Prevalence of urinary tract infection in febrile preschool children

Swatantar Singh¹, Sangeeta Parihar²*

¹Department of Pediatrics, ²Department of Gynecology, Government District Hospital, Rajouri, Jammu and Kashmir, India

Received: 18 January 2019
Accepted: 25 January 2019

*Correspondence:
Dr. Sangeeta Parihar,
E-mail: drsangeetaparihar12345@gmail.com

ABSTRACT

Background: Children with fever is a common and comprise a substantial proportion of the practice in outpatient department and emergency department. Little attention has been focused on the identification of urinary tract infection (UTI) in febrile in infants and children in the emergency department, despite recent information that suggests a high prevalence of urinary tract infections and significant associated morbidity in these patients. The present study is undertaken to estimate the prevalence of urinary tract infection in febrile preschool children (less than 5 years of age) in febrile children.

Methods: Febrile children less than 5 years attending outpatient department or admitted in Department of Paediatrics were enrolled into the study. Children below 1 month and above 5 years; any child who has received antibiotics 48 hours prior to evaluation; children with known congenital genitourinary anomalies; and were excluded from the study. Children with symptoms suggestive of UTI were interviewed using structured case record form (CRF). All symptomatic children were referred for urine routine microscopy and culture tests.

Results: The prevalence of culture positive cases for UTI was 6.36%. Male infants and female infants affected equally. But females affected more in the age between 1 years to 5 years as compared to males. Apart from fever, the commonest symptoms were dysuria, abdominal pain, vomiting, chills and rigors and loss of appetite. More than two-third of the patients with CP-UTI have E. coli as causative organism for UTI. Overall most sensitive antimicrobials were Ceftriaxone.

Conclusions: UTIs in preschool children are often having vague and variable symptoms, often fever is the only symptoms. An untreated UTI can lead to subsequent damage and impairment of renal structure and function, it is very important to diagnose and treat UTI in preschool children.

Keywords: Febrile illness, Pre-school children, Prevalence, Under five-year-old children, Urinary tract infection

INTRODUCTION

Children with fever is a common and comprise a substantial proportion of the practice in outpatient department and emergency department.¹ Little attention has been focused on the identification of urinary tract infection (UTI) in febrile in infants and children in the emergency department, despite recent information that suggests a high prevalence of urinary tract infections and significant associated morbidity in these patients.² Quite often, child had received antibiotics empirically, without adequate evaluation for urinary tract infection. Fever, however, is often the only symptom in children with urinary tract infections.³ UTI is one of the commonest bacterial illness among febrile infants and preschool children with a reported prevalence between 4.1% to 7.5%.⁴,⁵ UTI is responsible for 4 to 10% of febrile children admitted to the hospital. It is also the third
commonest infection in pediatric age group after respiratory and gastrointestinal infections. Typical urinary complaints are rare, often vague, below the age of 5 years. Most of these infections in the first 2 years of life are “occult” and most infection remains undiagnosed, unless detected in are not routinely tests. The children may be represented with characteristic features of upper and lower UTI like, abdominal pain, vomiting and fever with chills and rigors, and/or suprapubic pain. Sometimes only fever is present, and it has been accepted as a clinical marker of pyelonephritis-renal parenchymal involvement. Fever with significant bacteriuria and pyuria in children without obvious sources of infections must be presumed to be symptoms of pyelonephritis, an invasive infection of the renal parenchyma requiring prompt treatment. The studies using renal parenchyma-avid nuclear scans to determine the presence of urinary tract infection have revealed that more than 75% of children under 5 years of age with febrile urinary tract infection have pyelonephritis. Pyelonephritis leads to renal scarring in 27% to 64% of children with urinary tract infections in this age group, even in the absence of underlying urinary tract abnormalities. Most urinary tract infections that lead to scarring or diminished kidney growth occur in children younger than 4 years of age especially among infants in the first year of life. Among children under 3 years of age with recurrent urinary infections, putting them at higher risk for renal scarring, as many as one-third being asymptomatic. It is essential to identify urinary tract infections in febrile children and institute prompt treatment to reduce the potential for lifelong morbidity.

The present study is undertaken to estimate the prevalence of urinary tract infection in febrile preschool children (less than 5 years of age) in febrile children visiting Government District Hospital, Rajouri, Jammu and Kashmir.

