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Original Research Article

Prevalence of urinary tract infection in febrile children of less than five years of age

Mahishma K[1,*], Anil Kumar K[2]

[1] *Dept. of Paediatrics, Dr. V.R.K.Women's Medical College, Teaching Hospital & Research Centre, Aziz Nagar, Telangana, India*
[2] *Statistician (doctorate), GITAM (Deemed to be) University, Hyderabad, Telangana, India*

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ABSTRACT

Objective: To determine the prevalence of urinary tract infection in febrile children, less than 5 years of age. To assess the validity of microscopic urine analysis and urine culture in the diagnosis of urinary tract infection.
Design: Prospective study.
Setting: Children attending the department of paediatrics, Dr.V.R.K. Women's Medical College, Teaching Hospital & Research Centre, with febrile illness during June 2019-June 2020.
Subjects: 370 children between 1 month to 5 years of age.
Materials and Methods: Data related to age, sex, nutritional status, socioeconomic status and predisposing risk factors like urethral instrumentation, bowel habits etc, were noted. A thorough physical examination with relevant investigations were carried out in all these patients. Routine urinary microscopy was done in all patients and urine culture was done in those who showed pyuria of >5 pus cells/HPF in centrifuged urine sample.
Results: In our study, overall prevalence of UTI was 3.5% in children between 1 month to 5 yrs and 4.1% in children <2yrs and 7% in Children <1 year of age with M:F ratio of 1:1in children <2yrs. Prevalence of culture positivity was 44% in those who showed >10 pus cells/HPF in centrifuged sample of urine and 2.5% in those who showed >5pus cells/HPF.
Conclusions: The presence of obvious source of fever such as upper respiratory tract infection or otitis media is not reliable in excluding urinary tract infection. Overall prevalence of UTI in our study was low (3.5%) and prevalence among children <2yrs was 4.1% and <1 year of age was 7%. Pyuria of >5pus cells/HPF (centrifuged urine sample) should be considered as significant and further evaluation should be done to initiate prompt treatment.

1. Introduction

Children with fever comprise a substantial proportion of the practice in outpatient department and Emergency Medicine. Fever is the most common reason for children under 5 years of age to visit Emergency / outpatient departments. Unlike occult bacteraemia or severe bacterial illness (in infants and children) little attention has been focused on the identification of urinary tract infections in febrile children in the emergency department, despite recent information that suggests a high prevalence of urinary tract infections and significant associated morbidity in these patients. Quite often, child receives antibiotics empirically, without adequate evaluation for urinary tract infection. Fever, however, is often the only symptom in children with urinary tract infections.

Fever and significant bacteriuria and pyuria in children with undocumented sources of infections must be presumed

* *Corresponding author.*
E-mail address: mahishmak@gmail.com (Mahishma K).

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to be symptoms of pyelonephritis, an invasive infection of the renal parenchyma requiring prompt treatment.

Recent studies using renal parenchyma - avid nuclear scans to determine the presence of urinary tract infection have revealed that more than 75% of children under 5 years of age with febrile urinary tract infection have pyelonephritis. [1–3]

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. [4,5] Most urinary tract infections that lead to scarring or diminished kidney growth occur in children younger than 4 years of age especially among infants in the first year of life [2,5] those with gross reflux or obstruction and those who have a delay in therapy for urinary tract infection. Among children under 3 years of age with recurrent urinary infections, putting them at higher risk for renal scarring, as many as one-third being asymptomatic. [6]

It is essential to identify urinary tract infections in febrile children and institute prompt treatment to reduce the potential for lifelong morbidity. Progressive renal damage from unrecognized pyelonephritis in childhood may lead to hypertension and chronic renal failure in later life.

A study from Sweden showed that focal renal scarring caused by pyelonephritis in children carried a 23% risk for hypertension a 10% risk for end - stage renal disease, and a 15% risk for toxemia during pregnancy as an adult. [7] Approximately 13% to 15% of end - stage renal disease is thought to be related to urinary tract infection in childhood that was often unrecognized and therefore, under treated. [8]

The present study is undertaken to estimate the prevalence of urinary tract infection in febrile children less than 5 years of age and to assess the validity of routine microscopic urine analysis and urine culture in the diagnosis of Urinary Tract infection.

