

## “STUDY OF URINARY TRACT INFECTIONS IN FEBRILE CHILDREN”

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### ABSTRACT

**Introduction:** Febrile children comprise a major proportion in Paediatric out-patient Department. Urinary Tract Infection are one of the most common and serious infection of the childhood which leads to end organ damage. Considering the above scenario this study has been undertaken to evaluate the prevalence of urinary tract infection in febrile children, compare culture positive results with microscopic-urinalysis and to study the risk-factors associated with it.

**Methodology:** This analytical-cross-sectional study was conducted amongst children aged 2 months to 5 years admitted at Paediatric ward and PICU of a tertiary care hospital over a period of 18 months. The study protocol was approved by Institutional Ethical Committee.

**Results:** Frequency of study cases of urinary tract infection in febrile children in our study was 3.93%. Amongst the various risk factors studied in culture positive cases female sex contributes the most common risk factor followed by age <1 year. Amongst the culture positive cases, E coli was the most common organism for Urinary tract Infection accounting for total 11 i.e. (58%) of the total cases followed by Klebsiella and Enterococcus. Amongst the total studied cases (80), 19 cases i.e. (23.75%) of the total contributed to positive urine culture growth. Amongst the 19 culture-positive cases, 17 cases i.e. (89.5%) of cases showed significant pyuria whereas in culture-negative, only 1.65% had significant pyuria which was statistically significant. (p value < 0.00001). However, 02 (10.5%) cases with Urinary tract Infection would have been missed if only presence of significant pyuria on microscopy was taken as a method of diagnosis of UTI.

**Conclusion:** Many Febrile patients in our study who had positive culture reports had significant pyuria on urinalysis. So even today, febrile patients with UTI with culture-positive reports have significant pyuria on urinalysis. Hence, both microscopic urinalysis with evidence of culture-positive reports have been good indicators for diagnosis of UTI in children.

**Keywords:** Urinary Tract Infection, Febrile, Microscopic Urine Analysis, Escherichia Coli

## INTRODUCTION

Urinary Tract Infections is one of the commonest bacterial illnesses among febrile children and it reports prevalence between 4.1% - 7.5%, ranked next to gastrointestinal and respiratory infections<sup>1,2</sup>. Fever has been considered as one of the important findings in children with UTI because it a marker of involvement of renal parenchymal disease (Pyelonephritis)<sup>3,4</sup>. Common uropathogens causing Urinary Tract Infection in all age groups are Escherichia Coli (65-75%), Klebsiella spp., Proteus Mirabilis, Pseudomonas aeruginosa and many other Enterobacteriaceae<sup>5</sup>. Urinary Tract Infection may occur via two routes: hematogenous and ascending route. Hematogenous route is seen in first year of life whereas the ascendant route develops thereafter. In the ascendant route, there is migration, fixation and proliferation of this bacteria in the urinary tract and the bacteria resides there for a long period in the genitourinary tract and after spreading to the periurethral area via the perineum, they establish infection to the urinary tract by several mechanism. The clinical presentation of Urinary Tract Infection is diverse in all age groups ranging from Failure to thrive, vomiting, diarrhoea, irritability, jaundice are some of the common symptoms of new-borns and younger infants less than 3 months of age to presenting in children between age group, 3 months – 2 years with non-specific symptoms like vomiting, appetite loss, dehydration, abdominal pain and foul-smelling urine<sup>6,7</sup>. The classical symptoms of Urinary Tract Infection seen in elder age group are never seen younger population, this makes the diagnosis more difficult<sup>8</sup>. In the present study, we aimed to evaluate the prevalence of urinary tract infection in febrile children, compare culture positive results with microscopic urinalysis and to study the risk factors associated with it.

## METHODOLOGY

### Study Design and Sample Population:

This Analytical cross-Sectional study was conducted amongst children aged 2 months to 5 years admitted at Paediatric ward and Paediatric Intensive care unit (PICU) of a tertiary care hospital over a period of 18 months. **The study protocol was approved by Institutional Ethical Committee.**

### **Objectives:**

1. To study the percentage of Urinary Tract Infections in Febrile children below 5 years.
2. To compare the culture positive reports with microscopic urine analysis.
3. To study high risk factors for Urinary Tract Infections.

