



A Study Of Prevalence Of Urinary Tract Infection Among Preschool Febrile Children Attended To Pediatric Opd At Kims Amalapuram

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Abstract

Background: 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 six years of age.

Aim of the study :The present study was undertaken to know the prevalence of urinary tract infection in 250 preschool febrile children.

Methods: This is a cross-sectional study in which 250 preschool febrile children aged three years to six years who attended pediatric OPD were selected between 2018-2019. A detailed history was taken, and a clinical examination was done in all the cases to find out the cause of fever. 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.

Results: Prevalence of UTI in febrile preschool children in the age group of 3-6 years was 2.9% in males and 5.5% in females with the overall estimated prevalence of 4%. The above 50% of the cases belonged to grade V socioeconomic status. Next, to fever (100%), dysuria (40%), and vomiting (40%) were the common symptoms. The most common organism isolated from patients with UTI was E.coli. 80% of microorganisms were sensitive to ceftriaxone. Ultrasonographic features suggestive of acute pyelonephritis found in 20% of cases with UTI. MCU showed VUR in 1 case.

Conclusion :UTI should be considered as a potential cause of fever in children below 6 yrs of age. As the febrile children with UTI usually present with nonspecific signs and symptoms, a urine culture can be considered as a part of diagnostic evaluation. Urine Culture is the gold standard for the diagnosis of UTI in children. Parents should be educated about the importance of UTI and its long term complications so that they bring the children voluntarily for regular follow up.

Keywords: Urinary tract infection; Febrile children; Urine culture.

Introduction

Urinary tract infection is one of the most frequent bacterial illnesses among febrile infants and young children, with an estimated prevalence between 4.1% and 7.5%.^{1,2,3,4,5} It is the third most common infection in the pediatric age group, rank next to respiratory

and gastrointestinal infections and accounts for four to ten percent of febrile children admitted to hospital.⁵ Urinary complaints are rare and only occur after five years of age. The typical triad of abdominal pain, fever with chills, rigors, vomiting, and

suprapubic pain are common presentations of upper and lower UTI. It is often overlooked, especially in infants and young children, in whom the symptoms are vague and don't focus the attention on the urinary system. The presence of fever has long been preferred a finding of particular importance in infants and young children with UTI as it has been accepted as a clinical marker of renal parenchymal involvement (Pyelonephritis).⁶ UTI in children needs more attention because of the acute and chronic complications of it in children, which is not seen routinely in adults. The majority of these infections in the first two years of life are "occult" and that most infection remains undiagnosed if the tests are not routinely performed to detect them. Otherwise, renal scarring has been cited as one of the most common causes of end-stage renal disease (ESRD). It is also an established risk factor for subsequent hypertension.⁷ Thus, the high incidence of undiagnosed and untreated UTI in young children is a cause for clinical and public concern. It is understood that Up to 50% of the long term sequelae of UTI can be preventable by urine testing.⁸ Because of these considerations, pediatricians and other clinicians who examine the young febrile infants and children often consider the use of urinary testing such as a urinalysis, urine culture, or both of them to detect an occult UTI. Although microscopic urinalysis for leukocytes and bacteria is often used as a diagnostic test for UTI. But the sensitivity, specificity and predictive values of these tests have significantly varied according to the patient population studied, the definition of a positive culture result and the method of urinalysis.^{2,9,10,11} The difficulty of correctly diagnosing UTI in febrile children was evident in a study by Bauchner *et al.*, in which all episodes of illness ultimately diagnosed as UTI initially 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 gives high positive yields.^{1,13} Hence, a high index of suspicion should be maintained by practicing pediatricians during the first five years, and urine culture ordered whenever required.

Methodology: The present study was carried out in Konaseema institute of medical sciences,

Amalapuram, over 18 months from January 2018 to June 2019.

Two fifty febrile children between the age of 3 years to 6 years who attended the pediatric outpatient department formed the study group. Purposive sampling technique was used to select the cases for study.

Inclusion criteria :

1. Children aged 3-6 years
2. Fever of ≥ 37.40 C.
3. A minor potential source of fever, such as gastroenteritis, otitis media, URTI, or non-specific rash.