**METHODS**

It was a cross-sectional, prospective, observational, non-interventional study, carried out to analyse the prevalence of urinary tract infection in febrile preschool children (less than 5 years of age) in febrile children visiting Government District Hospital. The study was conducted in Department of Paediatrics, Government District Hospital, Rajouri, Jammu and Kashmir between July 2014 to June 2015. The study was approved by Human Research Ethics Committee. Written informed consent was obtained from parents of children before enrolling them into the study.

**Inclusion criteria**

- Febrile children less than 5 years attending outpatient department or admitted in Department of Paediatrics, Government District Hospital, Rajouri were enrolled into the study.

**Exclusion criteria**

- Children below 1 month and above 5 years; any child who has received antibiotics 48 hours prior to evaluation; children with known congenital genitourinary anomalies; and were excluded from the study.

Children with symptoms suggestive of UTI were interviewed using structured case record form (CRF). All symptomatic children were referred for urine routine microscopy and culture tests. From all children, sample of urine was collected. In children less than 2 years of age urine was collected by a bag and in others midstream sample was collected. Urine culture was done using blood agar and Mac Conkey agar by using a 0.001 ml calibrated wire loop and observed for 48 hours. Culture proven UTI cases were started on appropriate sensitive antibiotics. The patients were advised for the follow-up. During follow up, urine culture was done whenever recurrence of UTI was suspected.

**Operational definition**

**Febrile child**

Children with history of fever (Temperature; rectal ≥38.3°C or axillary temperature ≥37.8°C).

**Urinary tract infection**

Urinary tract infection is defined as growth of a significant number of organisms of a single species in the urine, in the presence of symptoms. Significant bacteriuria is growth with a colony count of >105/ml of a single species in a mid-stream clean catch urine sample.

**Statistical analysis**

The collected data was entered in the excel sheet. The data was analysed using descriptive statistics. The test variables were compared using Chi-square test for qualitative variables and Student’s test for quantitative variables. The p-value <0.05 was considered statistically significant for difference and association between variables.

**RESULTS**

During the study period, authors have screened total 660 preschool children (under 5 years of age) with fever. Out of this total 660 febrile children, 42 children found to be culture positive cases for UTI (CP-UTI). The prevalence of culture positive cases for UTI in this study was 6.36%. In the prospect of age, 16 (38.10%) children were found to be infant and 26 (61.90%) children were found to be of age between 1 years to 5 years. Females were predominantly affected with CP-UTI in comparison of males with M:F ratio of 1:1.6 (Table 1).
Table 1: Characteristics of febrile children.

| Characteristics       | Total (N=660) | Culture positive cases (N=42) |
|-----------------------|---------------|-----------------------------|
|                       | N  | %   | N  | %   |
| **Age (years)**       |    |     |    |     |
| <1 (Infant)           | 142 | 21.52 | 16 | 38.10 |
| >1 (Non-infant)       | 518 | 78.48 | 26 | 61.90 |
| **Gender**            |    |     |    |     |
| Male                  | 364 | 55.15 | 18 | 42.86 |
| Female                | 296 | 44.85 | 24 | 57.14 |

According to Figure 1 for distribution of the culture positive cases of UTI according to age and gender, male infants and female infants affected equally with 8 cases of CP-UTI in both genders. But females affected more in the age between 1 years to 5 years as compared to males.

![Figure 1: Distribution of the culture positive cases of UTI according to age and gender.](image)

Table 2: Distribution of the culture positive cases of UTI according to symptoms (N=42).

| Symptoms                        | Culture positive cases |
|---------------------------------|------------------------|
|                                 | N  | %   |
| Fever                           | 42 | 100 |
| Dysuria                         | 18 | 42.86 |
| Abdominal pain                  | 17 | 40.48 |
| Vomiting                        | 17 | 40.48 |
| Chills and rigors               | 16 | 38.10 |
| Loss of appetite                | 12 | 28.57 |
| Increased frequency             | 11 | 26.19 |
| Irritability                    | 11 | 26.19 |
| Passing high coloured urine     | 10 | 23.81 |
| Burning micturition             | 8  | 19.05 |
| Dribbling of urine              | 6  | 14.29 |
| Cough and cold                  | 5  | 11.90 |
| Foul smelling urine             | 3  | 7.14  |

According to symptomatology (Table 2), it is obvious that all the children of study group had fever as the commonest symptom as authors have screened febrile children for diagnosis of UTI. Apart from fever, the commonest symptoms were dysuria (18, 42.86%), abdominal pain (17, 40.48%), vomiting (17, 40.48%), chills and rigors (16, 38.10%) and loss of appetite (12, 28.57%) for UTI found in the present study.

