## **Research Article**

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20162386

# Study of culture and sensitivity pattern of urinary tract infection in febrile preschool children in a tertiary care hospital

Ashoka C., Kumar GV\*, Ananda Kumar TS, Viswanatha Kumar HM

Department of Pediatrics, Sri Siddhartha Medical College, Tumkur, Karnataka, India

Received: 03 June 2016 Accepted: 02 July 2016

\*Correspondence: Dr. Kumar GV,

E-mail: kumargowripura@yahoo.co.in

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## **ABSTRACT**

**Background:** Urinary tract infection (UTI) is the most common bacterial illness among febrile infants and young children, with a reported prevalence between 4.1% and 7.5%. Most infections remain undiagnosed if tests are not routinely performed to detect them.

**Methods:** The present study was carried out in G Kuppuswamy Naidu Memorial hospital, over a period of one year. Five hundred febrile children between the ages of 3 years to 6 years with fever who attended pediatric outpatient department formed the study group. Detailed history was taken and clinical examination was done in all the cases to find out the cause of fever with special emphasis given to symptoms of UTI.

**Results:** Five hundred febrile children between the ages of 3 years to 6 years with fever who attended pediatric outpatient department formed the study group. Out of 500 children's, 20 cases were diagnosed to have UTI as judged by the presence of significant bacterial growth in urine culture. There was slight female preponderance in culture positive cases with male to female ratio of 1:1.50. In culture positive cases, 12 (60%) patients had bacteria in their urine where as in culture negative cases only 5 (1.04%) patients had bacteriuria which was statistically significant. However, 8 (40%) cases with UTI would have been missed if only presence of bacteria on microscopy was taken as a method of diagnosis for UTI. In diagnosing UTI, pyuria >10 WBC/HPF was more specific with higher positive predictive value than the conventional >5 WBC/HPF. Bacteriuria occurring along with pyuria had a specificity of 98.3% in predicting infection. The most common organism isolated from patients with UTI was E.coli followed by klebsiella

**Conclusions:** Urinary tract infection should be considered as a potential cause of fever in children below six years of age. As the febrile children with UTI usually present with nonspecific signs and symptoms, urine culture should be considered as a part of diagnostic evaluation.

Keywords: UTI, Febrile, Klebsiella

## INTRODUCTION

Urinary tract infection (UTI) is the most common bacterial illness among febrile infants and young children, with a reported prevalence between 4.1% and 7.5%. It is the third most common infection in the pediatric age group, ranking next to respiratory and gastrointestinal infections and account for 4% to 10% of febrile children admitted to hospitals. Urinary complaints are rare and only after 5 years of age, the typical triad of abdominal pain, vomiting and fever with

chills, rigors or suprapubic pain are common presentation of upper and lower UTI. It is often over looked, especially in infants and young children in whom the symptoms are vague and don't focus the attention on urinary system. The presence of fever has long been considered a finding of special importance in infants and young children with UTI, because it has been accepted as a clinical marker of renal parenchymal involvement (Pyelonephritis).

The majority of these infections in the first 2 years of life are "occult". Most infections remain undiagnosed if tests are not routinely performed to detect them. Otherwise unexplained renal scarring has been cited as one of the most common causes of end-stage renal disease (ESRD) and is an established risk factor for subsequent hypertension. Thus, the high incidence of undiagnosed, untreated UTI in young children is a cause for clinical and public concern. Up to 50% of the long term sequelae of UTI in infants and young children appear preventable by urine testing. Because of these considerations, paediatricians and other clinicians who examine young febrile children often consider the use of urine testing (urinalysis, urine culture or both) to detect an occult UTI.

Although microscopic urinalysis for leukocytes and bacteria is often used as a diagnostic tests for UTI, the sensitivity, specificity and predictive values of these tests have varied greatly according to the patient population studied, the definition of a positive culture result and the method of urinalysis.<sup>2, 9-11</sup> The difficulty of correctly diagnosing UTI in febrile children is evident in a study by Bauchner et al, in which all episodes of illness ultimately diagnosed as UTI initially has been assigned other diagnosis, including acute otitis media, gastroenteritis, upper respiratory tract infection and bronchiolitis. 12 Various studies also have shown that routine culture in febrile children with clinical evidence of other illness give high positive yields.<sup>1,13</sup> Hence, a high index of suspicion should be maintained by practicing paediatricians during the first 5 years and urine culture ordered whenever required. In view of the above concern, this study has been under taken.

