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A study of prevalence of culture positive UTI in children: clinical profile, risk factor analysis, and microbiological profile

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ABSTRACT

Background: Urinary infection is one of the common infections occurring in children. Different literature says different definition for UTI. Indian Academy of Pediatrics defines urinary tract infection as the growth of a significant number of organisms of single species in urine culture with the presence of symptoms of UTI. The objective is to study the clinical profile of children with urine culture positive UTI.

Methods: The study was conducted in Kovai medical centre and hospital Coimbatore. The sample size is 150 children. The study population includes children with culture-positive UTI who are admitted between October 2015 to September 2016 over a period of 1 year. 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.

Results: Previous urinary tract infection was present in 2.7% of children. All children had the same organism grown in urine culture as in previous episode suggesting unresolved or persistent bacteremia. This is comparable with the literature stating unresolved bacteremia as the most common type of recurrent.

Conclusions: 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

In the worldwide pediatric age group urinary tract infection remains as a silent yet very frequently faced infection. It produces significant mortality and morbidity among pediatric population due to inconspicuous clinical manifestations.1 It results in significant morbidity by producing irreversible damage to the renal system that can never be salvaged if not recognized and treated early. Hence early recognition of subtle symptoms and signs will provide good outcome among patients suffering from urinary tract infection.² The etiology that predisposes to UTI is not very clear as not many studies are available worldwide to find the exact risk factors. If exact risk factors are known knowledge about prevention of risk factors help in the management of urinary tract infection as well as prevent recurrence.3 The risk factors of UTI depend on socioeconomic status and cultural habits like perianal cleaning methods and diaper usage. So, it is better to analyze the risk factors in specific cultural groups of different places so that the risk factors which is differing from population to population can be identified and different strategies can be formed for a population with different cultures.⁴ Hence this study is undertaken to

assess the clinical profile of UTI patients in a hospital which is catering to the various socioeconomic group and to analyze the risk factors which predisposes to UTI in this specific population.

This study also analysis microbiological profile. Knowledge about the type of organisms, prevailing in the society will help in determining the choice of antibiotics while waiting for the urine culture report.⁵

METHODS

The study was conducted in Kovai Medical Centre And Hospital Coimbatore the sample size is 150 Children. The study population includes children with culture-positive UTI who are admitted between October 2016 to September 2017 over a period of one year. 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.

Inclusion criteria

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

Exclusion criteria

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

The study design was made out and then Ethical committee approval was obtained. Informed written consent was taken from the child's parent or guardian. Child's history was then recorded as answers to the preprepared questionnaire in a proforma. Clinical examination was done, and the findings were recorded.

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.

Statistical analysis

The data were analyzed using SPSS version 20 software. Mean, median and standard deviation were used to substantiate quantitative, discrete variables and percentages for qualitative variables. Pie-charts were generated to visually represent the percentage of various qualitative variables. Bar-charts were also used in appropriate places.

RESULTS

Table 1 shows among the 150 cases analyzed in the study 98 children belonged to 2-5 years of age constituted 65.3% and 52 children belonged to 5-12 years of age constituting 34.7%.

Table 1: Age in years.

Age	Number	Percentage
2-5 Years	98	65.3
5-12 Years	52	34.7
Total	150	100

Table 2 shows in the total of 150 children 38 were male and 112 were female constituting 25.30% and 74.70% respectively.

Table 2: Sex distribution.

Sex	Number	Percentage
Male	38	25.30
Female	112	74.70
Total	150	100

Table 3 shows among 150 children 99 had fever history. 24 children had <3 days fever which is around 24.2% of total children and 3 to 5 days history was in 32 children constituting 32.3% and fever was present for >5 days in 43 children constituting 43.4%. Total fever cases summed up to 66% and are the most common symptom observed in the study. Chills and rigor were present in 36 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 3: Symptoms.

Symptoms	Number	Percentage
Fever		
<3 days	24	24.2
3-5 days	32	32.3
>5 days	43	43.4
Chills and rigor	36	36.4
Burning micturition	58	38.7
Increased frequency	72	48
High colored urine	11	7.3
Abdominal pain	64	42.7
Vomiting	33	22
Preputial bulging (males)	6	20.7

Increased frequency of micturition with small voids every time was present in 72 children constituting 48.0%. This symptom is observed the most common next only to fever in the study population. It was present in 64 patients constituting 42.7%. This is the next common history to increased frequency noticed in the study group. Vomiting

was present in 33 patients which are around 22% of the total. History of preputial bulging while urinating was present in 6 boys out of 29 uncircumcised boys which are around 20.7%.

Table 4 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 4: Clinical finding.

Findings	Number	Percentage
Phimosis (male)	6	20.7
Vaginal synechiae (female)	5	4.5
Malformations	0	0
Facial edema	2	1.3
Renal angle tenderness	2	1.3
Suprapubic tenderness	42	28.0

Table 5 shows *E. coli* was grown in the urine culture of 92 children which was 61.3% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp.* in 29 children which are around 19.3%.14 children's urine culture grew *Proteus mirabilis* which is around 9.3% of the total. Pseudomonas was grown in 5 children constituting 3.3%. Staph epidermidis growth is seen in 4 children which come around 2.7%. *Enterococci faecalis* was grown in 5 children which constitute 3.3%. Citrobacter growth was seen in 1 child and this constitutes 0.7%.

Table 5: Etiology.

Organism	Number	Percentage
E. coli	92	61.3
Klebsiella	29	19.3
Proteus	14	9.3
Pseudomonas	5	3.3
Staph epidermidis	4	2.7
Enterococci fecalis	5	3.3
Citrobacter	1	0.7

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. 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.⁷ Toxins include cytolethal distending toxin, alphahemolysin, 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.8 Certain other organisms have siderophore systems that acquire iron from heme which is an essential bacterial micronutrient. On analyzing the clinical profile of the study group fever was the most common presenting symptom with 66% of the children presenting with it. This is followed by increased frequency of urination which was seen in 48%. The third common symptom was abdominal pain which constituted 42.7%. 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. 10 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. 11 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. Most common causative organism was E. coli (61.3%) followed by Klebsiella, Proteus, and Pseudomonas constituting 19.3%, 9.3%, and 3.3% respectively.¹² 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 2.7% of children. All children had the same organism grown in urine culture as in previous episode suggesting unresolved or persistent bacteriuria. ¹³ 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 28% of children.14 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.¹⁵ None of the children had an external urogenital malformation. This may be because children <2 years were excluded from the study. Among laboratory findings 42% children had leukocytosis. This was the most common presentation. USG was able to detect abnormalities (cystitis/hydronephrosis) in 14% of children in the study group. 16

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. Signs like suprapubic tenderness and renal angle tenderness are

very rare. Common organisms causing urinary tract infection in present study population are *E. coli* followed by *Klebsiella*, *Proteus*, and *Pseudomonas*. In this study, USG abnormality was present in 14% of patients in the age group between 2 to 12 years. In this study constipation, voluntary withholding of urine and reduced water intake were found as risk factors for UTI which is like other studies.

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Institutional Ethics Committee

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