Original Article

Routine Urine Culture in Febrile Young Children

Pediatrics Section

CHANDRASHEKAR GOPAL SHETTIGAR, DIVAKAR RAO, PAVAN HEGDE, SANTHOSH SOANS

ABSTRACT

Objective: To assess the usefulness of the routine urine culture in febrile young children.

Setting: Tertiary care teaching hospital

Design: One year's prospective study from October 2009 to September 2010

Patients: 334 febrile young children who were less than 5 years of age, who were admitted to the paediatric ward.

Results: Out of 334 febrile children, 27 cases were diagnosed to have UTI , with overall estimated prevalence of 8.08%. Of the 27 patients with UTI, 17 (62.96%) cases had a provisional diagnosis which was other than UTI. One or the other symptoms which were referable to the urinary tract were present only in 52% of the patients with UTI. In 24% of the children with UTI, no other sign which was referable to the urinary tract was present, other than fever. A low yield was obtained in patients with respiratory infection (2.18%), neuroinfection (3.70%) and with enteric fever (3.84%). Of the 52 patients with gastroenteritis (GE), 5(9.61%) cases had UTI. Female patients with GE are particularly at an increased risk of UTI (23.52%). A high yield was obtained in patients with a provisional diagnosis of UTI (47.61%). Out of 31 patients who presented with fever with no apparent source, 7(22.58%) cases showed a significant growth on urine culture.

Conclusion: Urinary tract infection should be considered as a potential cause of fever in children below 5 years of age. A high yield was obtained whenever UTI was suspected, or in patients with fever with no apparent source and in female children with gastroenteritis.

Key Words: Febrile, urine culture, urinary tract infection, young children

KEY MESSAGE

- As febrile young children with UTI usually present with nonspecific signs and symptoms, the paediatricians should not hesitate to ask for the urine culture as a routine investigation in such patients until more sensitive techniques are available for the rapid diagnosis of UTI.

INTRODUCTION

Urinary tract infection (UTI) is a common bacterial illness among febrile young children, with a reported prevalence between 5.3% and 9.0% [1, 2, 3, 4, 5]. The clinical signs and symptoms of UTI are nonspecific and vague in the first 5 years of age. It may be present in febrile children with other illnesses, without any clinical evidence of UTI. Such infections if untreated can lead to subsequent renal scarring and are established risk factors of end stage renal disease. Thus, the high incidence of undiagnosed, improperly treated UTIs in young children is a cause of clinical and public concern.

The difficulty of correctly diagnosing UTIs in febrile children was evident in a study by Bauchner et al [6], in which all the episodes of febrile illnesses which were ultimately diagnosed as UTIs, had initially been assigned other diagnoses, including acute otitis media, gastroenteritis, upper respiratory tract infections and bronchiolitis. Various other studies from abroad have also shown that the routine urine culture in febrile children with a clinical evidence of other illnesses gave high positive yields [1, 2, 4, 6, 7, 8]. However, the precise data on the prevalence and the usefulness of the routine urine culture in febrile young children is not available from the developing countries. With a view on the above concerns, this study was under taken.

METHODS

Inclusion Criteria: Febrile children who were less than 5 years of age, who were admitted to the paediatric ward with an axillary temperature of ≥ 37.4ºC within 24 hours of admission, were included in the study.

Exclusion Criteria: Those children who had received antibiotics or had undergone bladder catheterization within 48 hours prior to the admission were excluded.

A detailed history was taken and clinical examination was done in all the cases to find out the cause of the fever, with special emphasis being given to the symptoms of UTI. Necessary investigations were carried out to find the cause of the fever.

The perineum and the genitalia were washed with soap and water. A freshly voided, clean catch, mid stream urine sample was collected in sterile containers for urinalysis and culture. The urine was collected by catheterization in those children who could not void urine within 24 hours after admission, after taking aseptic

precautions. Urinalysis was done within half an hour and the same specimen was immediately transported to the Department of Microbiology for urine culture.

The urine was cultured on CLED agar and Mac Conkey's agar by using a 0.001ml calibrated wire loop and the plates were observed for 48 hours. Colony counts which were >50 x 10^3/mland > 10^5/ml of single organisms in catheterised and mid stream urine samples respectively, were considered to be diagnostic of urinary tract infections [9]. A high yield was deemed to be present if >5% of the cultures yielded significant growth [10, 11, 12].

urine cultures were repeated 48 hours after starting the appropriate antibiotic therapy if there was no clinical response and once again, after the completion of the antibiotic course, to detect the bacteriological response to the treatment. Each case of UTI was treated and followed up as per standard protocols [10].