## **METHODS**

The present study was carried out in G Kuppuswamy Naidu Memorial hospital, over a period of one year. Five hundred febrile children between the ages of 3 years to 6 years with fever who attended pediatric outpatient department formed the study group. Detailed history was taken and clinical examination was done in all the cases to find out the cause of fever with special emphasis given to symptoms of UTI. Necessary investigations were carried out to find the cause of fever and all the data were recorded in a specially designed proforma for this study. Perineum and genitalia were washed with soap and water. A freshly voided clean catch mid-stream urine sample was collected in an autoclaved glass bottles for urinalysis and urine culture. Urinalysis was done within half an hour after obtaining urine sample and the same specimen was immediately transported to the department of microbiology for urine culture. Sensitivity, specificity and positive and negative predictive values were calculated for pyuria and bacteriuria in relation to urine culture results as the validating standard. Relationships between variables were analysed by using the chi-square test, 't' test, and 'z' test wherever necessary.

#### RESULTS

Out of 500 children's, 20 cases were diagnosed to have UTI as judged by the presence of significant bacterial growth in urine culture. There was slight female preponderance in culture positive cases with male to female ratio of 1:1.50 (Table 1). However, there was no statistically significant difference in culture positive cases among male and female children.

Table 1: Distribution of culture positive cases of UTI in children.

Sex	Total No.	Culture positive cases			
		Number Percentage			
Males	280	8	2.9		
Females	220	12	5.5		
Total	500	20	4.0		

Z = 1.41; P > 0.05 (NS)

Table 2: Sensitivity, specificity and predictive values of microscopic urinalysis in identifying positive urine culture results.

Component	Sensitivity (%)	Specificity (%)	PPV (%)	NPU (%)
>5 WBC/HPI	85	88	25	99.8
>10 WBC/HPF	95	98.5	57.9	98.1
>20 WBC/HPF	25	99.6	71.4	97.0
Any bacteria	60	99	70.6	98.3
Combined pyuria and bacteriuria	60	99	70.6	98.3

Table 3: Organisms grown in culture positive cases (n = 20).

Organisms	Total No. of cases (C)	Percentage
E.coli	16	80
Klebsiella	3	15
Proteus	1	5
Total	20	100

Prevalence of UTI in febrile preschool school in the age group of 3-6 years was 2.9% in males and 5.5% in females with overall estimated prevalence of 4%. About 75 (15%) cases had temperature >39.3°C of which 6 patients had UTI. Next to fever, dysuria and vomiting were the common symptoms. Out of the 7 patients with vomiting, 4 cases had gastroenteritis. Other nonspecific symptoms like irritability were also noted. Out of the 20 patients with UTI, 6 (30%) cases had ill and toxic appearance on clinical examination. 25% of cases with UTI had no other signs other than fever. Two patients with UTI had phimosis. Out of 20 patients with UTI, 14

(70%) cases had a provisional diagnosis other than UTI. This suggests that 14 children with UTI would have been missed if urine culture was not taken as a routine diagnostic method of evaluation. Nineteen (95%) patients with UTI and 58 (12%) cases without UTI had pus cells >

5 per HPF which was statistically significant. This suggests that 58 (12%) children without UTI would have been considered as infected if only pyuria was taken as a diagnostic method for UTI.

Table 4: Antibiotic sensitivity pattern of microorganisms (n = 20).

Drugs	E.Coli		Klebs	siella	Proteu	IS	Total		Overall percentage of sensitivity
	S	R	S	R	S	R	S	R	
Ampicillin	8	8	-	3	1	-	9	11	45
Cotrimoxazole	8	8	2	1	-	1	10	10	50
Gentamycin	11	5	2	1	1	-	14	6	70
Cephalexin	11	5	3	-	-	1	14	6	70
Norfloxacin	12	4	2	1	-	1	14	6	70
Ceftriaxone	12	4	2	1	1	-	15	5	75
Cephotaxime	10	6	3	-	1	-	14	6	70
Ciprofloxacin	10	6	2	1	1	-	13	7	65

Table 5: Comparative studies of urine microscopy for pus cells.