Table 3: Drug sensitivity pattern of organisms grown in urine culture.

| Drugs            | E. coli (n=30) | Klebsiella (n=9) | Proteus (n=3) | Total (n=42) | Overall percentage of sensitivity |
|------------------|----------------|------------------|---------------|--------------|----------------------------------|
|                  | S  | R  | S  | R  | S  | R  | S  | R  | S  | R  |     |                 |
| Ampicillin       | 12 | 18 | 0  | 9  | 2  | 1  | 14 | 28 | 33.33 |
| Amoxicillin      | 16 | 14 | 3  | 6  | 1  | 2  | 20 | 22 | 47.62 |
| Cotrimoxazole    | 15 | 15 | 4  | 5  | 0  | 3  | 19 | 23 | 45.24 |
| Gentamycin       | 12 | 18 | 5  | 4  | 1  | 2  | 18 | 24 | 42.86 |
| Cephalexin       | 13 | 17 | 5  | 4  | 0  | 3  | 18 | 24 | 42.86 |
| Norfloxacin      | 14 | 16 | 4  | 5  | 1  | 2  | 19 | 23 | 45.24 |
| Ceftriaxone      | 15 | 15 | 5  | 4  | 2  | 1  | 22 | 20 | 52.38 |
| Cephotaxime      | 12 | 18 | 7  | 2  | 1  | 2  | 20 | 22 | 47.62 |
| Ciprofloxacin    | 14 | 16 | 4  | 5  | 2  | 1  | 20 | 22 | 47.62 |

DISCUSSION

UTIs remain the commonest bacterial infection in childhood.18 The incidence of UTI in children at the age of 6 years of age is 1%-2% in boys and 3%-7% in girls.18 Authors have screened total 660 preschool children (under 5 years of age) with fever. Out of this total 660 febrile children, 42 children found to be culture positive cases for UTI (CP-UTI). The prevalence of culture positive cases for UTI in this study was 6.36%.

International Journal of Contemporary Pediatrics | March-April 2019 | Vol 6 | Issue 2 | Page 322
A Nigerian study found out that UTI is common in this group of children with prevalence of 9%. A cross sectional study done by Shaw and Gorelick in 1999 reported, the prevalence rates of UTI in febrile infants in the emergency department as approximately 3.5% with higher rates for white girls, uncircumcised boys, and those without another potential source of fever. Fallahzadeh et al, estimated prevalence of urinary tract infections in preschool children and reported a prevalence of 4.4%. Bauchner et al. in 1987 evaluated the frequency of urinary tract infection in 664 febrile children younger than 5 years of age and reported the prevalence as 1.7%. According to Hoberman et al, the prevalence of urinary tract infection in febrile infants was 5.3% and the prevalence in infants less than 2 months was 4.6% and in infants with no suspected urinary tract infection, with associated other illnesses the prevalence was 5.1%. The prevalence of present study is comparable to all these studies conducted all over the world.

In the prospect of age, 38.10% of children were found to be infant and 61.90% of children were found to be of age between 1 years to 5 years. Females were predominantly affected with CP-UTI in comparison of males with M:F ratio of 1:1.6. But on distribution of the CP-UTI according to age and gender, male infants and female infants affected equally with 8 cases of CP-UTI in both genders. But females affected more in the age between 1 years to 5 years as compared to males. Roberts K et al, studied 193 febrile children less than 2 years and reported a prevalence of urinary tract infection as 4.1%. The prevalence of urinary tract infection in febrile girls was 7.4%. The prevalence of urinary tract infection varies with age. During the 1st year of life, the male: female ratio is 2.8: 5.4: 1. Beyond 1-2 years, there is a striking female preponderance, with a male: female ratio of 1:10. In boys, most urinary tract infections occur in the first year of life. Approximately 3-5% of girls and 1% of boys acquire a urinary tract infection. In girls, the average age at the first diagnosis is 3 years, which coincides with the onset of toilet training.

