



RESEARCH ARTICLE

CLINICO-MICROBIOLOGICAL PROFILE OF CULTURE POSITIVE URINARY  
TRACT INFECTION IN CHILDREN

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ABSTRACT

Urinary Tract Infection (UTI) is one of the commonest bacterial infection in children. Male children have less chances than female children and may be associated with renal parenchymal damage leading to long term renal complications. Though children rarely presents with symptoms of UTI, a high index of suspicion is warranted as fever may be only feature in small children. Purpose of this study was to see clinical presentation and outcome of culture positive UTI in children.

**Material and Methods:** Our study was conducted in a tertiary care service hospital in India. All culture positive UTI were enrolled in the study. All demographic, clinical and investigational data were collected.

**Results:** A total of 55 culture positive UTI were enrolled in the study period. Female outnumbered the male gender by 1.4:1. The most common age for presentation was in infant and preschooler (1-4 years) age group. The most common presentations were fever, urinary complaint and diarrhea. Fever was sole presentation in infant in culture positive UTI in comparison with other age group. 40% children were asymptomatic. The most common organism were E coli and proteus. Renal tract anomalies were found in 7% cases and on follow up 3.7% children had abnormality on either DTPA or DMSA scan. Most common empirical antibiotics used was aminoglycosides and mean duration for injectable antibiotics was 4.6 days.

**Conclusion:** The Culture positive UTI was most common in female and the most common organism were gram negative with good response to empirical antibiotics aminoglycosides. In a febrile infant even without any associated symptom exclusion of UTI is recommended.

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INTRODUCTION

Urinary tract infection (UTI) is one of the commonest bacterial infections of childhood. The chances of male and female child developing UTI in first ten years of life are 1% and 3% respectively. [1] UTI in earlier life can lead to serious complications like renal parenchymal damage and renal scarring that can lead to hypertension and progressive renal disease in later years. [2, 3] Unfortunately children rarely present with classical signs of UTI and pyelonephritis, hence there are high chances of missed or wrong diagnosis. Diagnosis of UTI in febrile episodes in children is difficult and often missed unless high index of suspicion is maintained and evaluated. [4, 5, 6] Fever might be only clinical feature of UTI in infants and recent guidelines suggest urinalysis and cultures for fever without source in infants. [7] Other common clinical features associated with UTI are dysuria, increased frequency of micturition and vomiting. Screening children for UTI can be

difficult due to practical problems of uncontaminated sample collection especially in non-toilet trained age group. Significant bacteruria in urine culture is essential to diagnose UTI. These patients should also be screened for urinary tract anomalies as UTI may be the marker of congenital anomalies of urinary tract. [8] Ultrasonography (USG) of urinary tract is usually the first screening tool for anomalies and complications. Gram negative bacilli are the commonest pathogen in community acquired UTI. [9] With prevalence of antibiotic misuse other pathogens especially fungi like Candida are assuming importance in hospital acquired UTI.

We conducted this study to determine the clinical and bacteriological profile of pediatric patients presenting with culture proven UTI.

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## METHODOLOGY

### Study Design

this retrospective study was carried out at pediatric department of a tertiary hospital in western India. Case records and electronic records of culture proven UTI patients aged 1 month to 12 years treated at this centre from January 2014 to August 2016 were examined. Data regarding age, gender, clinical features, relevant biochemical as well as bacteriological investigation and imaging studies was collected and analysed.

### Inclusion Criteria

All children between age 1 month and 12 years managed at this centre as a case of culture proven UTI as confirmed by positive urine culture.

### Exclusion Criteria

Children with immunodeficiency, neutropenia with Absolute Neutrophil Count (ANC) <500/cmm and previous bladder dysfunction were excluded.

### Data Analysis

Statistical analysis was done using SPSS version 20. For numerical data requiring estimation and evaluation of parameters such as age, mean, median, standard deviation and interquartile ranges were calculated. Proportion of individuals belonging to specific group or having particular attributes was expressed in absolute number and percentage. The difference between two or more proportions was tested using the Chi-square test.  $p$  value < 0.05 was considered to be significant. The difference between mean of two or more groups was tested using T test.  $p$  value < 0.05 was considered to be significant.