Author	No. of specimen studied	Positive microscopic criteria	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Goldsmith and Campos <sup>17</sup>	1010	> 5WBC/HPF	82	81	23	98
Lohr et al <sup>11</sup>	689	> 5WBC/HPF	80.4	84.3	47.1	96.1
Hoberman et al <sup>1</sup>	856	>5WBC/HPF	54	96	45	97
Matthai J and Ramaswamy <sup>10</sup>	356	>5 WBC/HPF	84	66.6	79	73.5
Present study	500	>5 WBC/HPF	85	88	25	99.8

Table 6: Comparative studies of urine microscopy for bacteria.

Author	No. of specimen studied	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Lohr et al <sup>11</sup>	689	99	71	37.2	99.8
Hoberman et al <sup>1</sup>	856	86	63	11	99
Hoberman et al <sup>2</sup>	2181	91	96.6	57.2	99.7
Matthai J and Ramaswamy <sup>10</sup>	376	78	96	96.7	74.22
Present study	500	60	99	70.6	98.3

Table 7: Comparative studies of urine microscopy for combined pyuria and bacteriuria.

Author	No. of specimen studied	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Shaw et al <sup>69</sup>	491	96	45	15	99
Hoberman et al <sup>9</sup>	698	65.6	99.2	80.8	98.4
Lohr et al <sup>11</sup>	689	99	65.1	33	99.7
Present study	500	60	99	70.6	98.3

In culture positive cases, 12 (60%) patients had bacteria in their urine where as in culture negative cases only 5 (1.04%) patients had bacteriuria which was statistically significant. However, 8 (40%) cases with UTI would have been missed if only presence of bacteria on microscopy was taken as a method of diagnosis for UTI. In diagnosing UTI, pyuria > 10 WBC/HPF was more specific with higher positive predictive value than the conventional > 5 WBC/HPF (Table 2).

Bacteriuria occurring along with pyuria had a specificity of 98.3% in predicting infection. The most common organism isolated from patients with UTI was E. coli followed by Klebsiella (Table 3).

Majority of the organisms were resistant to Ampicillin (55%). 75% of microorganisms were sensitive to ceftriaxone. 70% were sensitive to gentamycin, norfloxacin and cephalexin (Table 4).

## **DISCUSSION**

Urinary tract infection is a common problem in the pediatric age group and is a significant risk factor for long term sequelae. The clinical signs and symptoms of UTI are nonspecific and vague in the first 6 years of life. It may be present in febrile children with other illnesses, without clinical evidence of UTI. Such infection, if untreated can lead to subsequent renal scarring and is an established risk factor for end stage renal disease.

Out of the 500 febrile children who attended pediatric OPD, 20 patients had UTI giving an overall prevalence of 4%. Study by Sunitha V et al showed an overall prevalence of UTI was 4%. The showed an overall prevalence of UTI was 4%. The prevalence of urinary tract infection in febrile young children. In the present study, the prevalence of UTI showed female preponderance with a male to female ratio of 1:1.5. However, overall male to female ratio of 1:1.5 was not statistically significant. Similar observation has been made by Singh S D et al. In the present study, 19 (95%) patients with UTI and 58 (12.08%) cases without UTI had pus cells >5/HPF which was statistically significant (<0.05), 58 (12.08%) cases without UTI would have been considered as infected if only pyuria was taken as a diagnostic method for UTI.

In the present study, we found that pyuria defined as >5 WBC per HPF had a sensitivity of 85% and specificity of 88%. However positive predictive value was low (25%). These findings correlate well with the study by Lohr et al who defined pyuria as > 5 WBC per HPF in centrifuged urine. Goldsmith et al recorded a sensitivity of 82% and specificity of 81% while Hoberman et al obtained figures of 54% and 96% respectively (Table-5).

In the present study, 12 (60%) patients with UTI and 5 (1.04%) patients without UTI had bacteria in their urine which was statistically significant. However, 8 (40%) cases with UTI would have been missed if presence of

bacteria alone on microscopy was taken as a method of diagnosis for UTI. Thus, absence of bacteria on microscopy does not rule out the UTI.

Urine microscopy for bacteria significantly improves the reliability of urinalysis for detection of UTI, with a sensitivity of 60% and specificity of 99%. This is similar to observations made by Matthai J et al who noted sensitivity of 78% and specificity of 96% using centrifuged urine sediments (Table 6). Bacteriuria occurring along with pyruia had a specificity of 98.3% in predicting infection which is similar to the observation made by Hoberman et al (Table 7).9 Although microscopic urinalysis cannot substitute for a urine culture to document the presence of UTI, but it may be valuable in selecting patients for prompt initiation of antibiotic therapy while awaiting the results of urine culture. The most common organism isolated from patients with UTI was E.coli, (80%) followed by Klebsiella (15%). This is in accordance with most of the previous studies. Majority of the organisms (55%) were resistant to ampicillin with a slightly better sensitivity to cotrimoxazole (50%). 75% of microorganisms were sensitive to ceftriaxone. This suggests a need to do repeat urine culture to confirm bacteriological cure as most of the organisms are resistant to commonly used antibiotics.