All Patients aged 2 months to 5 years of age admitted to Paediatric ward and Paediatric Intensive Care Unit and admitted for at-least 48 hours were included in the study. Urinary tract Infection will be defined as whose urine culture shows colony count of  $>10^5$ /ml organism of a single species. Those patients whose urine culture is positive and urine routine microscopy shows no pus cells will also be considered as Urinary Tract Infection.

### **Inclusion Criteria:**

1. Febrile Children between 2 months to 5 years in Paediatric Ward and Paediatric Intensive Care Unit

### **Exclusion Criteria:**

1. Any febrile child received antibiotics 48 hours prior to admission
2. Parents/Guardians not willing to enroll the child in study
3. Children with chronic kidney disease

### **Data Collection and Analysis:-**

All the admitted children and fulfilling the above-mentioned criteria were studied in detail over a period of 18 months (November 2019-April 2021). Detailed evaluation was done in relation to relevant history, general examination and systemic examination. Above data was documented on a pre-structured proforma, following which a provisional diagnosis was made and the necessary lab investigations were sent to confirm the diagnosis of Urinary Tract Infection which included Complete blood count, urine routine and urine culture. Child and Parents were told that during sample collection perineum and genitalia should be washed with soap and water. In children below 2 years of age urine sample will be collected under aseptic precaution by transurethral bladder catheterisation, around 10 ml of urine will be collected in sterile bottle and will be sent for urinalysis and urine culture and sensitivity and in children above 2 years of age freshly voided clean catch mid-stream urine sample will be collected and sent. In the present study fresh urine samples were centrifuged in standard manner and examined under microscope for pyuria and haematuria. In the study  $>5$  pus cells/hpf in a centrifuged urine sample was considered as significant for pyuria. Urine sample collected in sterile container was sent to Microbiology department within 1 hour for further

processing. Urine culture were inoculated into Blood Agar and MacConkey agar plate with 0.01ml calibration loop. All plates were incubated for 24 hours under aerobic condition to obtain accurate colony count.

### **Statistical Analysis: -**

Once all the data was collected, it was filled in Microsoft Excel sheet and analysed statistically. The frequency and percentage were obtained for observation tables from Microsoft excel sheet. To study the Frequency of Urinary tract Infection in Febrile children, chi square test was used. Detailed statistical analysis was done with the help of statistician.

### **RESULTS:**

Frequency of study cases of urinary tract infection in febrile children admitted in paediatric ward and PICU among 2034 patients, admitted in the duration of 18 months in Bharati Vidyapeeth (Deemed to be University), Medical College & Hospital, Sangli was 3.93% as shown in figure 1. In the total of 80 cases in the present study, 44 were males and 36 were females constituting 55% and 45% of the total cases respectively as shown in Table no 1. Out of 80 cases in the present study, Patients aged between 2- 12 months of age comprised 38.75% (n=31) of total patients, 13-24 months were 13.75% (n=11) and 25-60 months were 47.5%(n=38) respectively as shown in Table no 1. Maximum patients were in between the age group of 25-60 months. Amongst the various risk factors studied in culture positive cases female sex contributes the most common risk factor constituting 52.63%, and age < 1year and uncircumcised males being the second most common risk factors constituting 31.57% each, Whereas the other risk factors like Constipation, structural urinary tract anomaly, systemic illness constitutes 26.31%, 10.52% and 15.78% respectively as shown in Table no 1. In the total of 80 cases included in the study, 19 cases i.e. 23.75% showed positive urine culture growth as shown in Table no 2. In the present study amongst the total culture positive cases, growth of E. coli was seen in 11 cases (58%) and it constitutes the most common organism for urinary tract infection, with Klebsiella and Enterococcus constituting 15.75 % each and Coagulase positive staphylococci being 10.50 % respectively as shown in Table no 3. In our study among 80 children, 18(22.5%) showed significant pyuria in urinalysis whereas 62(77.5%) did not show significant pyuria in urinalysis. In the present study, out of total 19 culture positive cases 17(89.5%) cases showed significant pyuria whereas in culture negative cases only 01(1.65%) had significant pyuria which was statistically significant as shown in Table no 4. However, 02(10.5%) cases with Urinary tract Infection would have been missed if only presence of significant pyuria on microscopy was taken as a method of diagnosis of