2. Aims and Objectives

1. To determine the prevalence of urinary tract infection in febrile children, less than 5years of age.
2. To assess the validity of microscopic urine analysis and urine culture in the diagnosis of urinary tract infection.

3. Material and Methods

The present study was conducted in the department of paediatrics, Dr. V.R.K. Women's Medical College, Teaching Hospital & Research Centre, Aziznagar.

3.1. Selection of patients

Febrile children less than 5years attending the out patient department or admitted in the hospital over a period of 13 months were included in the study.

3.2. Inclusion criteria

1. Febrile children between 1 month to 5 years.
2. Fever {rectal ≥38.3°C or auxiliary temperature ≥37.8°C}.

3.3. Exclusion criteria

1. Children below 1month and above 5 years.
2. Any child who has received antibiotics 48 hours prior were not be included in the study.
3. Children with known congenital genitourinary anomalies.

3.4. Methods of study

370 children were included in the study, data related to age, sex, nutritional status, socioeconomic status and predisposing risk factors like urethral instrumentation, bowel habits etc., were noted. A complete history related to the onset, duration of fever and associated symptoms such as nausea, vomiting, diarrhea, urinary disturbances, other system involvement was obtained.

A thorough physical examination with relevant investigations was carried out in all patients. Routine blood counts, urine analysis was done and those showing pus cells > 5 per HPF in centrifuged urine sample were taken as study group and urine culture sensitivity was done in them, USG examination were done, in culture positive cases, one case DTPA scan was done, the detailed data was entered in the proforma.

3.5. Collection of urine sample

From all 370 cases a sample of urine was collected. In children under 2 years of age urine was collected by a bag and in others midstream sample was collected.

3.6. Collection of bag sample

In children below 2 years of age the genitalia was cleaned with soap and water and person collecting sample washed hands before touching the bottle or bag for collecting urine sample. In males prepuce retracted if possible, in females below 2 years labia was washed. Urine was collected in bag, around 10 ml of urine was transferred into sterile bottle and sent for culture and sensitivity .In children above 2years midstream sample was collected.

3.7. Method of collection of mid stream sample

After taking the above precautions child was allowed to pass urine, mid stream sample was collected in sterile bottle and was sent for culture and sensitivity.

3.8. Urine analysis

The fresh urine sample obtained from the above techniques were subjected for urinalysis and culture and sensitivity. The urine specimens were centrifuged in a standard manner, 10ml of urine was span at the rate of 2500 rpm for 20-30mintes, supernatant decanted off and sediment re-suspended in the remaining 0.2ml.The urine was examined under miscroscope for Hematuria, and Leukocyturia. In the present study more than 5 pus cells/HPF in a centrifuged urine sample was taken as significant pyuria and culture and sensitivity was performed in that patient / case.

3.9. Urine culture

The clean catch mid stream urine was inoculated into blood and mac conkey agar plates with a 0.01ml calibrated loop. All plates were incubated at 35-37^{0}C for 24 hrs. under aerobic condition to obtain accurate colony count. On culture of mid stream sample of urine, a colony count of more than 10^5 /ml organisms of a single species was considered significant.

Samples showing insignificant growth, mixed growth of two or more pathogens or growth of non-pathogens were not considered as culture positive. The following definitions were employed in the present study.

3.10. Significant pyuria

Presence of more than 5 pus cells /HPF in a centrifuged urine sample.

3.11. Positive urine culture

A positive urine culture was defined as growth of $>10^5$ colonies of a single urinary tract pathogen/ml of specimen in a mid stream of urine.