### Observations

Total of 55 culture positive UTI cases were included in the study as they met our inclusion and exclusion criteria. Youngest case was 2 months male infant, whereas eldest was 10 years female child. 23 were male and 32 were female with male:female ratio of 1:1.4. Male to female ratio in  $\leq 1$  year age group was 1.4: 1. Maximum patients in our study were in the age group of 1-5 years (56.36%), followed by  $\leq 1$  year age group (30.9%) with a median age of 24 months.

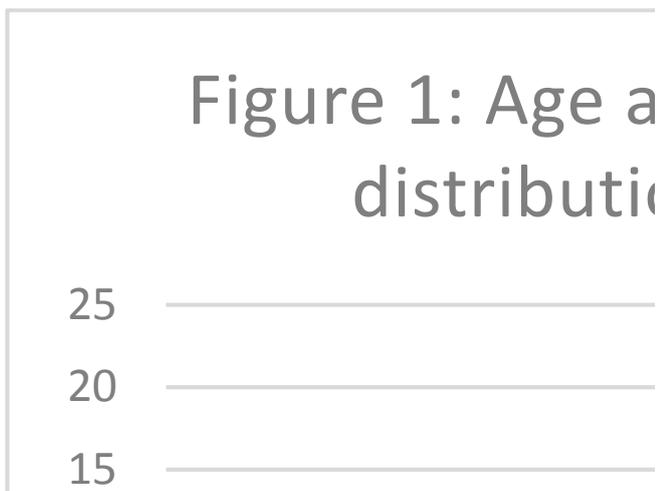


Figure 1 shows age-wise and gender-wise distribution of data.

Most common symptom was fever which was found in 42 cases (72.3%), followed by urinary symptoms in form of dysuria, increased frequency of micturition and crying while micturition, in 25 cases (45.4%), diarrhoea in 9 cases (16.3%), vomiting in 6 cases (10.9%) and pain abdomen in 4 cases (7.2%). Table 1 shows the clinical features of cases.

Table 1 Clinical presentation of UTI

Clinical feature	Number of cases [n = 55]	Percentage
Fever	42	72
Urinary symptom	25	45
Diarrhoea	9	16
Vomiting	6	11
Pain abdomen	4	7

On analysis, presence of fever as symptom was significantly high amongst infant age group compared to rest of cases (OR 7.38, 95% CI 0.87-62.32,  $p = 0.045$ ). However, variation of rest of symptoms across different age and gender groups was statistically not significant. Figure 2 shows comparison of febrile cases amongst age and gender groups.

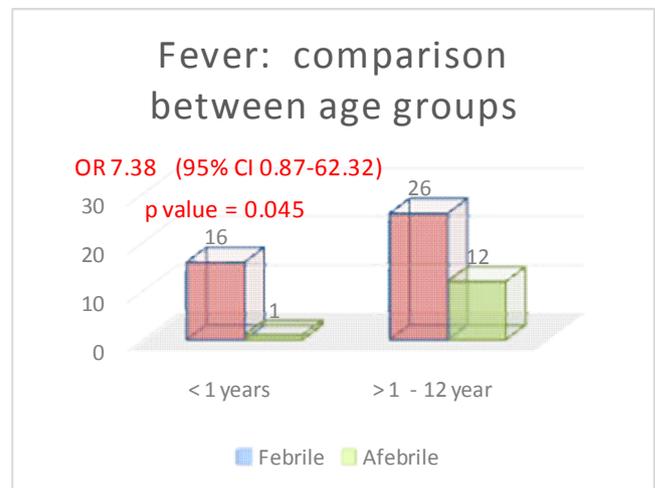
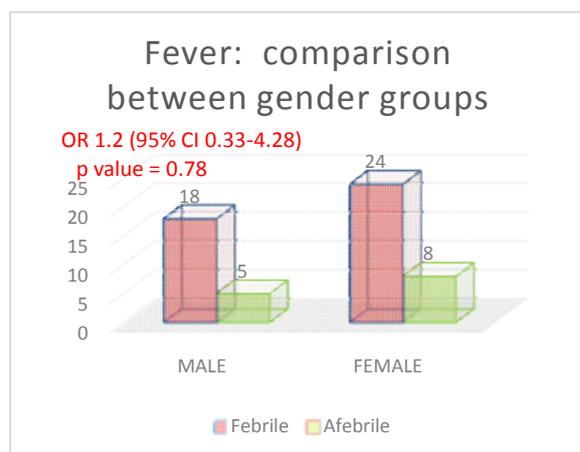


