

Study of Urinary Tract Infection in Febrile Infants and Young Children

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ABSTRACT

Introduction Among febrile infants and young children, UTI is one of the commonest bacterial infections with prevalence varying between 4.1% and 7.5%. Study aimed to determine the prevalence of urinary tract infection (UTI) in febrile children from 1 month to 5 years of age and to assess the validity of microscopic urine analysis and urine culture in diagnosis of UTI.

Material and methods: A single centre, prospective study done over period of 1 year in the department of Pediatrics of a tertiary level medical college and hospital in northern India. Febrile patients from age 1 month to 5 year were enrolled in study and urine sample was sent for routine microscopic examination as well as for culture and sensitivity. Demographic and clinical details collected in predesigned proforma. Urine samples were collected under aseptic measures and was examined under microscope as well as inoculated for culture and sensitivity. Collected data was analyzed by SPSS version 22.

Results: 180 febrile patients of age between 1 month and 5 years were enrolled in this study. Children having positive urine culture showing 10^5 / ml colonies count of organism of single species were considered to be having urinary tract infection. Out of 180 cases, 35 patients showed significant pyuria in centrifuged urine sample and 19 cases showed positive urine culture, giving a prevalence of UTI as 10.5%. Sensitivity and Specificity of urine analysis (with significant pyuria to be considered > 5 pus cell/ High Power Field) was 78.95% and 87.58% respectively. Positive Predictive Value and Negative Predictive Value was 42.86% and 97.24% respectively.

Conclusion: UTI is one of the common causes of fever in children under 5 years of age and should be strongly suspected. Urine culture is the gold standard for diagnosing UTI.

Keywords: Children, Culture And Sensitivity, Pyuria, Urine, Urinary Tract Infection, UTI

Thus, UTI in infants and young children could be easily overlooked, leading to acute and chronic complications.

Common uropathogens include *Escherichia coli* (accounting for approximately 85% of UTIs in children), *Klebsiella*, *Proteus*, *Enterobacter*, *Citrobacter*, *Staphylococcus saprophyticus*, and *Enterococcus*.⁵

The prevalence and incidence of pediatric UTI varies by age, ethnicity, gender and circumcision status. Around 2.2% of boys and 2.1% of girls have UTI before age of 2 years and 2% boys and 7% girls would have UTI by 6 years of life.¹ Study aimed to determine the prevalence of urinary tract infection (UTI) in febrile children from 1 month to 5 years of age and to assess the validity of microscopic urine analysis and urine culture in diagnosis of UTI.

MATERIAL AND METHODS

This hospital based, open labelled, cross sectional, observational, prospective study was conducted in the department of Pediatrics, NMCH, Patna over a period of 1 year from 01/01/2019 to 31/12/2019.

Selection of patients

Febrile children of age from 1 month to 5 years, presenting in outpatient department (OPD) or admitted in department of Paediatrics, NMCH, Patna over the study period.

Inclusion criteria

1. Fever, axillary temperature $\geq 100.4^\circ\text{F}$ (38°C).
2. Age between 1 month and 5 years.

Exclusion criteria

1. Children below 1 month or above 5 years.
2. Any child who had received antibiotics 48 hours prior to the presentation.
3. Children with known congenital genitourinary anomalies.
4. Febrile children with symptoms and/or signs localising

INTRODUCTION

Pediatric urinary tract infection (UTI) is one of the common causes for children to present in healthcare setup.¹⁻² 8% of girls and 2% of boys would at least have had one episode of UTI by the age of 7 years.³ After respiratory and gastrointestinal infections, UTI is the 3rd most common infection in pediatric age group and accounts for around 4-10% admissions of febrile children.⁴ UTI has varied presentation ranging from asymptomatic infection to mild lower urinary tract symptoms, to febrile and systemic illness. Infants and small children with UTI rarely presents with urinary complaints and it is only after age of 5 years that the typical triad of presenting features of abdominal pain, vomiting and fever with chills, rigors or suprapubic pain usually develops.¹

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to systems other than renal

4. Consent not given.

Method of study: Following a written informed consent from caregivers, children were enrolled for this study. Details regarding age, sex, socioeconomic status, bowel habits, predisposing risk factors, relevant history and examination findings were noted in pre-determined proforma.

