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Non-localizing Fever as Urinary Tract Infection in Children

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Introduction: Urinary tract infection (UTI) is one of the commonly diagnosed bacterial infections of childhood. However, fever without a localizing point often remains the diagnostic dilemma and not diagnosing UTI could have devastating result for an otherwise easily manageable entity.
Materials and Methods: All febrile children aged 2 months to 10 years without an apparent cause of fever were enrolled and evaluated for possible UTI.
Results: A total of 304 children were recruited; 140 were males and 164 females. Of 304 who had fever without any apparent signs, 40 had UTI. The prevalence of UTI was 13.2% in the study group.
Conclusions: Urinary tract infection presenting as fever without any focus was present in 13.2% of hospitalized patients favouring urine examination to rule out UTI in all febrile children without definite source of fever.

Keywords: Child; E Coli; Fever; Urinary tract infections.

Running Title: Non-localizing Fever as Urinary Tract Infection

Introduction

For any pediatric health care provider, urinary tract infection (UTI) is challenging because the diagnosis of UTI is not so straight forward and a miss in diagnosing the UTI could have long-term consequences. Over the recent decades, the importance of UTI and its complications has been increasingly recognized, in particular the role of UTI as an occult cause of febrile illness in young children. Screening studies in emergency departments suggest that up to 17% of children under the age of one presenting with fever had UTI and over a half of them were treated with other diagnoses and urine test had not been performed for them [1]. Urinary tract infections occur in 1-3% of girls and 1% of boys [2].

Totally the prevalence of UTI varies with age. During the first year of life, the male: female ratio is 2.8-5.4:1. Beyond 1-2 years, there is a female preponderance with 1:10 male to female ratio [2]. The overall prevalence of UTI in children under 2 years with an undifferentiated febrile illness is approximately 5% [3]. Undifferentiated fever in infants and young children can be a clinical marker of UTI involving renal parenchyma [4].

Renal parenchymal infections are associated with renal scarring, hypertension, preeclampsia in pregnancy, reduced renal function and chronic renal failure [5]. Studies have shown that after a single UTI, 15-41% of children are thought to develop scarring in long-term [6, 7]. The first attack of UTI in infancy and early childhood is usually not a single attack but beginning of a continuum process with recurrences in both boys and girls. Recurrence rates of 25% in neonates and 30% in older children have been reported after one episode of UTI, which increases to 60% and 75% after the second and third episodes, respectively [8]. Properly and timely management of UTI in children could avert possible devastating future complications. Childhood morbidity due to UTI is more important in younger children, especially in resource limited societies like ours. Therefore, the current study was performed to know the epidemiology of UTI in children in Kashmir India.

Materials and Methods

This was a prospective hospital based observational study, conducted in Department of Pediatrics G.B. Pant General Hospital over one year from April 2013 to March 2014. Patients having axillary temperature of $\geq 101^0$F, who were not taking antibiotics, were not immunodeficient, not catheterized and did not have a definite source of fever on examination, were considered eligible for the study. All patients less than 2 months and more than 10 years and those with possible infections like meningitis, pneumonia, arthritis, cellulitis, adenitis, osteomyelitis, gastroenteritis, varicella, measles, bronchiolitis, herpetic stomatitis and those with autoimmune diseases were excluded from the study.

All febrile children aged 2 months to 10 years, fulfilling the inclusion criteria were enrolled and divided into three groups. In the first group including 2 months to 2 years children, urine was collected by supra-pubic aspiration. In the second group including 2 years to 5 years children urine was collected by urinary catheterization or clean catch midstream urine. In the third group including 5 years to 10 years children urine was collected by clean catch mid stream urine. For routine urine examination 10-15 mL was taken and for urine culture 5 mL was taken. After collecting urine by a proper method and informed consent from

Table 1. Criteria for Diagnosis of Urinary Tract Infection [9]

Method of collection	Colony Count on Culture per ml	Probability of infection %age
1. SPA	a. Gram –ive bacilli: Any number	
	b. Gram +ive cocci	
	> Few thousands	> 99%
1. Trans Urethral	$>10^5$	95% : infection
Catheterization	$10^4 – 10^5$	Infection likely suspicious
	$10^3 – 10^4$	Repeat infection unlikely
	$<10^3$	_____
2. Clean void	$>10^4$	Infection likely
a) Boys	a) Boys: 3 Specimen $>10^5$	95 %
b) Girls	b) Girls :2 Specimen $>10^5$	90%
	1 specimen > 10^5	80%
	5 x $10^4 – 10^5$	Suspicious, repeat
	10,000 – 50,000	If sympatic :suspicious, repeat
		If asymptomatic: infection unlikely
	< 10,000	Infection unlikely

parents, urine specimens were sent to the laboratory in sterile containers for culture and antibiotic sensitivity.