Statistical Analysis: Correlations between the variables were analysed by using the Chi-square test, the't' test and the 'z' test wherever necessary. P values < 0.05 were taken as statistically significant. The analysis was done by using the SPSS version 17.0 statistical software.

RESULTS

Out of 334 febrile children, 27 cases were diagnosed to have UTI with an overall estimated prevalence of 8.08%. The results of this study were analysed as in [Table/Fig 1]

Age (months)	Male	Female	Total no. of cases	Culture positive cases			%
				Male	Female	Total	
0-12	69	44	113	5	4	9	7.96
13-60	122	99	221	8	10	18	8.14
Total	191	143	334	13	14	27	8.08

[Table/Fig-1]: Age and sex wise distribution of cases P > 0.05

Temperature (°C)	Mean ± SD (°C)	Total no. of cases	Culture positive cases	Percentage
37.4-38.3	37.84±0.39	132	6	4.54
38.4-39.3	38.83±0.28	144	12	8.33
>39.3	40.07±0.50	58	9	15.51

[Table/Fig-2]: Temperature at the time of presentation P > 0.05

There was a slight male preponderance in the culture positive cases in the age group of < 12 months (male to female ratio- 1.25:1) and a female preponderance in the age group of 13 to 60 months (male to female ratio- 1:1.25), with an overall male to female ratio of 1:1.07. However, there was no statistically significant difference in the culture positive cases among the male and female children.

About 58 (15.43%) cases had temperature which was > 39.3°C, of which 9 patients had UTI. However, there was no statistically significant difference among the three groups of temperatures [Table/Fig 2]. After fever, dysuria (44%) and vomiting (36%) were the common symptoms. One or the other symptoms which were referable to the urinary tract were present only in 52% of the patients with UTI. In 24% of the children with fever, no other sign which was referable to the urinary tract was present. Other non specific symptoms like the refusal of feeds (16%), loss of appetite (32%) and irritability (28%) were also noted. [Table/Fig 3] & multiple bar diagram [Table/Fig 4] showing provisional diagnosis and UTI cases.

Of the 27 patients with UTI) 17 (62.96%) cases had a provisional diagnosis other than UTI. This suggests that 17 children with UTI would have been missed, if the urine culture was not taken as a routine diagnostic method of evaluation. The most common organism which was isolated from the patients with UTI was *E. coli* (80%), followed by *Klebsiella* (16%). A majority of the organisms were resistant to co-trimoxazole (64%) and ampicillin (54%), with a better sensitivity to ceftriaxone (93%) and cefixime (90%).

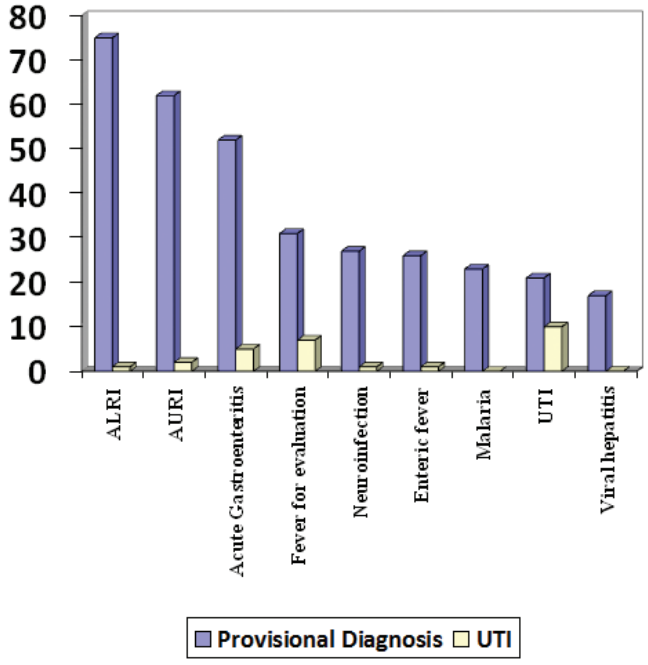
DISCUSSION

Over four decades ago, North [11] recognised that acute febrile illnesses in children might indicate hidden UTIs, but he dismissed this notion as he could find no growth in 26 consecutive samples. Larger and more recent studies which were carried by Roberts et al[12], Bonadio [13] and Hoberman et al [2] from abroad and by Dharnidharka et al [4, 7] from India have refuted this. Among 193