Collection of urine sample: For children under 2 years of age, around 10 ml of urine sample was collected in sterile bottle, under aseptic precautions by transurethral bladder catheterisation or suprapubic aspiration. In children above 2 years of age, a clean-catch mid-stream specimen was collected.

Urine analysis: The urine sample collected was centrifuged in standard manner @ 2500 rpm for 30 mins, supernatant decanted off and re-suspended in 0.2 ml urine. It was then examined under microscope.

Urine culture: Urine was inoculated into blood and MacConkey agar plates with 0.01ml calibrated loop. Plates were then incubated at 35-37 °C for 24 hours. Colony count more than 10⁵ / ml organism of single species were considered significant. Samples showing insignificant growth, mixed growth of two or more pathogens or growth of non-pathogens were considered as culture negative.

Definitions:

Significant pyuria: > 5 pus cells /HPF in a centrifuged urine sample.

Positive urine culture: 10⁵/ ml colonies count of organism of single species.

Urinary Tract infection case: Children having positive urine culture.

Other investigation: CBC, USG whole abdomen, Micturating Cystourethrogram (MCU), performed as and when needed.

STATISTICAL ANALYSIS

The data was analyzed by SPSS version 22. *P*-value of < 0.05 was considered significant.

RESULT

219 patients who met inclusion criteria were screened. 39 of these met exclusion criteria and thus were excluded. 180 children were finally included in the study and all further data would be discussed for these 180 patients. 46.6% (n=84) of these patients were female and 53.4% (n=96) were male (table 1).

19.4% (n=35) patients showed significant pyuria in centrifuged urine sample, of which 57.1% (n=20) were male (p > 0.05) (Table 2).

19 children showed significant growth of single species organism on urine culture, giving the prevalence of 10.5%. Out of these 19 children 12 (63.1%) were female (p > 0.05) (Table 3).

68.4% (n=13) showed *E.coli*, 21% (n=4) showed

Age	Sex		Total
	Male	Female	
1 month- 1 year	37 (54.4%)	31 (45.6%)	68 (37.8%)
1 year- 2year	36 (59.0%)	25 (40.9%)	61 (33.9%)
2year- 5 year	23 (45.1%)	28 (54.9%)	51 (28.3%)
Total	96 (53.4%)	84 (46.6%)	180

Table-1: Age and Sex distribution of enrolled cases (n=180)

Age	Sex		Total
	Male	Female	
1 month – 1 year	5 (45.5%)	6 (54.5%)	11 (31.4%)
1 year – 2 year	6 (66.7%)	3 (33.3%)	9 (25.7%)
2 year – 3 year	4 (66.7%)	2 (33.3%)	6 (17.1%)
3 year – 4 year	3 (60.0%)	2 (40.0%)	5 (14.2%)
4 year – 5 year	2 (50.0%)	2 (50.0%)	4 (11.4%)
Total	20 (57.1%)	15 (42.9%)	35

Table-2: Age and Sex distribution of cases with Significant Pyuria

Age	Sex		Total
	Male	Female	
1 month – 1 year	2 (33.3%)	4 (66.7%)	6 (31.6%)
1 year – 2 year	2 (40.0%)	3 (60.0%)	5 (26.3%)
2 year – 3 year	1 (33.3%)	2 (66.7%)	3 (15.8%)
3 year – 4 year	1 (33.3%)	2 (66.7%)	3 (15.8%)
4 year – 5 year	1 (50.0%)	1 (50.0%)	2 (10.5%)
Total	7 (36.9%)	12 (63.1%)	19