Urine was refrigerated, if not plated within one hour of receipt. Standard quantitative cultures were performed by laboratory technologists. A loop calibrated to deliver approximately 0.001 mL was used to inoculate blood, chocolate and Macconkey agar plates. All plates were incubated at 30^0C and examined daily for growth for two days. A positive result was considered as per the criteria for diagnosis of urinary tract infection Table 1. The study was reviewed and approved by our institutional review board. Renal ultrasound and voiding cystourethrography performed in patients if indicated.

Statistical Analysis

Data was analyzed using SPSS software by Chi-Square and Fisher's Exact tests. A p-value of <0.05 was taken as significant.

Results

Results of our study are shown in Tables 2-5.

E. coli was the commonest organism isolated (85%) followed by klebsiella and citrobacter. Incidence of E. coli causing UTI was statistically higher (P<0.001) as compared to other organisms as depicted in Table 5.

Table 2. Total Number of Male and Female patients in different age groups

Age	Males	Females	Total
2 M – 2 Y	68	66	134
>2 Y – 5 Y	38	56	94
>5 Y – 10 Y	34	42	76
Total	140	164	304

Table 3. Prevalence of UTI in febrile children

Age	Total Patients	Culture Positive	Culture Negative
2 M – 2 Y	134	18 (13.4%)	116
>2 Y – 5 Y	94	12 (12.8%)	82
>5 Y–10 Y	76	10 (13.2%)	66
Total	304	40 (13.2%)	264 (87.8%)

Table 4. Distribution of patients with UTI with respect to sex.

Sex	Total Patients	UTI (%)	P Value
Male	140	10 (7.1%)	0.043(Sig.)
Female	164	30 (18.3%)	

Table 5. Bacteriological profile of UTI

Organism	Number	Percentage	P Value
E.Coli (E)	34	85%	E vs K P-Value<0.001
Klebsiella (K)	4	10%	K vs C P-Value=0.562
Citrobacter (C)	2	5%	C vs E P-Value<0.001

Discussion

Our study included 304 children aged 2 months to 10 years. Among 304 patients, 140 were males and 164 females. In total, 134/304 (44%) of patients were aged between 2 months to 2 years, 94/304 (30%) were 2-5 years and 76/304 (25%) were 5-10 years. This trend shows that the most common age group with febrile UTI was under 2 years, which is consistent with earlier studies [10,11]. In our study, UTI was present in 40 patients of 304 patients aged 2 months to 10 years, who had fever without any apparent cause. Therefore, prevalence of UTI was 13.2%, which is quite comparable with other studies [12-14]. Of 40 confirmed cases of febrile UTI, 30 (75%) were females and 10 (25%) males (p< 0.05%), which is similar to other studies [16-18].

Regarding urinary microbiology in UTI diagnosed patients, E. coli (E) was isolated in 34 (85%), Klebsiella in 4 (10%) and Citrobacter in 2 (5%) cases (P value<0.001), which is similar with the earlier studies [19,20]. In this study, frequencies of positive cultures were 25% for males and 75% for females (ratio~1:3). Farajnia et al. [21] reported the ratio of 1:2 and Farrell et al [17] reported it as 1:4.1. In our study we had abnormal renal urinary tract ultrasonography (RUS) in 25% (10/40) suggestive of Grade IV/V vesicoureteral reflux (VUR). RUS has the advantage of being readily available, radiation free and noninvasive. Thus, RUS alone would be an attractive alternative

to perform a voiding cystourethrography after the first episode of febrile UTI in less than 2 years.

Limitations

The prevalence of UTI was higher in the study sample than 7% used for the sample size calculation, which might cause misinterpretation of data.

Conclusions

Detecting the source of infection in children with fever is a diagnostic dilemma and only few cases are investigated for UTI. Urinary tract infection presenting as fever without any focus was found in 13.2% of hospitalized patients in our study. This was supported by previous studies favouring urine examination to rule out UTI in all febrile children without definite source of fever.

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Conflict of Interest

None declared

Financial Support

None declared

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