

Study of Urinary Tract Infections in Febrile Infants and Children 2 to 24 Months at a Tertiary Care Centre

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ABSTRACT

Background: UTI is one of the most common serious bacterial infection in febrile infants and young children and more common than bacterial meningitis, pneumonia and occult bacteraemia. It includes 10% of all febrile children, 13.6% of febrile infants and 7% of febrile newborns. Present study was conducted to estimate the prevalence and etiological factors of UTI among febrile children 2 to 24 Months of age.

Methods: A cross-sectional hospital-based study was conducted among 173 children with fever for more than 5 days without localizing signs, between the ages of 2 to 24 Months attending the Paediatric OPD of Rama Medical College, Hapur, UP (India). Those who have >5 pus cells in urine analysis, urine culture was done. Children with recurrent UTI were evaluated by abdominal ultrasonogram, MCU and DMSA scan.

Results: 43 children showed significant pyuria (24.9%) and among them 23 children (53.5%) showed culture positivity. The overall prevalence rate of urinary tract infection in the present study was 13.3%. Urine culture was positive in 22.9% and 100% of children with pus cells 5- 10/HPF and >10/HPF respectively. Proportion of UTI is more in uncircumcised male (9.33%) compared to circumcised male (6.67%). Among 173 children, Among children with recurrent urinary tract infection, features of pyelonephritis in DMSA scan were present in 3 (33.3%) children and grade 3 VUR (Reflux into dilated ureter) was present in 1 subject (11.1%) in MCU and no reflux in rest 5 children (55.5%).

Conclusions: UTI is a common pediatric problem with the potential to produce long-term morbidity. Young children presenting with fever may have nonspecific symptoms of UTI, and a high index of suspicion is appropriate in this setting, as bacteriuria would indicate a high probability of upper tract infection. As an initial screening test urinalysis is useful and pus cells count of >5/HPF is suggestive of UTI and a count of >10/HPF is highly suggestive of UTI and a culture of the urine is required to confirm the diagnosis.

Key Words: Febrile Children, Urinary Tract Infection (UTI), Recurrent UTI. Renal scar.

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INTRODUCTION

Urinary Tract Infection (UTI) is defined by the presence of organisms in the urinary tract, which is usually sterile. However, since asymptomatic colonization of the urinary tract can occur, other features such as the presence of inflammatory markers or follow-up cultures may be needed to definitively diagnose a UTI.¹

UTI is one of the most common serious bacterial infection in febrile infants and young children and more common than bacterial meningitis, pneumonia and occult bacteraemia.² It includes 10% of all febrile children, 13.6% of febrile infants and 7% of febrile newborns.³ About 8% of girls (3% pre-pubertal) and 2% of boys (1% pre-pubertal) experience at least one episode of UTI up to the age of 7 years.⁴

Stephen M. Downs stated in a technical report of American Academy of Pediatrics that the overall problem of managing UTI

in children between 2 months and 2 years of age was conceptualized as an evidence model. The model depicts the relationships between the steps in the diagnosis and management of UTI. The steps are divided into the following four phases: 1) recognizing the child at risk for UTI, 2) making the diagnosis of UTI, 3) short-term treatment of UTI, and 4) evaluation of the child with UTI for possible urinary tract abnormality.

Phase 1 according to this evidence model represents the recognition of the child at risk for UTI. Age and other clinical features define a prevalence or a *priori* probability of UTI, determining whether the diagnosis should be pursued. If children at sufficiently high risk for UTI are not identified for diagnostic evaluation, the potential benefit of treatment will be lost. However, children with a sufficiently low likelihood of UTI should be saved

the cost of diagnosis (and perhaps misdiagnosis) of UTI when the potential for benefit is minimal.⁵

The incidence of UTI is highest in the first year of life for all children (1%) but decreases substantially among boys after infancy.⁶ Estimates of UTI incidence among infant boys have varied in different populations, likely due to factors such as circumcision, which has been associated with a reduction in risk of UTI.⁷⁻⁹

