ISSN: 0975-1556

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2021; 13(4); 199-205

Original Research Article

To Assess the Clinico-Epidemiological Characteristics of Children with Urinary Tract Infection

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Received: 02-06-2021 / Revised: 19-06-2021 / Accepted: 27-07-2021
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Conflict of interest: Nil

Abstract

Aim: The aim of this study was to evaluate the clinico-epidemiological profile of children suffering from urinary tract infection. **Methods:** This retrospective observational study was done at the Department of Pediatric, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 15 months. 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, 62 children belonged to 2-5years of age constituted 62% and 38 children belonged to 5-14 years of age constituting 38%. 100 children 32 were male and 68 were female constituting 32% and 68% respectively. 15 children had <3 days fever which is around 25.42% of total children and 3 to 5 days history was in 18 children constituting 30.51% and fever was present for >5 days in 26 children constituting 44.07%. Total fever cases summed up to 59% and are the most common symptom observed in the study. Chills and rigor were present in 42 patients with fever. Burning micturition history was present in 42 children which are around 42%. Increased frequency of micturition with small voids every time was present in 53 children constituting 53%. The third common symptom was abdominal pain which constituted 45%. Vomiting was present in 23 patients which are around 23% of the total. History of preputial bulging while urinating was present in 6 boys out of 32 boys which are around 18.75%. *E. coli* was grown in the urine culture of 62 children which was 62% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp*. in 18 children which are around 18%. 11 children's urine culture grew *Proteus mirabilis* which is around 11% of the total. Pseudomonas was grown in 5 children constituting 5%. Staph epidermidis growth is seen in 2 children which come around 2%. *Enterococci faecalis* was grown in 1 child which constitute 1%. Citrobacter growth was seen in 1 child, and this constitutes 1%. **Conclusion:** UTI is a common childhood illness. This study shows age and gender distribution in accordance with available literature. Females were more commonly affected than males. Fever being most common presenting symptom followed by vomiting and pain abdomen.

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

Introduction

Urinary tract infections (UTIs) are common bacterial infections in children. The diagnosis of UTI is very often missed in young children due to minimal and nonspecific symptoms. The developing renal cortex in young children is vulnerable to renal scarring resulting in hypertension and chronic renal failure. These morbidities in adults often have their origin in childhood. A clinically suspected case of UTI should be defined and documented with urine culture report. After the diagnosis of UTI, its category should be defined. This helps in guiding a clinician about the appropriate radio/nuclear imaging evaluation, choice of antimicrobial agent, duration of treatment and need of chemoprophylaxis. Even a single confirmed UTI should be taken seriously[1]. The risk of having a UTI before the age of 14 years is approximately 1-3% in boys and 3-10% in girls. Complications include renal parenchymal damage and renal scarring that can lead to hypertension and progressive renal insufficiency in later life. In children, UTI may be the first presentation of an underlying congenital anomaly of the urinary tract. Therefore, rapid diagnosis, institution of early treatment and further evaluation by imaging modalities is important to preserve the function of the growing kidney[2]. Etiological agents of UTI are variable and usually depend on time, geographical location and age of patients. However, Escherichia coli, Proteus mirabilis, Enterobacter agglomerans, Citrobacter freundii and Klebsiella pneumonia account for over 70% of cases[3,4]. Knowledge of the exact incidence and prevalence of UTI among children is essential for paediatricians because 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[5,6].

High fever with temperature of 39.5ºC or more is the single best predictive parameter[7,8]. 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[9]. 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 bedtime 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 at the Department of Pediatric, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 15 months, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

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. Children with age-2 to 14 years and urine culture positivity were included in this study. Children with **a**ge-2 to 14 years and insignificant growth in the urine culture were excluded from this study.

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 22.0 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 100 cases analyzed in the study 62 children belonged to 2-5years of age constituted 62% and 38 children belonged to 5-14 years of age constituting 38%. Table 2 shows in the total of 100 children 32 were male and 68 were female constituting 32% and 68% respectively.