Figure 2 Profile of febrile children with culture proven UTI



Out of total 42 cases with fever, 17 had no other presenting symptoms (40%) (Figure 3). On analysis of these cases with atypical presentation, females had significantly high chances of culture positive UTI compared to males ( $p = 0.048$ ). Figure 4

shows comparison of atypical cases amongst age and gender groups.



Figure 3 Clinical symptoms in febrile UTI patients

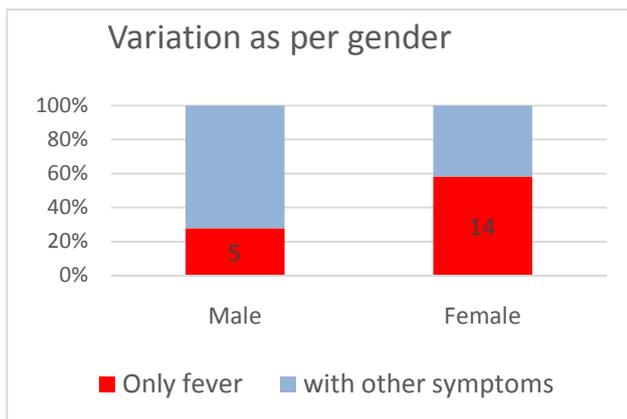
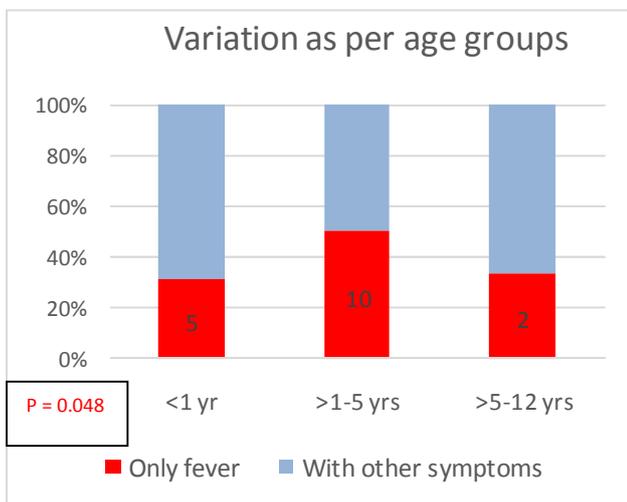


Figure 4 Predictor for culture proven UTI in different age and gender groups

Significant pyuria (> 5 pus cells/ HPF urine sample) was found in 12 cases (21.8%) whereas CRP was positive (> 0.6 ng/ml) in 22 cases (40%). Most common organism isolated on urine cultures were Escherichia coli and Proteus mirabilis (Table 2).

Table 2 Microbiology of culture proven UTI

Organism isolated	No of cases [n = 55]	Percentage
Escherichia coli	46	83.6
Proteus mirabilis	3	5.4
Proteus vulgaris	2	3.6
Pseudomonas aeruginosa	1	1.8
Klebsiella oxytoca	1	1.8
Enterococcus aerogenes	1	1.8
Enterococcus faecalis	1	1.8

USG abnormalities were found in 4 cases (7.2%), unilateral hydronephrosis in 3 cases and ectopic solitary kidney in one case. On further follow up at 3 months, Tc99- DMSA scan (dimercaptosuccinic acid) and Tc99-DTPA (diethylenetriaminepentacetate) scan were abnormal in one each with cortical scarring in one and PUJ (pelviuretric junction) obstruction in another. MCU (micturating cystourethrogram) revealed unilateral grade 4 VUR (Vesico Ureteric Reflux) in one case. The average length of stay in hospital and duration of therapy was 7 days. There was no significant variation as per age, gender and type of organism isolated. 52 (94.5%) cases were started on parental antibiotics, Aminoglycosides in 45 (81.8%) and 3<sup>rd</sup> generation cephalosporins in 5 (9.1%) and carbapenem/Pitaz in 1 each. 3 (5.5%) children were started on oral antibiotics on admission and were continued. Mean duration of parental therapy was 4.6±1.2 days and all were continued on oral antibiotics for total duration of 7-10 days (Table 3).

