
<i>Citrobacter</i>	1	1

## Discussion

Most of the urinary infections are monomicrobial. *E. coli* is the most common organism except in neonates where it is Group B Streptococcus. In the case of immunocompromised patients and patients with indwelling catheters, *Candida* growth can occur.<sup>10</sup> This is mainly because colonic bacteria are the major cause of UTI. *E. coli* is closely followed by *Klebsiella* and *Proteus*. The organism is then internalized into epithelial cells which leads to apoptosis, hyper infection and invasion into the surrounding epithelial cells or an establishment of bacterial focus and forms a base for recurrent UTI where drugs cannot reach the focus. *E. coli* also release toxins which cause cell destruction, cell cycle arrest and change in cellular morphology and function.<sup>11</sup> Toxins include cytolethal distending toxin, alpha- hemolysin, cytotoxic necrotizing factor-1 and secreted auto transferase toxin. *E. coli* also has a glycosylated polysaccharide capsule that interferes with phagocytosis and complement-mediated destruction.<sup>12</sup> Certain other organisms have siderophore systems that acquire iron from heme which is an essential bacterial micronutrient. in the present study 100 children 61 had fever history. 16 children had <3 days fever which is around 26.23% of total children and 3 to 5 days history was in 20 children constituting 32.79% and fever was present for >5 days in 25 children constituting 40.98%. Total fever cases summed up to 61% and are the most common symptom observed. This is followed by increased frequency of urination which was seen in 51%. The third common symptom was abdominal pain which constituted 44%.<sup>13</sup> This is like another study by Chon C, et al, which included children from two months to fifteen years conducted in Nepal except that the second common presentation was abdominal pain.<sup>14</sup> In a study by Yamamoto S et al, taking all children with urinary infection coming to the outpatient department at the Philippines also showed fever as the most common presentation and abdominal pain as the second common one.<sup>15</sup> fever was the most common presentation but the percentage was very high (92%) and dysuria was a second common presentation with 68% of children presenting with it. This study involved children up to fifteen years of age at Abbottabad. in the present study *E. coli* was grown in the urine culture of 59 children which was 59% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp.* in 21 children which are around 21%. 10 children's urine culture grew *Proteus mirabilis* which is around 10% of the total. *Pseudomonas* was grown in 4 children constituting 4%. *Staph epidermidis* growth is seen in 2 children which come around 2%. *Enterococci faecalis* was grown in 3 children which constitute 3%. *Citrobacter* growth was seen in 1 child and this constitutes 1% respectively.<sup>16</sup> The study also suggested that poor genital hygiene and toilet habits were almost always associated with other factors and so not necessarily predispose UTI. Previous urinary tract infection was present in 3% of children. All children had the same organism grown in urine culture as in previous episode suggesting unresolved or persistent bacteriuria.<sup>17</sup> This is comparable with the literature stating unresolved bacteriuria as the most common type of recurrent UTI. Suprapubic tenderness was the most common clinical finding, but it was seen only in 26% of children.<sup>18</sup> Majority of children presented as fever without focus in correlation with literature. All children with suprapubic tenderness dint have cystitis in USG and all children with cystitis dint have suprapubic tenderness.<sup>19</sup> None of the children had an external urogenital malformation. This may be because children <2 years were excluded from the study. Among laboratory findings 40% children had leukocytosis. This was the most common presentation. USG was able to detect abnormalities (cystitis/hydronephrosis) in 15% of children in the study group.<sup>20</sup>

### Conclusion

The study group in which the risk factors were analysed had a female preponderance (may be due to the short urethra, easy ascending infection). In present study population fever and increased frequency are two important symptoms followed by abdominal pain.

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