In males, UTI is more common during neonatal period and early infancy and it gradually declines afterwards. About 8% of girls including 3% of prepubertal girls, and 2% of boys including 1% of prepubertal boys experience at least one episode of UTI by the age of 7. As the commonest symptom as authors have screened febrile children for diagnosis of UTI, it is obvious that all the children of study group had fever. The other commonest symptoms were dysuria (42.86%), abdominal pain (40.48%), vomiting (40.48%), chills and rigors (38.10%) and loss of appetite (28.57%) for UTI found in the present study. In the study done by Shetty, et al., the similar type of symptomatology found-dysuria (45%), irritability (30%), increased frequency (25%), decreased appetite (25%), and refusal of feeds (15%). Vague and variable signs and symptoms may present in early childhood as the patient becoming more specific as the child grows older. Even in the absence of specific signs and symptoms, a UTI should be included in the differential diagnosis of high-grade fever in preschool children. Asymptomatic bacteriuria may be present in about 3% of preschool age children, about one-third of these children will have some symptoms of UTI eventually.

More than two-third (71.43%) of the patients with CP-UTI have E. coli as causative organism for UTI in the present study. The other causative organisms for UTI were Klebsiella (21.43%) and Proteus (7.14%). The most common organism for UTI isolated was E. coli (80%) followed by Klebsiella in the study done by Shetty, et al. According to literature, E. coli is responsible for over 80% of pediatric UTIs. Other common Gram negative organisms responsible for UTI include Klebsiella, Proteus, Enterobacter, and occasionally Pseudomonas.

In the present study, overall most sensitive antimicrobials were Ceftriaxone (52.38%), Amoxicillin (47.62%), Cephotaxime (47.62%), Ciprofloxacin (47.62%), Cotrimoxazole (45.24%), and Norfloxacin (45.24%). In the study done by Shetty, et al, 75% of microorganisms were sensitive to ceftriaxone; 70% were sensitive to gentamycin, norfloxacin and cephalxin; and majority of the organisms were resistant to Ampicillin (55%). The usual antimicrobial choices are Cephalosporins, Amoxicillin + Clavulanic acid, or Cotrimoxazole (Trimethoprim + Sulfamethoxazole). It is very important to be aware local microorganisms and antibiotic susceptibility.

**CONCLUSION**

UTIs in preschool children are often having vague and variable symptoms, often fever is the only symptoms. An untreated UTI can lead to subsequent damage and impairment of renal structure and function, it is very important to diagnose and treat UTI in preschool children.