Table 1: Age Distribution of patients

Age	Number	Percentage
2-5 Years	62	62
5-14 Years	38	38
Total	100	100

Table 2: Dender distribution of patients

Gender	Number	Percentage
Male	32	32
Female	68	68
Total	100	100

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

Area	Number of patients	Percentage
Urban	23	23
Rural	77	77
Total	100	100

77 children i.e., 77% came from rural area and 23 i.e., 23% from urban areas. (Table 3.)

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

social classes	Number of patients	Percentage
lower classes	65	65
middle class	30	30
upper class	5	5

Most of the cases were from lower classes with 65% and 30% incidence in middle class and 5% upper class paediatric patient was admitted our hospital during the study. (Table 4.)

Table 5 shows among 100 children 51 had fever history. 15 children had <3 days fever which is around 25.42% of total children and 3 to 5 days history was in 18 children constituting 30.51% and fever was present for >5 days in 26 children constituting 44.07%. Total fever cases summed up to 59% and are the most common symptom observed in the study. Chills and rigor were present in 42 patients with fever. Burning micturition history was present in 42 children which are around 42%. 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	59	59
<3 days	15	15
3-5 days	18	18
>5 days	26	26
Chills and rigor	42	42
Burning micturition	45	45
Increased frequency	53	53
High colored urine	8	8
Abdominal pain	45	45
Vomiting	23	23
Preputial bulging (males)	6	18.75

Increased frequency of micturition with small voids every time was present in 53 children constituting 53%. The third common symptom was abdominal pain which constituted 45%. Vomiting was present in 23 patients which are around 23% of the total. History of preputial bulging while urinating was present in 6 boys out of 32 boys which are around 18.75%.

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)	7	21.88
Vaginal synechiae (female)	5	7.35
Malformations	0	0
Facial edema	1	1
Renal angle tenderness	1	1
Suprapubic tenderness	24	24

Table 7 shows *E. coli* was grown in the urine culture of 62 children which was 62% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp*. in 18 children which are around 18%. 11 children's urine culture grew *Proteus mirabilis* which is around 11% of the total. Pseudomonas was grown in 5 children constituting 5%. Staph epidermidis growth is seen in 2 children which come around 2%. *Enterococci faecalis* was grown in 1 child which constitute 1%. Citrobacter growth was seen in 1 child, and this constitutes 1%.

Table 7: Etiology of patients

Organism	Number	Percentage
E. coli	62	62
Klebsiella	18	18
Proteus	11	11
Pseudomonas	5	5
Staph epidermidis	2	2
Enterococci fecalis	1	1
Citrobacter	1	1

Discussion

UTI was more common in children. Ineffective toilet training and the resultant ascending infection from urethra may be predisposing children of this age group for UTI. In consensus statement of Indian pediatric nephrology group, it has been mentioned that during the first year of life, male was more effected, beyond 1-2 years, there is female preponderance with male.

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[10]. 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[11]. 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[12]. Certain other organisms have siderophore systems that acquire iron from heme which is an essential bacterial micronutrient. In the present study 100 children 51 had fever history. 15 children had <3 days fever which is around 25.42% of total children and 3 to 5 days history was in 18 children constituting 30.51% and fever was present for >5 days in 26 children constituting 44.07%. Total fever cases summed up to 59% and are the most common symptom observed in the study. The third common symptom was abdominal pain which constituted 45%[13]. 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.[14] 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[15]. 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 62 children which was 62% of the total. This was the most common causative organism in the study group. This was followed by *Klebsiella spp*. in 18 children which are around 18%.11 children's urine culture grew *Proteus mirabilis* which is around 11% of the total. Pseudomonas was grown in 5 children constituting 5%. Staph epidermidis growth is seen in 2 children who come around 2%. *Enterococci faecalis* was grown in 1 child which constitute 1%. Citrobacter growth was seen in 1 child, and this constitutes 1% respectively[16]. 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.[17] 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 24% of children[18]. Majority of children presented as fever without focus on correlation with literature. All children with suprapubic tenderness dint have cystitis in USG and all children with cystitis dint have suprapubic tenderness[19]. 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[20].

Conclusion

UTI is a common childhood illness. This study shows age and gender distribution in accordance with available literature. Females were more commonly affected than males. Fever being most common presenting symptom followed by vomiting and pain abdomen.

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