Exclusion criteria :

- 1) Children on antibiotics
- 2) Children with immunosuppression
- 3) Definite source of fever on examination Eg: Penunonia, varicella.

A detailed history was taken, and a clinical examination was done in all the cases to find out the cause of fever with particular 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 midstream urine sample collected in an autoclaved glass bottles for urinalysis and urine culture. Urinalysis is done within half an hour after obtaining a urine sample, and the same specimen was immediately transported to the department of microbiology for urine culture. Urine albumin is qualitatively estimated by the sulphosalicylic acid method and recorded as nil, haze +, cloud ++, granular precipitate +++. One ml of the urine was centrifuged at 3000 rpm for one minute. Unstained specimen of the sediment was examined microscopically for pus cells and bacteria, and the result published per high power field. Gram stain was also done on the centrifuged specimen and result reported per oil immersion field. Urine was cultured on blood agar and MacConkey agar by using a 0.001 ml calibrated wire loop and observed for 48 hours. A colony count of more than 10⁵/ml of single organisms was considered a diagnostic of urinary tract infection. Samples with multiple growths are regarded as contaminated, and those with a colony

count less than 105/ml were not taken as positive for infection. Pyuria defined as > 5 WBCs per HPF and bacteriuria as the presence of any number of bacteria per HPF or oil immersion field. Urinalysis is considered positive when both pyuria >5 WBCs per HPF and bacteriuria were present. These two parameters of routine microscopic urinalysis were correlated with standard quantitative urine culture reports since significant bacterial growth on culture is the “gold standard” for the diagnosis of UTI. Sensitivity, specificity, and positive and negative predictive values are calculated for pyuria and bacteriuria with urine culture results as the validating standard. Relationships between variables were analyzed by using the chi-square test, ‘t’ test, and ‘z’ test wherever necessary. Renal function tests (blood urea and serum creatinine) done in all the culture-positive cases. Further, following investigations in culture proved UTI cases were carried out to know the involvement of upper urinary tract, vesicoureteral reflux, obstructive lesions, and other congenital anomalies of the urinary tract. Plain X-ray abdomen/KUB region and abdominal ultrasound are done in all the culture-positive cases. If one of these

investigations showed any underlying anomaly, IVP, and MCU further evaluated them.

1) Intravenous pyelogram (IVP) and Micturating cystourethrogram (MCU) was done after the urine became sterile, usually between 3 to 4 weeks.

All the culture proved cases were treated with appropriate antibiotics, and patients were put on prophylactic antibiotic therapy till the radiological investigation was over. After a complete diagnosis, each case was managed both medically and surgically whenever required and advised for follow-up. During follow up, urine culture was done whenever recurrence of UTI was suspected.

Results

During the 18 months study period at konaseema institute of medical sciences and research foundation amalapuram, a total number of 250 febrile preschool children between the age of 3 to 6 years who attended the pediatric outpatient department were studied. Out of these patients, 10 cases were diagnosed to have UTI as judged by the presence of significant bacterial growth in urine culture. The results of this study were analyzed as follows.

Table 1 : Sex Wise Distribution Of Cases

Sex	Total No.	Culture positive cases	
		Number	Percentage
Males	140	4	2.9
Females	110	6	5.5
Total	250	10	4.0

Chisquare value=0.51; p-value=0.4745(NS); P > 0.05 (NS)

There was a slight female preponderance in culture-positive cases with male to female ratio of 1:1.50. However, there was no statistically significant difference in culture-positive cases among male and female children. Prevalence of UTI in febrile preschool schools in the age group of 3-6 years was 2.9% in males and 5.5% in females with an overall estimated prevalence of 4%.

TABLE 12 : (Graph 3) TEMPERATURE AT THE TIME OF PRESENTATION (N = 250)

Temperature (°C)	Mean ± SD (°C)	Total No. of cases (n)	Culture positive cases (C)	Percentage (c/n x 100)
37.4 – 38.3	37.84 ± 0.39	100	2	2
38.4 – 39.3	38.83 ± 0.28	112	5	4.4
> 39.3	40.07 ± 0.50	38	3	8

$\chi^2 = 2.61$, P-Value=0.2718(NS); P > 0.05 (NS)

About 38 (15%) cases had temperature > 39.30C, of which three patients had UTI. There was no statistically significant difference among the three groups.