UTI. In the present study, between urinalysis and urine culture statistically significant relationship was being found. The chi square statistics was used with Yate's correction is 59.1589. The p value was <0.00001. significant if p value <0.05

There were few limitations of the study:

1-Small sample size

2-Hospital based cross sectional study

### **DISCUSSION:-**

Urinary tract infection (UTI) is one of the most common disease in infants and the second most common infectious disease in toddlers. In our study frequency of study cases of urinary tract infection in febrile children admitted in pediatric ward and PICU was 3.93%. In a similar study, Roberts et al reported that the rate of confirmed UTI was 4.1%. Similarly other studies conducted Dharnidarka et al, Hoberman et al and Bonadio et al in their studies of febrile children reported prevalence of 5.4%, 5.3% and 5.53% respectively and have also recommended urine culture as a part of diagnostic evaluation<sup>3,9</sup>.

It was found that out of total children included in the study 44 (55%) cases were male and 36 (45%) cases were female with M:F ratio 1.22:1 and majority 47.5% (n=38) within the age group of 2-5 years of age group followed by 38.75% (n=31) cases had age less than 1 year and 13.75% (n=11) cases were seen having age between 13 – 24 months. In study conducted by Prasad PL et al (2018), they observed out of 10 UTI cases 60% cases were male cases and 40% were female cases with M:F ratio 1.5:1 which was similar with our study<sup>6</sup>. Most of the cases were under 1 year of age in their study. In studies conducted by Krober et al, Crain EF et al and Dayan et al, high preponderance of UTI was found in males with a male to female ratio of 1.95:1, 2.6:1 and 3.6:1.6<sup>6</sup>. In most of the studies, it is proved that the incidence of urinary tract infection in children less than 1 year is equal in both males and females.

The etiology predisposing to UTI is vague and not very clear and studies are being conducted to find out the exact risk factors for the development of UTI. We should have the proper knowledge of risk factors for urinary tract infection which will help us in the prevention of development of Urinary tract Infections<sup>10,11</sup>. In the present study, among the various risk factors studied female sex contributes the most common risk factor constituting 52.63%, and age < 1 year and uncircumcised males being the second most common risk factors constituting 31.57% each, Whereas the other risk factors like Constipation,

structural urinary tract anomaly, systemic illness constitutes 26.31%, 10.52% and 15.78% respectively. Higher risk in males of developing UTI in the initial 12 months of life as compared to females was found in the study conducted by Prasad PL et al.<sup>6</sup>, 4 out of 10 cases of UTI used to wear tight perineal clothing, 7 cases wiping from back, 2 cases of VUR and 2 cases had obstructive uropathy. It is also comparable with Loening-Baucke V et al and Koff SA et al constipation is being found one of the important risk factors of urinary tract infection<sup>12</sup>.

In the present study out of 80 cases, 19 cases ie.23.75% showed positive urine culture growth. In the present study, among culture positive cases 58% grew E. coli constitutes the most common organism for urinary tract infection, with Klebsiella and Enterococcus constituting 15.75 % each and Coagulase positive staphylococci being 10.50 %. In a similar study, Waisman et al observed out of the total 35 cultures, 27 were positive for E coli (76%), 2 for Klebsiella (6%), 2 for Enterococcus(6%). This findings were similar to our study. Similar results were found in the study conducted by Zamir G et al and Zorc JJ et al with the most common organism for causation being E. Coli, 85% and 80% respectively<sup>13,14</sup>. In the study conducted by Hoberman et al E. Coli was the most common organism reported. Also study conducted by Aravind Bagga et al reported Ecoli being the most common organism in first symptomatic urinary tract infection and also in recurrent infections. Culture growth (gender wise) In the present study, among culture positive cases 11(58%) grew E. coli constitutes the most common organism for urinary tract infection, in females being 08 and in males being 03. Klebsiella was found only in males 03 (15.7%) and Enterococcus constituting 15.7 % and in which 2 in females and 1 in male and Coagulase positive staphylococci being found in males only 2(10.50%).