febrile children who were younger than 2 years, Roberts et al found that the rate of confirmed UTI was 4.1%. Similarly, Dharnidharka et al [4], Hoberman et al [2] and Bonadio [13], in their studies on febrile infants, reported a prevalence of 5.4%, 5.3% and 5.53% respectively and have recommended routine urine culture as a part of the diagnostic evaluation. However, Bauchner et al [6] had reported a low prevalence of (1.75%) in 664 febrile children who were younger than 5 years. This low prevalence may be due to the

Diagnosis	Male	Female	Total no. of cases	Culture positive cases			Percentage	P value
				Male	Female	Total		
ALRI*	45	30	75	1	0	1	1.33	>0.05
AURI†	38	24	62	1	1	2	3.22	>0.05
Acute gastroenteritis	35	17	52	1	4	5	9.61	<0.05
Fever for evaluation	17	14	31	4	3	7	22.58	>0.05
Neuroinfection	14	13	27	1	0	1	3.70	>0.05
Enteric fever	12	14	26	1	0	1	3.84	>0.05
Malaria	11	12	23	0	0	0	0	>0.05
UTI	11	10	21	4	6	10	47.61	>0.05
Viral hepatitis	8	9	17	0	0	0	0	>0.05
Total	191	143	334	13	14	27		

[Table/Fig-3]: Causes of fever depending on provisional diagnosis



[Table/Fig 4]: Multiple bar diagram showing provisional diagnosis and UTI cases.

exclusion of those patients whose chief complaint was dysuria. In contrast to this, dysuria was the most common symptom (44%) in our study. In a study by Zorc et al [5], infants with a maximum recorded temperature of ≥39 ˚C had a higher rate of UTI (16.3%) than other infants (7.2%). We also found that 15.51% of the children with UTI had a temperature which was >39.3˚C. However, there was no statistically significant difference among the three groups of temperatures.

In the present study, 17(62.96%) cases had a provisional diagnosis other than UTI, such as gastroenteritis, respiratory infection, etc. This suggests that 17 children with UTI would have been missed, if urine culture was not taken as a routine diagnostic method of evaluation. However, routine urine culture may not be beneficial in all the patients with fever.

Of the 137 patients with respiratory infections, only 3(2.18%) cases had UTI. This low yield is similar to the findings of the studies which were done by Bauchner et al [6] and Dharnidharka et al [4], who have shown a prevalence of 1.27% and 1.25% respectively. Routine urine cultures in such patients are not justified.

Of the 48 cases with gastroenteritis, 5(9.61%) patients had UTI. Female patients with gastroenteritis were particularly at an increased risk of getting UTIs (23.52%), which was statistically significant. This observation was in accordance with the findings of the studies which were done by Dharnidharka et al [4] and Srivaths et al [13], who reported a high prevalence of 25% and 40% respectively and recommended routine urine culture in such patients. Heavy periurethral colonization which is often associated with perineal contamination following gastroenteritis will explain the high degree of prevalence in these patients.

Out of 21 patients with a provisional diagnosis of UTI, 10 (47.61%) cases had culture proven UTI, which was similar to the findings of a study by John Matthai et al [14], who found it in 60% of patients with suspected UTI.

Seven (22.58%) cases who presented with fever with no apparent source, had UTI which represented a high yield. In a retrospective study on 508 children with fever of uncertain causes, Buys et al [15] reported significant bacteruria in 44(8.66%) children. Similarly, Roberts et al [12] and Shaw et al [16] had reported a high prevalence of UTI in children with no definite source of fever and recommended urine culture in such patients.

In the present study, one patient each with a provisional diagnosis of neuroinfection and enteric fever had UTI. Both Bauchner et al and Dharnidharka et al [4] had shown the absence of UTI in any of the patients with neuroinfection. In another study involving 28 children with enteric fever, Dharnidharka et al [7] had found 2 cases with positive urine cultures. In our study, no patients with malaria and viral hepatitis had UTI, which was similar to the observations made by Dharnidharka et al [7]. Hence, the routine urine culture in these patients is not useful.