TABLE 3 : SYMPTOMS IN CULTURE POSITIVE CASES (N = 10)

Sl. No.	Symptoms	Culture positive cases (C)	Percentage (%) (c/n x 100)
1	Fever	10	100
2	Dysuria	4	40
3	Vomiting	4	40
4	Chills and rigors	3	30
5	Loss of appetite	3	30
6	Increased frequency	2	20
7	Irritability	3	30
8	Decreased urine output	2	20

9	Passing high colored urine	2	20
10	Burning Micturition	2	20
11	Puffiness of face	2	20
12	Loose stool	2	20
13	Abdominal distension	2	20
14	Abdominal pain	2	20
15	Refusal of seeds	2	20
16	Dribbling of urine	1	10
17	Cough and cold	1	10
18	Convulsion	1	10
19	Foul-smelling urine	1	5

Next to fever, dysuria and vomiting were the common symptoms. Out of the four patients with vomiting, 2 cases had gastroenteritis. Other non-specific symptoms like irritability were also noted. One patient who presented with convulsion had normal findings on clinical examination and was finally diagnosed as a febrile seizure.

TABLE 4 : PHYSICAL FINDINGS IN CULTURE POSITIVE CASES (N = 10)

Sl. No.	Signs	Culture positive cases (C)	Percentage (%) (c/n x 100)
1	Temperature $\geq 37.4^{\circ}\text{C}$	10	100

2	Ill and toxic appearance	3	30
3	Dehydration	2	20
4	Puffiness of face	2	20
5	No other signs	3	30
6	Pedal edema	1	10
7	Bladder distension	1	10
8	Renal angle tenderness	1	10
9	Suprapubic tenderness	1	10
10	Ascites	1	10
11	Phimosis	1	10
12	Hypertension	1	10
13	Signs of AURI	1	10
14	Signs of ALRI	1	10

Out of the ten patients with UTI, 3 (30%) cases had an ill and toxic appearance on clinical examination. 30% of cases with UTI had no other signs other than fever. One patient with UTI had phimosis.

Table 5: Causes Of Fever Depending On Provisional Diagnosis

	Male	Female	Total	Percentage	P-value	Inference
No. of cases						
Culture Positive						

Diagnosis	Total (n)		Cases		Total (C)	age (c/n*100)		nce	
	male	femal e	male	Fema le					
ALRI	35	30	65	1	0	1	1.5	> 0.05	NS
AURI	28	25	53	0	1	1	1.8	> 0.05	NS
Acute gastroenteritis	26	17	43	1	2	3	7.1	> 0.05	NS
Fever for evaluation	14	4	18	0	1	1	5.5	> 0.05	NS
Neuro infection	4	3	7	0	0	0	0	-	-
Enteric fever	14	10	24	1	0	1	4.1	> 0.05	NS
Malaria	6	6	12	0	0	0	0	-	-
UTI	11	9	20	1	2	3	15	> 0.05	NS
Viral hepatitis	2	6	8	0	0	0	0	-	-
Total	140	110	250	4	6	10	-	-	-

The provisional diagnosis was made mainly based on the presenting symptoms and signs. The above table shows the common ways of presentation of febrile children. The most common cause of fever is a respiratory infection, followed by gastroenteritis. Out of 10 patients with UTI, 7 (70%) cases had a provisional diagnosis

other than UTI. It suggests that seven children with UTI would have been missed if urine culture was not taken as a routine diagnostic method of evaluation.

TABLE 6 : URINALYSIS – PROTEINURIA (N = 250)

Grade	With UTI	Without UTI	Total
Nil	3	170	173
1 +	4	50	54
2 +	2	15	17
3 +	1	5	6
Total	10	240	250

$\chi^2 = 9.12$; P- VALUE=0.0277(S); P < 0.05 (S)

seven (70%) patients with UTI and 70 (29.1%) cases without UTI had statistically significant proteinuria.