**Funding: No funding sources**

**Conflict of interest: None declared**

**Ethical approval: The study was approved by the Human Research Ethics Committee**

**REFERENCES**

1. Al-Eissa YA, Ghazal SS, Al-Zamil FA, Al-Salloum AA, Al-Omair AO, Al-Nasser MN. Pattern of febrile illnesses in children seen at a pediatric ambulatory care setting. J Family Community Med. 2000;7(2):61-5.
2. DePorre AG, Aronson PL, McCulloh RJ. Facing the ongoing challenge of the febrile young infant. Crit Care. 2017;21(1):68.
3. Robinson JL, Finlay JC, Lang ME, Bortolussi R, Canadian Paediatric Society, Infectious Diseases and Immunization Committee, Community
Paediatrics Committee. Urinary tract infections in infants and children: Diagnosis and management. Paediatr Child Health. 2014;19(6):315-25.
4. Hoberman A, Wald ER, Reynolds EA, Penchansky L, Charron M. Pyuria an bacteriuria in urine specimens obtained by catheter from young children with fever. J Pediatr. 1994;124:35-9.
5. Fallanazadeh MH, Alamdarbe HM. Prevalence of urinary tract infection in preschool febrile children. Irn J Med Sci. 1999;24:35-9.
6. Shaw KN, Gorlick M, McGowan KL, Yaksoe HM, Schwartz JS. Prevalence of urinary tract infection in febrile young children in the emergency department. Pediatrics. 1998;102(2):e16.
7. Alper BS, Cirry SH. Urinary tract infection in children. Am Fam Physician. 1005;72:2483-8.
8. American academy of pediatrics, committee on quality improvement, subcommittee on urinary tract infection. The diagnosis, treatment and evaluation of the initial urinary tract infection in febrile infants and young children. Pediatr. 1959;103:843-52.
9. Shaw KN, Gorlick MH. Urinary tract infection in the pediatric patient. Pediatr Clin North Am. 1999;46:6.
10. Benador D, Benador N, Siosman DO, Nussle D, Mermillod B, Girardin E. Cortical scintigraphy in the evaluation of renal parenchymal changes in children with pyelonephritis. J Pediatr. 1994;124:17-20.
11. Majd M, Rushton HG, Jantausch B, Wiedermann BL. Relationship among Vesicoureteral reflux, P-fibrinated Escherichia coli and, acute pyelonephritis in children with febrile urinary tract infection. J Pediatr. 1991;119:578-85.
12. Rushton HG, Majd M, Jantausch B, Wiedermann BL, Belman AB. Renal scarring following reflux and non reflux pyelonephritis in children: Evaluation with 99m technetium-dimercaptosuccinic acid scintigraphy. J Urol. 1992;147:1327-32.
13. Berg UB. Long term follow-up of renal morphology and function in children with recurrent pyelonephritis. J Urol. 1992;148:1715-20.
14. Cohen M. Urinary tract infections in children: Females aged 2 Through 14, first two infections. Pediatrics. 1972;50:271-8.
15. Hay AD, Birnie K, Busby J, on behalf of the DUTY team. The Diagnosis of Urinary Tract infection in Young children (DUTY): a diagnostic prospective observational study to derive and validate a clinical algorithm for the diagnosis of urinary tract infection in children presenting to primary care with an acute illness. Southampton (UK): NIHR Journals Library; 2016 Jul. (Health Technology Assessment, No. 20.51.) Chapter 1, Introduction. Available at: https://www.ncbi.nlm.nih.gov/books/NBK373506/.
16. Edelu BO, Ojinnaka NC, Ikekuna AN. Fever detection in under 5 children in a tertiary health facility using the infrared tympanic thermometer in the oral mode. Ital J Pediatr. 2011;37:8.
17. Schmiemann G, Kniehl E, Gebhardt K, Matejczyk MM, Hammers-Pradier E. The diagnosis of urinary tract infection: a systematic review. Dtsch Arztebl Int. 2010;107(21):361-7.
18. Beetz R. May we go on with antibacterial prophylaxis for urinary tract infections? Pediatri Nephrol. 2006;21(1):5-13.
19. Musa-Aisien AS, Ibadin OM, Ukoh G, Akpede GO. Prevalence and antimicrobial sensitivity pattern in urinary tract infection in febrile under-5s at a children’s emergency unit in Nigeria. Ann Trop Paediatr. 2003;23:39-45.
20. Fallahzadeh MH, Alamdarlu HM. Prevalence of urinary tract infection in preschool febrile children. Irn J Med Sci. 1999;24:35-9.
21. Bauchner H, Philipp B, Dahefsky B, Klein JO. Prevalence of bacteriuria, in febrile children. Pediatri Infect Dis. 1987;6:239-42.
22. Hoberman A, Chao HP, Keller DM, Hickey R, Davis HW, Ellis D. Prevalence of urinary tract infection in febrile infants. J Pediatr. 1993;123:17-2.
23. Roberts KB, Charney E, Sweren RJ, Ahonkhai VI, Bergman DA, couler MP. Urinary tract infection in infants with unexplained fever: A collaborative study. J Pediatr. 1983;103:864-67.
24. Jack Elder S. Urologic disorders in infants and children. In: Richard E Behrman, Kleigman RM, Jenson HB, eds. Nelson textbook of Pediatrics. Harcourt and Saunders; 2000:1621-1622.
25. Lopez Sastre JB, Aparicio AR, Coto Cotallo GD, Fernández Colomer B, Crespo Hernández M. Urinary tract infection in the newborn: clinical and radio imaging studies. Pediatr Nephrol. 2007;22(10):1735-41.
26. Bauer R, Kogan BA. New developments in the diagnosis and management of pediatric UTIs. Urologic Clin North Am. 2008;35(1):47-58.
27. Shetty PN, Prashanth S, Jagadashwara S. Prevalence of urinary tract infection among preschool febrile children attending the pediatric OPD. Int J Contemp Pediatr. 2017;4(2):561-7.
28. Habib S. Highlights for management of a child with a urinary tract infection. Int J Pediatr. 2012;2012:943653.
29. Bhat RG, Katy TA, Place FC. Pediatric urinary tract infections. Emerg Med Clin N Am. 2011;29:637-53.
30. Zorc JJ, Kiddoo DA, Shaw KN. Diagnosis and management of pediatric urinary tract infections. Clinical Microbiology Reviews. 2005;18(2):417-22.
31. UTI Clinical practice guidelines for the diagnosis and management of initial UTI in febrile infants and children 2-24 months of age. Pediatr. 2011;128:595.