In our study among 80 children, 18(22.5%) showed significant pyuria in urinalysis whereas 62(77.5) did not show significant pyuria in urinalysis. In the study conducted by Schroeder AR et al, the urinalysis component which had the highest sensitivity was pyuria (defined as >3 WBCs/HPF).<sup>5</sup> Comparison of culture positive reports with microscopic urinalysis In the present study, out of total 19 culture positive results 17(89.5%) cases showed significant pyuria whereas in culture negative case only 01(1.65%) had significant pyuria which was statistically significant. However, 02(10.5%) cases with Urinary tract Infection would have been missed if only presence of significant pyuria on microscopy was taken as a method of diagnosis of UTI. Hence, in the present study, we conclude that most febrile patient with Urinary Tract Infection had both culture positive reports as well as significant pyuria in microscopic urinalysis, so both the methods are reliable indicators for the diagnosis of

urinary tract infection. In our study, specificity and sensitivity of urine analysis was 96.77% and 94.44% respectively. In a similar study conducted by Waisman Y et al reported sensitivity and specificity of 88.6% and 88.4%<sup>1</sup>. The p value for above statistical comparison is <0.00001, and it is statistically significant.

### **CONCLUSION:-**

Urinary Tract Infections accounts for one of the commonest causes in children admitted to Paediatric ward and PICU. Escherichia coli followed by Klebsiella spp is the commonest organism for Urinary Tract infection in children. Most of the febrile patients in our study who had positive culture reports had significant pyuria on urinalysis. So even today, febrile patients with UTI with culture positive reports have significant pyuria on urinalysis. We conclude that both microscopic urinalysis with evidence of culture positive reports have been good indicators for diagnosis and treatment of Urinary Tract Infections in children.

### **DECLARATION : -**

Study Funding: None

Conflict of Interest: None

**ETHICAL APPROVAL:** - This study protocol was approved by

The Chairman, Institutional Ethics Committee

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**Table 1. Baseline characteristics of the patients included in the study**

VARIABLES	Number	Percentage%
<b>Gender</b>		
Male	44	55%
Female	36	45%
<b>Age Group</b>		
2-12 months	31	47.5%
13-24 months	11	13.75%
25-60 months	38	47.5%
<b>Risk factors of Urinary Tract infection</b>		
Age<1 year	06	(31.57%)
Female sex	10	(52.63%)
Constipation	05	(26.31%)
Structural urinary tract anomaly	02	(10.52%)
Uncircumcised males	06	(31.57%)
Systemic illness	03	(15.78%)

**Table 2. Table depicting Distribution of patients according to the organisms grown in urine culture.**

Organism isolated (Urine culture)	Number of cases(n=19)	Percentage (%)
E Coli	11	58%
Klebsiella spp	03	15.75%
Enterococcus	03	15.75%
Coagulase positive staphylococci	02	10.5%

**Table 3. Table depicting Distribution of Significant Pyuria ( $\geq 5$  pus cells/Hpf) on urine examination**

Pyuria	Sex		Total
	Male	Female	
Present	11(13.75%)	07(8.75%)	18(22.5%)
Absent	33(41.25%)	29(36.25%)	62(77.5%)

**Table 4. Table depicting comparison of Urine culture positive reports with microscopic urinalysis (Pyuria)**

Microscopic urinalysis Pyuria	Urine culture		Total
	Positive	Negative	
Significant	17	01	18
Not significant	02	60	62
Total	19	61	80

The chi square statistics is used with Yate's correction is 59.1589.

The p value is <0.00001. significant if p value <0.05

Figure No 1

Flowchart showing frequency of study cases, among total admissions occurred in Pediatric ward and PICU in the time duration from November 2019 to April 2021