TABLE 7 : MICROSCOPIC URINALYSIS – PYURIA (N = 250)

No. of pus cells per HPE	With UTI	Without UTI	Total
0-5	1	211	212
6-10	4	25	29
11-20	3	3	6
>20	2	1	3
Total	10	240	250

$\chi^2 = 77.86$; p-VALUE= 0.0001(HS); P < 0.05 (S)

9 (90%) patients with UTI and 29 (12%) cases without UTI had pus cells > 5 per HPF, which was statistically significant. It suggests that 29 (12%) children without UTI would have been considered as infected if the only pyuria were taken as a diagnostic method for UTI.

TABLE 8 : MICROSCOPIC URINALYSIS – BACTERIURIA (N = 250)

Bacteriuria	With UTI	Without UTI	Total
Present	6	2	8
Absent	4	238	242
Total	10	240	250

Chisquare =90.23; p-value= 0.0001 (HS);P < 0.05 (S)

In culture-positive cases, 6 (60%) patients had bacteria in their urine, whereas in culture-negative cases, only 2 (2.9%) patients had statistically significant bacteriuria. However, 4 (40%) cases with UTI would have been missed if the only presence of bacteria on microscopy was taken as a method of diagnosis for UTI.

Table 9: 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

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.

TABLE 10: ORGANISMS GROWN IN CULTURE POSITIVE CASES (N = 10)

Organisms	Total No. of cases (C)	Percentage
E.Coli	8	80
Klebsiella	1	10
Proteus	1	10
Total	10	100

The most common organism isolated from patients with UTI was E.coli. It is followed by klebsiella and proteus.

TABLE 11 : ANTIBIOTIC SENSITIVITY PATTERN OF MICROORGANISMS (N = 10)

Drugs	E.Coli		Klebsiella		Proteus		Total		Overall percentage of sensitivity
	S	R	S	R	S	R	S	R	
Ampicillin	4	4	-	1	-	1	4	6	40
Cotrimoxazole	4	4	1	-	-	1	5	5	50
Gentamycin	5	3	1	-	1	-	7	3	70
Cephalexin	6	2	1	-	-	1	7	3	70
Norfloxacin	6	2	-	1	1	-	7	3	70
Ceftriaxone	6	2	1	-	1	-	8	2	80
Cefotaxime	5	3	1	-	1	-	7	3	70
Ciprofloxacin	5	3	-	1	1	-	6	4	60

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The majority of the organisms are resistant to Ampicillin (60%). 80% of microorganisms were sensitive to ceftriaxone. 70% were sensitive to gentamycin, norfloxacin, and cephalixin.

TABLE 12 : RENAL FUNCTION TESTS (N = 10)

Component	Normal	Raised	Percentage
Blood urea	9	1	10
Serum creatinine	9	1	10

Only one patient with UTI had raised blood urea and serum creatinine levels.

Radiological evaluation :

All the 10 cases with UTI had normal plain x-ray abdomen

TABLE 13: ABDOMINAL ULTRASOUND FINDINGS IN UTI CASES (N = 10)

Findings	No. of cases	Percentage
Normal	8	80
Abnormal	2	20
Total	10	100

In 80% of cases with UTI, ultrasonography was normal. Ultrasonographic features suggestive of acute pyelonephritis were found in 20% of cases with UTI.

TABLE 14: ABDOMINAL ULTRASOUND FINDINGS IN UTI CASES (N = 2)

Abnormal findings	No. of cases
Acute pyelonephritis with ascites	1
Acute pyelonephritis with bilateral hydronephrosis	1

All the 2 cases with abnormalities on ultrasound had acute pyelonephritis. In addition to this, they had associated abnormalities, as shown in the table 24.

Intravenous pyelography done in 2 cases, of which one patient had hydronephrosis, all of which were detected by USG. MCU is done in 2 cases, 1 of which showed VUR.

Follow-up :

Seven patients were followed for variable periods of 6 months to one year. The remaining three children were lost to follow-up. During follow up, one patient had recurrent UTI. One patient with recurrent UTI had growth of the same organism (*E.coli*) on urine culture. Her abdominal ultrasound was suggestive of acute pyelonephritis with normal MCU and IVP studies.