Another issue affecting estimates of incidence is the increased recognition of UTI as a potential source of febrile illness in young children. Screening studies in emergency departments suggest that up to 5% of children under the age of 2 presenting with fever have UTI, and over half of these would have been given alternative diagnoses such as otitis media had the urine not been screened as part of the study.^{10,11}

Long-term complications of UTI have been associated with renal scarring and include hypertension, chronic renal failure, and toxemia in pregnancy. Long-term follow-up data are limited, although one Swedish study found that children diagnosed with renal scarring due to pyelonephritis during the 1950s and 1960s developed high rates of hypertension (23%) and end-stage renal disease (10%).¹² Few studies question the association between pyelonephritis and end-stage renal disease.^{13,14} Although the individual risks associated with UTI remain unclear, the high prevalence of UTI and potential morbidity associated with complications require careful attention to diagnosis and management.

Acute pyelonephritis consists of 2/3 of febrile UTIs in early childhood.² Recent studies using renal parenchyma-avid nuclear scans have revealed that more than 75% of children under 5 years of age with febrile urinary tract infection have pyelonephritis.¹⁵⁻¹⁷ 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.^{18,19} Most urinary tract infections that lead to scarring or diminished kidney growth occur in children younger than 4 years of age, especially in the first year of life.^{16,19} It is essential to identify urinary tract infection in febrile children early and institute prompt treatment to reduce the potential for lifelong morbidity. Therefore, present study was conducted to estimate the prevalence and etiological factors of UTI among febrile children 2 to 24 Months of age.

MATERIALS AND METHODS

A cross-sectional hospital-based study was conducted among 173 children with fever for more than 5 days without localizing signs, between the ages of 2 to 24 Months attending the Paediatric OPD of Rama Medical College, Hapur, UP (India).

A detailed proforma for collecting data related to age, sex, nutritional status, socioeconomic status (Using Kuppuswamy Socio-economic status scale) and predisposing risk factors like urethral instrumentation, bowel habits, etc. was prepared. Complete history related to the onset of fever, duration associated symptoms such as nausea, vomiting, diarrhea, urinary disturbances and other system involvement was obtained. Thorough physical examination was done in all patients. Routine blood counts, urine analysis were done for all patients and those showing pus cells >5 per HPF in centrifuged urine sample were taken as study group and urine culture sensitivity were done. If recurrent UTI (≥ 2 episodes), a thorough physical examination and USG abdomen/renal function test/DMSA/MCU was done for that patient to find out the abnormalities that predispose to recurrent infections. The details of the history, physical examination as well as laboratory findings were entered in the proforma.²⁰

Table 1: Distribution of study participants across different age group, sex, socio-demographic and clinical variable

Variable	No. of cases	Percentage	
Age Groups (In Months)	2-6 months	37	21.4
	7th-12 months	69	39.9
	13th-18 months	21	12.1
	19th-24 months	46	26.6
Sex	Males	75	43.4
	Females	98	56.6
Socio- economic Status	Upper	4	2.3
	Upper middle	71	41.1
	Lower middle	85	49.1
	Upper lower	13	7.5
Previous History of UTI	No previous history	157	90.8
	Previous history of UTI	16	9.2
Congenital Anomalies	Absent	171	98.8
	Present	2	1.2
Total	173	100	

RESULTS

Total number of children studied were 173, among them 106 children were below 1 year and 67 above 1 year, 75 were males and 98 were females; 43 children showed significant pyuria (24.9%) and among them 23 children (53.5%) showed culture positivity. The overall prevalence rate of urinary tract infection in the present study was 13.3%. Among culture positive cases, most commonly found organism was *E. coli* (52.17) followed by *Proteus* species (17.39%), *Klebsiella* (13.04%), *Staphylococci* (8.7%). Urine culture was positive in 22.9% and 100% of children with pus cells 5- 10/HPF and >10/HPF respectively.

Proportion of UTI is more in uncircumcised male (9.33%) compared to circumcised male (6.67%). Among 173 children, 142 children were having good bladder hygiene (No constipation, no faecal soiling, cleaning the perineum with water and wiping from front to back), 31 were having poor bladder hygiene. Proportions of urinary tract infection were 11.97% and 19.35% respectively in good v/s poor bladder hygiene, i.e. higher in those with poor hygiene.