3.12. Statistics used

All Statistical data was done using SPSS (Statistical Package for Social Sciences)

4. Results

In the present study of 370 cases 165 (44.5%) were males, 205 (55.4%) were females, 100 cases were < 1year (27.02%). Maximum cases of urinary tract infection were in the age < 2 years (64.8%). Minimum age in the study group was 2 months and maximum age in the study group was 60 months.Table 1

In the present study 48 children (12.9%) showed Pyuria in centrifuged urine sample of which 26 (54.16%) were males and 22(45.8%) were females. Majority were < 2 years, 58%.Table 2

Majority of children belong to class II (54%) and class III (45.8%) according to modified Prasad's classification of Socio Economic Status.Table 3

Nutritional status of majority of children was normal (54%), 20% were in grade I PEM, 10% were in grade II PEM, 4% belong to class III and class IV.Table 4

In our study among 370 children 48 (12.97%) showed significant pus cells in urine, 70% of children with pyuria showed more than 5 pus cells / HPF and 16% showed more than 10 pus cells/ HPF. 12% showed numerous of pus cells.Table 5

In our study growth > 10^5 CFU/ml of single organism was considered significant growth. 73% of Pyuric children showed no significant growth on Urine culture. Among positive cultures 69.33% showed E.coli, 7.6% showed acinobacter, citrobacter, pseudomonas, and serratia species.Table 6

Though children with known congenital genito urinary anamolies were excluded in the study, USG done in all cases who were culture positive revealed renal involvement / anomaly in 6 cases (38.46%). All the children were males.Table 7

5. Discussion

Urinary tract infections are quite common but potentially serious infections of childhood. They cause acute morbidity as well as long term sequeale including hypertention and impaired renal function. Accurate diagnosis of urinary tract infection is important to facilitate appropriate management of acute illness, and to ensure appropriate evaluation and followup. Equally important is accurately ruling out a urinarytract infection to avoid unnecessary cost and potentially harmful treatment and evaluation.

The present study was a prospective study conducted in department of pediatrics Dr. V.R.K. Women's Medical College, Teaching Hospital & Research Centre, over a period of 13 months between June 2019 to June 2020 to determine the magnitude of urinary tract infection in febrile children between 1month to 5 years and also to assess the validity of routine microscopic urine analysis and culture in the diagnosis of urinary tract infection.

A total of 370 febrile children were included in the study, out of 370 patients in study 165 were males and 205 were females with M:F ratio 1:1.2 and majority of them i.e.64.8%were <2 years.

In our study out of 370 children 48 children showed significant pyuria (12.9%) of pyuric cases 26% showed significant bacterial growth making an overall prevalence of 3.5%. Among culture positive UTI'S 76% were <2 years of age with a overall prevalence of 4.1% in children <2 years and 7% in children <1 year.

Prevalence of febrile UTI in infants in our study is almost similar to study by Dharni Dharaka et al[9](1993)who reported a prevalence of 5.4% in febrile infants, Hoberman et al[10] (1993)who reported prevalence of 5.3% in infants.

Table 1: Age and Sex distribution of 370 cases

Age	Sex		Total
	Male	Female	
< 1 year	40(24.24)	60(29.26)	100(27.02)
1 – 2 years	75(45.45)	65(31.70)	140(37.83)
> 2 years	50(30.30)	80(39.02)	130(35.13)
Total	165	205	370

Table 2: Age and sex distribution of subjects with urine showing > 5 pus cells/HPF

Age	Sex		Total
	Male	Female	
< 1 year	6(23.07)	10(45.45)	16(33.33)
1-2 years	8(30.77)	4(18.18)	12(25.00)
2-3 years	4(15.38)	1(4.55)	5(10.42)
3- 4 years	5(19.23)	4(18.18)	9(18.75)
4-5 years	3(11.54)	3(13.64)	6(12.50)
Total	26(100.0)	22(100.00)	48(100.00)

Table 3: Distribution of socio economic status

SES	Sex		Total
	Male	Female	
Class II	14(53.85)	12(54.55)	26(54.17)
Class III	12(46.15)	10(45.45)	22(45.83)
Total	26(100.00)	22(100.00)	48(100.0)

Table 4: Distribution of subjects based on Nutritional status (IAP-Classification) in Pyuric children showing > 5 pus cells/HPF.