Table 3 Antibiotics choice and durations

Antibiotics	Number, Percentage
Empirical: Aminoglycosides	45, 81.8
3 <sup>rd</sup> Generation Cephalosporin	5, 9.1
Oral antibiotics	3, 5.5
Mean duration of injectible antibiotics	4.6± 1.2 days

## DISCUSSION

Urinary tract infection is a common infection in childhood with serious associated morbidity in few cases. In our study, overall ratio of female to male cases was 1.4:1, however in infant age group male outnumbered female 1.7:1. Other studies also showed female preponderance varying from 1.5:1 to 2:1. [10-13]. The likely causations are due to shorter urethra, its proximity to anal opening and hence predisposing female children to ascending infection from the faecal flora. [2]

In our study, maximum number of culture positive UTI were within age group >1-5 years [56.4%]. This was similar to other studies by Malla *et al*, [12] Patel *et al*, [14], Sharma *et al*, [15] and Singh *et al* [16]. The proportion of cases in >1-5 years in these studies varied from 56.5% to 37.7%. However, Gupta *et al* [18] and Gadge *et al* [21] found maximum number of patients (56.5% and 37.7%, respectively) in the age group of less than 1 year.

Fever was the most common symptom in our study, present in 72.3% cases. This is in consonance with various other studies. [15-20] Urinary symptoms (dysuria, increased frequency of micturition, crying while micturition), diarrhoea, vomiting and pain abdomen were another common symptom noticed, which correlates with other studies. [12,15,16,18,19] Significant pyuria

(>5pus cells/HPF centrifuged urine sample) was found in only 21.8% cases, much less than established sensitivity of the test (73-74%).<sup>[22,23]</sup> It could be due to improper collection and handling of the specimen. USG abnormality was found in 4 cases (7.2%), which was similar to findings of Wing Hang Luk *et al*,<sup>[24]</sup> However, Manohar *et al*<sup>[17]</sup> and G Zamir *et al*<sup>[25]</sup> found USG abnormality in 17% cases, which could be due to differences in study population age groups compared to our study.

Only culture positive cases were included in our study. Most common organism isolated across all age group and irrespective of sex in our study was *Escherichia coli* (83.6%). This was similar to various studies from India<sup>[17,19,21,26-28]</sup> and rest of world as well.<sup>[12,15,16,29-31]</sup> *Proteus* was second most common organism isolated (9%), as reported by Chakupurakal R *et al*<sup>[32]</sup> and Bouskraoui M *et al*<sup>[33]</sup> between 5-12%. Average length of stay, irrespective of age, gender and organism isolated was 7 days, ranging from 3 to 16 days depending on clinical features and response to therapy. Average duration of total antibiotic therapy was 7 days, most of the cases were started on intravenous amikacin empirically pending antibiotic sensitivity report as per unit and hospital policy and later on changed to appropriate intravenous or oral antibiotics depending on sensitivity and clinical response to therapy.

#### Limitation of our Study

The sample size of the study is small; hence it might not truly reflect the study population. Being a retrospective descriptive study, it fails to identify any risk factors associated with culture proven UTI in children. Our hospital admits only complicated UTI or infant with UTI hence the data on antibiotics may be skewed as uncomplicated UTI may be treated with oral antibiotics safely. A prospective study with larger sample size is more desirable.

#### CONCLUSION

Urinary tract infection is a common bacterial infection in children. Females are more affected than males. High prevalence of fever and other nonspecific symptoms especially in infants and young children supports the need for screening all febrile young children for UTI.

Diagnosis must be based on a positive urine culture as this has implications for detailed evaluation for congenital abnormalities and follow up. *Escherichia coli* and *Proteus mirabilis* are the most common organisms causing UTI in children in the community setting. Ultrasound examination of abdomen is a sensitive test to detect renal parenchymal involvement and underlying abnormalities of urinary tract. Large scale studies are required to monitor the pattern of antibiotic resistance to help formulate appropriate empirical pharmacotherapy for UTI.

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