CONCLUSION

Urinary tract infections should be considered as a potential cause of fever in children below 5 years of age. A high yield was obtained whenever UTI was suspected or in patients with fever with no apparent source and in female children with gastroenteritis.

REFERENCES

[1] Crain EF, Gershel JC. Urinary tract infection in febrile infants younger than 8 weeks of age. *Paediatrics* 1990; 86(3):363-367.
[2] Hoberman A, Chao HP, Keller DM, Hickey R, Davis HW, Ellis D. Prevalence of urinary tract infection in febrile infants. *J Pediatr* 1993; 123(1): 17-23.
[3] Shaikh N, Morone NE, Bost JE, Farrell MH. Prevalence of Urinary Tract Infection in Childhood: A Meta-Analysis. *Pediatr Infect Dis J* 2008; 27(4): 302-308.
[4] Dharnidharka VR, Kandoth PW. Prevalence of bacteriuria in febrile infants. *Indian Pediatr* 1993; 36: 887-890.
[5] Zorc JJ, Levine DA, Platt SL, Dayan PS, Macias CG, Krief W, et al. Clinical and demographic factors associated with urinary tract infection in young febrile infants. *Paediatrics* 2005; 116(3):644-8.
[6] Bauchner H, Philip B, Dashefsky B, Klein JO. Prevalence of bacteriuria in febrile children. *Pediatr Infect Dis J* 1987; 6: 239-242.
[7] Dharnidharka VR, Kandoth PW. Asymptomatic bacteriuria in children with acute febrile illness. *Bom Hosp J* 1993; 35: 187-190.
[8] Hoberman A, Wald ER. Urinary tract infection in young febrile children. *Pediatr Infect Dis J* 1997; 16: 11-17.
[9] Consensus Statement on Management of Urinary Tract Infections, Indian Paediatric Nephrology group, Indian Academy of Paediatrics. *Indian Pediatr* 2001; 38: 1106-1115.
[10] American Academy of Paediatrics, 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. *Paediatrics* 1999; 103: 843- 852.
[11] North AF. Bacteruria in children with acute febrile illness. *J Pediatr* 1961; 63: 408-411.
[12] Roberts KB, Charney E, Sweren RJ, Ahonkhai VI, Bergman DA, Coulter MP, et al. Urinary tract infection in infants with unexplained fever: a collaborative study. *J Pediatr* 1983; 103: 864-867.
[13] Srivaths PR, Rath B, Prakash SK, Talukdar B. Usefulness of screening febrile infants for urinary tract infection. *Indian Pediatr* 1996; 33: 218-220.
[14] John Matthai, Ramaswamy M. Urinalysis in urinary tract infection. *Indian J Pediatr* 1995; 62: 713-716.
[15] Buys H, Pead L, Hallett R, Maskell R. Suprapubic aspiration under ultrasound guidance in children with fever of undiagnosed cause. *Br Med J* 1994; 308: 690-692.
[16] Shaw KN, Gorelick M, McGowan KL, Yakscoe MN, Schwartz JS. Prevalence of urinary tract infection in febrile young children in the emergency department. *Paediatrics* 1998; 102: E16.

AUTHOR:
1. Dr. Chandrashekar Gopal Shettigar
2. Dr. Divakar Rao
3. Dr. Pavan Hegde
4. Dr. Santhosh Soans

NAME OF DEPARTMENT(S)/INSTITUTION(S) TO WHICH THE WORK IS ATTRIBUTED:
Department of Paediatric, A.J. Institute of Medical Sciences, Kuntikana, Mangalore.

NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr Chandrashekar GS
Asst. Professor, Dept. of Paediatrics, A.J. Institute of Medical Sciences, Kuntikana, Mangalore-575004, India.
Ph: 09448857548, Facsimile numbers: 0824-2225541
E-mail address: drchandru2003@rediffmail.com

DECLARATION ON COMPETING INTERESTS:
No competing Interests.

Date of Submission: **Mar 25, 2011**
Date of Peer Review: **Mar 29, 2011**
Date of Acceptance: **Mar 31, 2011**
Date of Publishing: **June 13, 2011**