Nutrition	Sex		Total
	Male	Female	
Normal	18(69.23)	8(36.36)	26(54.17)
I	2(7.69)	8(36.36)	10(20.83)
II	2(7.69)	3(13.64)	5(10.42)
II with K	1(3.85)	2(9.09)	3(6.25)
III	1(3.85)	1(4.5)	2(4.17)
IV	2(7.69)	——	2(4.17)
Total	26(100.00)	22(100.00)	48(100.00)

Table 5: Distribution of pus cells in urine

No of Pus cells in urine	Sex		Total
	Male	Female	
> 5	18(69.23)	16(72.72)	34(70.83)
> 10	3(11.54)	5(21.73)	8(16.67)
Numerous	5(19.23)	1(4.55)	6(12.50)
Total	26(100.00)	22(100.00)	48(100.0)

Table 6: Distribution of urine culture

Urine culture report	Sex		Total
	Male	Female	
No growth	18(69.2)	17(77.27)	35(72.91)
E.coli	5(19.23)	4(18.18)	9(18.75)
Acinobacter	——	1(4.55)	1(2.08)
Citrobacter	1(3.85)	——	1(2.08)
Pseudomonas	1(3.85)	——	1(2.08)
Serratia species	1(3.85)	——	1(2.08)
Total	26(100.00)	22(100.00)	48(100.0)

Table 7: Abdominal ultra sound scan findings in culture positive children

Abdominal ultra sound	Sex		Total
	Male	Female	
Bilateral hydronephrosis with thickened bladder wall with cystitis	1		1
Bilateral moderate pleural effusion with ascites		1	1
Crossed fussed ectopic left kidney/mild hepatosplenomegaly	1		1
Dilated non-peristaltic bowel loops (small) possibility of Paralytic ileus/Intenstinal obstruction		1	1
Evidence of large bladder calculi	1		1
Features suggestive of bilateral moderate hydro nephroureterosis/cystitis	1		1
Gross ascitis punctate discrete spots in lung parenchyma seen		1	1
Lt sided minimal pleural effusion minimal free fluid in the peritoneal cavity	1		1
Massive hydronephrosis (lt side)	1		1
Mild hepatosplenomegaly		1	1
Normal		1	1
Rt sided hydronephrosis with PUJ obstruction with dysplastic kidney on Rt side	1		1
Suggestive of hepato splenomegaly	1		1
Total	8	5	13

Overall prevalence of UTI in febrile children in our study was 3.5% and 7% in children <5years and infants respectively in contrast to study conducted by

R.K.Kaushal et al[11](2003)who reported higher prevalence of 8.4% and 12.3% in children <5years and infants respectively.

Overall prevalence of febrile UTI in infants in our study (7%) was higher compared to report by Shaw K.N et al[1](1998)from USA who reported prevalence of 3.3% in febrile infants.

In our study prevalence of UTI in <2 years age group was 4.1% which was similar to study by Roberts k.et al[12](1983)who coated prevalence of 4.1%.P.R Srivasths et al[13](1996) reported a prevalence of 2.48% in children <2 years which was lowest reported from a developing country.

M:F ratio of culture positive cases in the age group of <2 years was 1:1 and in children >2 years there was male preponderance although children with known renal anamolies were excluded in our study. We detected renal anamolies for the first time (6 out of 13) by USG examination this explaining the male preponderance in our study.

Among culture positive cases 69% grew E.coli and 7% each of pseudomonas, citrobacter, acinobacter, serratia species, which correlates with other studies. Bryan C.S et al[14](1984) reported E.coli as the common urinary pathogen in 85%of cases. According to Aravind Bagga et al[15] (2000)90% of first symptomatic urinary tract infection and 70% reccurence infections were due to E.coli. Hoberman et al[10](1993) reported as E.coli as the most common bacterium isolated in his study.