Table-3: Age and Sex distribution of cases with POSITIVE urine culture

Urine analysis	Urine culture		
	Positive	Negative	Total
Positive	15 (TP)	20 (FP)	35
Negative	4 (FN)	141 (TN)	145
Total	19	161	180

Table-4: Chi Square Analysis (urine analysis * urine culture)

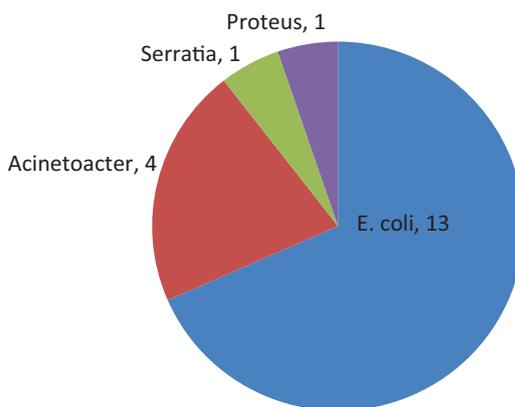


Figure-1: Distribution of pathogens in urine culture

Acinetobacter and 5.2% (n=1) showed *Serratia* and *Proteus* each (Figure 1).

Majority of patients of significant pyuria (n=20, 57.1%, *p* < 0.05) as well as culture positive UTI (n=11, 68.7%, *p* > 0.05) were of age less than 2 years.

Of these only 42.8% (n= 15) of patients with significant pyuria had positive culture and 4 patients (21%) with culture positive UTI didn't had significant pyuria. (Table 4)

In the present study, Sensitivity and Specificity of urine analysis (with significant pyuria to be considered > 5 pus cell/ HPF) was 78.95% and 87.58% respectively. PPV and NPV was 42.86% and 97.24% respectively.

DISCUSSION

This hospital based, open labeled study was carried out in the Department of Pediatrics, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, over a period of 1years to determine the prevalence of UTI in febrile children of from 1 month to 5 years of age and to assess the validity of microscopic urine analysis and urine culture in diagnosis of UTI.

Prevalence of UTI in febrile children from 1month to 5 years of age, in present study was found out to be 10.5%, which is in agreement of various previous studies where prevalence was found out to be ranging from 2.1% to 13.7%.^{2,6-11}

In this study, among 19 culture positive cases, 13 (68.4%) grew *E.coli*, 4 (21%) showed growth of *Acinetobacter* and both *Serratia* and *Proteus* grew in 1 (5.2%) culture each. This finding is similar to various previous studies^{2,12-16} showing *E.coli* to be most commonly isolated pathogen ranging from 60 – 90% in cases of childhood UTI.

Out of 180 febrile children who met the inclusion criteria, 19.4% (n=35) children showed significant pyuria (>5 pus cells/ HPF). Only 42.8% (n= 15) of patients with significant pyuria had positive culture. Thus it could be concluded that pus cell in urine is poor predictor of culture positive UTI in children.

In the present study, Sensitivity and Specificity of urine analysis (with significant pyuria to be considered > 5 pus cell/ HPF) was 78.95% and 87.58% respectively. PPV and NPV was 42.86% and 97.24% respectively. This sensitivity and specificity rate is similar to that reported by Bachur R et al¹⁷ and Waisman Y et al.¹⁸ Zorc JJ et al¹⁹ ShawKN et al.²⁰ Waisman Y reported PPV and NPV of 75.6% and 95% respectively which is similar to our study.

CONCLUSION

Only small percentage of pyuria patient is found to be culture positive UTI. Conversely culture positive UTI could be present even in patient not having pyuria in routine urine analysis. Thus high index of suspicion should be kept in under 5 years of febrile children and culture & sensitivity testing of urine should be sought for in all suspected case.

Limitation

This is a single centre study with relatively small sample size. Larger, multicentric study should be done for more definite results.

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