Among 173 children, pinworm infestation was present in 41 and absent in 132. Among children with pinworm infestation 17.07% were having UTI and among children without pinworm infestation 12.12% were having UTI.

Among children with recurrent urinary tract infection, features of pyelonephritis in DMSA scan were present in 3 (33.3%) children and grade 3 VUR (Reflux into dilated ureter) was present in 1 subject (11.1%) in MCU and no reflux in rest 5 children (55.5%).

DISCUSSION

Prevalence of UTI in febrile infants in our study, 2-6 months– 6 (16.2%), 7-12 months–9 (13.04%), which is slightly higher in contrast to study conducted by R.K. Kaushal et al.²¹ (2003) who reported prevalence of 8.4% and 12.3% in children <5 years and infants respectively and lower than Mohammed MTP et al.²⁰ who reported prevalence of 18.75% in children 2-6 months old & 14.14% in 7-12 months old children. Prevalence of febrile UTI in infants in our study is higher compared to study by Dharni Dharaka et al.²² (1993) who reported a prevalence of 5.4% in febrile infants and Hoberman et al.²³ (1993) who reported prevalence of 5.3% in infants and Mohammed MTP et al.²⁰ who reported it as 11.3%.

43 children showed significant pyuria (24.9%) and among them 23 children (53.5% of patients showing pyuria) showed culture positivity. Urine culture was positive in 22.9% and 100% of children with pus cells 5- 10/HPF and >10/HPF respectively. Similar findings were reported by Mohammed MTP et al.²⁰ Hence, the presence of pyuria of >5 leukocytes/HPF in a centrifuged sample is a significant indicator of UTI.

Proportion of UTI is more in uncircumcised male (9.33%) compared to circumcised male (6.67%), but the association was not statistically significant. Among 173 children, 142 children were having good bladder hygiene, 31 were having poor bladder hygiene. Proportion of urinary tract infection were 11.97% and 19.35% respectively in good v/s poor bladder hygiene, i.e. higher in those with poor hygiene, but both these associations were not statistically significant. Similar findings were reported by Mohammed MTP et al.²⁰

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According to Chand et al.²⁴ primary VUR occurs in less than 1% of the general population and as many as 50% of children who present with recurrent UTI will have VUR. But in our study VUR was present in only 11.1% of children with recurrent UTI.

The question of when to screen for UTI has been evaluated in a number of studies and addressed by a subcommittee of the American Academy of Pediatrics.²⁵ The presence of specific symptoms for UTI, including dysuria, frequency, urgency, suprapubic discomfort, and flank pain, should lead to screening. However, young children with UTI may present with nonspecific symptoms, such as poor feeding, vomiting, irritability, jaundice (in newborns), or fever alone, and a broader approach to screening may be appropriate. Two recent studies of the prevalence of UTI among children presenting to an emergency department with fever found rates ranging from 3.5 to 5.5%.^{10,11} Girls were more than twice as likely as boys to have UTI, and among boys, uncircumcised infants had an eightfold higher risk. This finding compares well with population-based studies of UTI which document a 4- to 10-fold increase in risk of UTI among uncircumcised males during the first year of life, likely due to colonization of the mucosal surface of the foreskin with bacteria.²⁶ Other risk factors for UTI among children less than 2 years of age included young age, absence of another source of fever, height of fever, ill appearance, history of UTI, presence of urinary symptoms, and tenderness in the suprapubic area.¹¹

CONCLUSION

UTI is a common pediatric problem with the potential to produce long-term morbidity. Young children presenting with fever may have nonspecific symptoms of UTI, and a high index of suspicion is appropriate in this setting, as bacteriuria would indicate a high probability of upper tract infection. As an initial screening test urinalysis is useful and pus cells count of >5/HPF is suggestive of UTI and a count of >10/HPF is highly suggestive of UTI and a culture of the urine is required to confirm the diagnosis. Prevalence of culture positivity was 100% in those who showed >10 pus cells/HPF in centrifuged sample of urine. In culture positive UTI, it is always important to do an MCU/DMSA scan to look for VUR and pyelonephritic changes/renal scars, respectively.

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