Because of economical constraints urine cultures were done only in children who showed significant pyuria which revealed positive culture in 26%. Hence validity of urine examination could not be accurately ascertained.

In our study 40% of children who showed numerous pus cells were culture positive and 44%who showed >10% were culture positive and 2.5% of children showing >5pus cells were culture positive. Hence the presence of pyuria of >5leukocytes/HPF in a centrifuged sample is a significant indicator of UTI.

6. Conclusion

1. Clinicians should be aware of the possibility that febrile children may have urinary tract infection and should consider obtaining a urine culture specimen as part of their diagnostic evaluation.
2. The presence of another potential source of fever such as upper respiratory tract infection or otitis media is not reliable in excluding urinary tract infection.
3. Several studies in developed countries have shown a low prevalence (1.7 – 4.1%) of urinary tract infection in febrile children.[9,10]
4. Present study reveals similar overall prevalence of UTI (3.5%) in febrile children 1 month to 5 years and 4.1% in children <2 years and 7% in children <1 year of age.
5. The study would have been more conclusive if urine cultures were done in all febrile children screened, but economical constraints limited us to do urine culture only in those children showing significant pyuria of > 5 pus cells/ HPF of centrifuged urine sample and we found that 26% of febrile pyuric children were culture positive hence the validity of study cannot be

Table 8: Final diagnosis in all pyuric children

Diagnosis	Sex		Total
	Male	Female	
Acute URI	1		1
Ano-rectal malformation for definitive surgery with fever	1		1
Atypical febrile seizures		1	1
Bronchitis		1	1
Bronchopneumonia with grade III malnutrition	1		1
Case of unknown poisoning	1		1
CCHD? TOF with cyanotic spell		1	1
Dengue fever	3	2	5
Dengue haemorrhagic fever	1		1
UTI with Ectopic left kidney	1		1
Febrile convulsion	1		1
Febrile seizures with URTI		1	1
Global developmental delay with fever induced complex partial seizures		1	1
Grade III PEM with giardiasis		1	1
Haemolytic anaemia/p.kinase deficiancy/iron deficiency anaemia with RTI		1	1
Hischprung's disease with enterocolitis	1		1
Hydronephrosis with PUJ obstruction	1		1
Jejunitis with perforation (non-specific inflammation on histopathological examination)		1	1
Juvenile diabetes mellitus		1	1
Kwashiorker with severe anaemia		1	1
UTI with Large bladder calculi	1		1
Lt sided empyemothroracis with sepsis with peritonitis	1		1
UTI with Lt.pelvic uretric junction obstruction with massive hydronephrosis	1		1
Malaria	1		1
Megaloblastic anaemia		1	1
Meningoencephalitis	1		1
UTI with Moderate bilateral hydronephroureterosis/cystitis	1		1
Multiple pyemic abscess	1		1
Neuro infection/Post measles encephalitis	1		1
UTI with Posterior urethral valve	1		1
Psychomotor retardation seizure precipitated by fever		1	1
Pyogenic meningitis	1		1
Rhematic fever with UTI	1		1
Seizure disorder for evaluation (Normal growth and development)	1		1
Septecemia with microcephaly with craniostenosis		1	1
UTI		1	1
UTI		1	1
UTI with febrile seizures		1	1
UTI with sepsis with acute renal failure (Pre-renal cause)		1	1
Viral fever	2	3	5
Total	26	22	48

asscessed.

6. Prevalence of culture positivity was 44% in those who showed >10 pus cells/HPF in centrifuged sample of urine compared to 2.5% in those who showed > 5 pus cells/HPF.
7. Hence we conclude that pyuria of > 5 pus cells /HPF in centrifuged sample should be considered as significant pyuria and further evaluation should be done promptly to initiate treatment and to prevent morbidity and long term sequele.

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8. Conflict of Interest

The author declares no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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Author biography

Mahishma K, Assistant Professor

Anil Kumar K, Assistant Professor

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