One patient with phimosis who had undergone circumcision was doing well on follow up. One child with hydronephrosis was asymptomatic on followup.

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 six years of age. 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. UTI in the pediatric population is a recognized cause of acute morbidity and chronic medical conditions such as hypertension and renal insufficiency in adulthood. Recent studies from abroad as well as from India have shown that the routine urine culture in such patients gives high positive yields, particularly in infants and young children.^{1,2,3} The overall prevalence varies from 2.48% to 10.78%.^{5,6} Our prevalence also falls in this range. Similarly, Dharnidarka *et al.*, and Hoberman *et al.* in their studies of 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.^{1, 12} There were no consistent symptoms common to all patients with UTI other than fever. However, the dysuria and vomiting were the predominant symptoms. Other non-specific symptoms like loss of appetite (30%) irritability (30%) and refusal of feeds (20%) were

also noted. Similar to the present study, non-specific symptoms were also seen in a study by Ginsburg *et al.* (1992), like irritability (55%), poor feeding (38%), vomiting (36%) diarrhea (31%) and abdominal distention (8%).¹³ In the present study, there was no significant difference among the three groups of temperature. However, high yield (8%) was obtained in patients with temperature $> 39.3^{\circ}\text{C}$. In the present study, 7 (70%) cases had a provisional diagnosis other than UTI, such as gastroenteritis, a respiratory infection. It suggests that children with UTI would have been missed if urine culture was not taken as a routine diagnostic method of evaluation. However, a routine urine culture may not be beneficial in all patients with fever

In the present study, 7 (70%) patients with UTI and 70 (29.1%) cases without UTI had statistically significant proteinuria ($P < 0.05$). The presence of false-positive results in 70 (29.1%) patients may be due to febrile proteinuria. In the present study, 9 (90%) patients with UTI and 29 (12.08%) cases without UTI had pus cells $>5/\text{HPF}$ which was statistically significant (<0.05), 29 (12.08%) cases without UTI would have been considered as infected if only pyuria was taken as a diagnostic method for UTI. In our study, we attempted to know the value of routine microscopic analysis in the diagnosis of UTI by examining the urine for pus cells and bacteria using centrifuged urine. In the present study, we found that pyuria defined as >5 WBC per HPF had a sensitivity of 85% and specificity of 88%. However, the positive predictive value was low (25%). In the present study, 6 (60%) patients with UTI and 2 (0.9%) patients without UTI had bacteria in their urine, which was statistically significant. However, 4 (40%) cases with UTI would have been missed if the presence of bacteria alone on microscopy was taken as a method of diagnosis for UTI. Thus, the absence of bacteria on microscopy does not rule out the UTI. The most common organism isolated from patients with UTI was *E.coli*, (80%) Followed by *Klebsiella* (10%) and *proteus* (10%). It is as per most of the previous studies.^{14,15} The majority of the organisms (60%) were resistant to ampicillin with slightly better sensitivity to cotrimoxazole (50%). 80% of microorganisms were sensitive to ceftriaxone. It suggests a need to do a repeat urine culture to confirm a bacteriological cure as many of the organisms are resistant to commonly used antibiotics.

Ultrasonographic features suggestive of acute pyelonephritis was found in 2 (20%) cases and hydronephrosis in 1 of them. Though it is a raid that 30-50% of children and 40-50% of infants with UTI have VUR, none of our patients had VUR on ultrasonography.

Conclusion

Urine microscopy for bacteria significantly improves the reliability of microscopic urinalysis for the detection of UTI, mainly when one combines this with an examination of the urinary sediment, for pyuria. However, a positive result neither detects all patients with UTI, nor the negative test completely rules out infection. Hence, urine culture is the gold standard for the diagnosis of UTI in children. Initially, it is helpful to consider the organisms most frequently responsible for UTI in choosing the antimicrobial agent. 80% of organisms are sensitive to ceftriaxone, and 70% are sensitive to norfloxacin. But, because of the convenience of oral administration, norfloxacin is a good antibiotic for the initial treatment of UTI, pending the specific drug depending upon sensitivity report.

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