## **CONCLUSION**

Urinary tract infection should be considered as a potential cause of fever in children below six years of age. As the febrile children with UTI usually present with nonspecific signs and symptoms, urine culture should be considered as a part of diagnostic evaluation. High yield was obtained whenever UTI was suspected or in patients with fever with no apparent source and in female children with gastroenteritis. Hence urine culture should be done routinely in such patients. Urine microscopy for bacteria significantly improves the reliability of microscopic urinalysis for detection of UTI, particularly when one combines this with examination of the urinary sediment, for pyuria. However, positive results neither detect all patients with UTI nor the negative test completely rules out infection. Hence, urine culture is the gold standard for diagnosis of UTI in children.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

#### **REFERENCES**

- Hoberman A, Chao HP, Kellen DM, Hickey R, Davis HW, Ellis D et al. Prevalence of urinary tract infection in febrile infants. J Pediatr. 1993;123:17-23
- 2. 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;124:513-9.
- 3. Fallanzadeh MH, Alamdarbe HM. Prevalence of urinary tract infection in preschool febrile children. Irn J Med Sci. 1999;24:35-9.
- 4. Shaw KN, Gorelick M, McGowan KL, Yakscoe HM, Schwartz JS. Prevalence of urinary tract infection in febrile young children in the emergency department. Pediatrics. 1998;102:e16.
- 5. Alper BS, Cirry SH. Urinary tract infection in children. Am Fam Physician. 2005;72:2483-8.
- 6. 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.
- Smellie JM, Poulton A, Prescond NP. Retrospective study of children with renal scarring associated with reflux and urinary infection. BMJ 1994; 308:1193-6.
- 8. Kramer MS, Tange SM, Drummond KN, Mills EL. Urinary testing in young febrile children: A risk benefit analysis. J Pediatr. 1994;125:6-13.
- 9. Hoberman A. Enhanced urinalysis as a screening test for urinary tract infection. Pediatr. 1991;91:1197-9.
- 10. Matthai J, Ramasway M. Urinalysis in urinary tract infection. Indian J Pediatr. 1995;62:713-6.
- 11. Lohr JA, Portilla MG, Gender TG, Dunn ML, Dudley SM. Making a presumptive diagnosis of urinary tract infection by using a urinalysis

- performed in an on-site laboratory. J Pediatr. 1993;122;22-5.
- 12. Barchner H, Philipp B, Darhgsky B. Prevalance of bacteriuria in febrile children. Pediatr Infect Dis J. 1987;6(3):239-42.
- 13. Sood S, Upadhyaya P, Kapil A, Lodha R, Jain Y, Bagga A. An indigenously developed nitrite kit to Aid in the diagnosis of urinary tract infection. Indian Pediatr. 1999;36:887-90.
- 14. Sunita V, Siva Sankara Murty YV, Sai Sunil Kishore M, Tarakeswara Rao P, Madhusudhan Rao K, Pundarikaksha V. Prevalence of Urinary Tract Infection in Febrile children. International journal of health research in modern integrated medical sciences. 2015;2(2):33-8.
- 15. Shaw KN, Gorelick MH. Urinary tract infection in the pediatric patient. Pediatr Clin North Am. 1999;46:1111-24.
- 16. Singh SD, Madhup SK. Clinical Profile and Antibiotics Sen¬sitivity in Childhood Urinary Tract Infection at Dhulikhel Hospital. Kathmandu Univ Med J. 2013;44(4):319-24.
- Goldsmith BM, Campos JM. Comparison of urine dipstick, microscopy and culture for the diction of bacteriuria in children. Clin Pediatr. 1990;29:214-8.

Cite this article as: Ashoka C, Kumar GV, Ananda Kumar TS, Viswanatha Kumar HM. Study of culture and sensitivity pattern of urinary tract infection in febrile preschool children in a tertiary care hospital. Int J Contemp Pediatr 2016;3:1032-6.