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# Original article

# Clinico-aetiological Profile of Urinary Tract Infection in Pediatrics Department in a Tertiary Care Hospital

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**Abstract:**

***Background:*** Urinary tract infection (UTI) is one of the important cause of infection in pediatric age group. ***Objectives:*** The study was designed to assess the clinical profile, common bacterial microorganisms causing UTI and their antimicrobial susceptibility patterns at Bashundhara Ad-din medical college and hospital. ***Materials and Methods:*** A cross-sectional study involving children aged 1 month to 15 years who had UTI symptoms was carried out in the pediatric department from January to June 2023. Among suspected patients, standard urine testing and microscopic examination were carried out. Urine cultures and sensitivity tests were subsequently done for the pyuria patients (n = 110). This study included 44 patients with UTIs who tested positive for culture. Patients that were both indoors and outpatients provided clinical data. ***Result:*** Among 317 suspected cases only 110 had pyuria and among them only 44 (13.8%) having significant culture positive result. Fever, poor feeding, vomiting, irritability were most common symptoms below One year while children presented with fever, abdominal pain and increased frequency of micturition mostly. E.coli was reported as the most common (59%)etiological agent followed by Proteus(12%),Staphylococcus aureus (9%), Pseudomonas(7%), klebsiella (5%). E.coli was sensitive mostly to Ampicillin (70%),Nitrofurantoin (68.5%),Meropenem and Amikacin (61.5%).Klebsiella was 100% sensitivetoAmikacin and Nitrofurantione. Proteus was mostly sensitive to Meropenem (84%),Imipenem (73%). Pseudomonas was 100% sensitive to Piperacillin-Tazobactum,Meropenem (66.7%). Enterococcus was 100% sensitive to Linezolid and vancomycin (90%). Staphylococcusaureus wassensitive to Nitrofurantoin (98%) and Gentamycin (75%),Vancomycin (50%). Coagulase negative staphylococcus was 100% sensitive to Vancomycin, 91% sensitive to Gentamycin. Acinetobacter was 90% sensitive to Piperacilli-Tazobactum combination and 85% to Nitrofurantoin. Staphylococcus saprophyticus was 90% sensitive to Linezolid,Vancomycin. ***Conclusion:*** Though various microorganisms are responsible for UTI in children, E. coli is the most common causative agent. Rational use of antibiotics must be encouraged and restriction of antibiotic abuse should be done to retard development of further drug resistance.

***Keywords:*** UTI, bacterial Isolates, antibiotic susceptibility.

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**Introduction:**

Urinary tract infection (UTI) is one of the most common bacterial infection seen in pediatric population, which is a significant cause of morbidity in children.[1,2] The overall prevalence of UTIs among infants and young children is estimated to be approximately 2%–20%.[3,4] Since UTI can present with non-specific clinical features, UTI is underdiagnosed. [5,6] UTI is associated with renal parenchymal scarring in approximately 10-30% of pediatric patients presenting with febrile UTI.[7,8] Hence it is necessary to clinically suspect UTI and start the children on appropriate empirical antibiotics at an early stage.

Children's UTIs are frequently caused by bacteria, with E. coli being the most common isolate pathogen in the pediatric age range.[9] Proteus mirabilis, Staphylococcus aureus, Enterococci, and Klebsiella spp. are additional bacteria that can cause UTIs. [10,11] Many antibiotics are not effective against the majority of these infections. [11-13].Treatment requires an understanding of the microorganisms involved and the antibiotic susceptibility of uropathogens in each geographic environment.[14]

The gold standard for diagnosing UTIs is urine culture and sensitivity pattern.[16] In girls' midstream urine, a colony count of more than 105CFU/ml of a single species and more than104 CFU/ml in boys' urine is regarded as confirmatory for UTI.17Significant bacteriuria is defined as any growth from suprapubic aspiration or a pure growth of 102/ml from a catheterized urine sample.[15]

Although E. coli has been reported to account for most of the cases of symptomatic UTI in children.[16,17] Studies from some other parts of the world however, have shown a changing trend in the bacteriology of UTI.[18-20] The spectrum of etiologic agents causing UTI and their antimicrobial resistance pattern have been continuously changing over the years, both in community and in hospitals.[20] It is especially true for developing countries where antibiotics are prescribed often irrationally. [21] In Bangladesh, most of the centers use antibiotics empirically due to unavailibity of standard therapeutic guidelines and local susceptibility data. In this perspective this study was designed to investigated the incidence, the various clinical presentation, the microbiological profile and antibiotic sensitivity pattern of UTI in children at a tertiary teaching institute.

**Materials and Methods:**

A cross sectional study was conducted in the department of Pediatrics,Bashundhara Ad din Medical College Hospital. The study was done for a period of 6 months(January 2023 to June 2023). The study protocol was approved by the ethical committee of the institution. The objective of the study was to analyze the clinical presentation of UTI in children between 1month to 15 years of age, to analyze the causative microorganism and their drug susceptibility in urinary tract infection in children.

Inclusion criteria: Children between the age group of 1month to 15 years of age who presented with symptoms like fever, abdominal pain, dysuria, urgency, frequency, poor feeding, vomiting, irritability during the study period, who visited both the outpatient and inpatient department was included in the study. Exclusion criteria: Recurrent UTI, other causes of pyuria like glomerulo-nephritis, vasculitis (SLE and others), known urinary malformations,children on antibiotics within last seven days of sample collection and samples having mixed collections were excluded. Alsorepeated samples from same patient who has already been included and those samples with evidence of perineal contamination was excluded from the study. Children were categorized according to age group like neonate (0 to 28 days), infant(birth to 1 year), toddler(1 to 3 years), preschool age (3 to 5 years), children (5 to 15 years).

Patient details including age, sex, clinical presentation, previous history of UTI and any congenital anomaly was collected from suspected indoor and outdoor patients after taking consent and entered in the predesigned proforma. Urine culture and sensitivity report was collected from the patients and analyzed. Urine sample collected by clean catch midstream technique or catheter sample was included. Urine sample showing significant growth that is more than or equal 105 CFU/ml of single micro-organism in presence of symptoms was considered significant and processed for further identification and susceptibility testing.

Antibiotic susceptibility test was done by conventional method and interpreted according to Clinical and Laboratory Standards Institute Guidelines (CLSI) 2019 and 2020. Antibiotics tested were Ampicillin, Cephalosporins, Amikacin, Gentamicin, Co-trimoxazole, Nitrofurantoin, Piperacillin- tazobactam, Fluoroquinolones and Carbapenems for gram-negative organisms and Ampicillin, Gentamicin, Nitrofurantoin, Norfloxacin,Llinezolid and Vancomycin for gram-positive organisms.

Statistical analysis was done using Statistical package for social sciences (SPSS) Software version [16].

**Result:**

Among 317 suspected cases only 110 had pyuria and among them only 44 having significant growth in culture media result accounting 13.8% of total sample studied. Occurance of UTI was highest (n=22,50%) in children (5-15 yrs ) and lowest in below 1 yr age group (n=3,6.81%).

Fever (66.6%), poor feeding (66%), vomiting (33%), irritability(33%) were most common symptoms in neonate and infants while children presented with fever(86.3%), abdominal pain (65.9%) and increased frequency of micturition (72.7%) mostly (table l).

E.coli was reported as the most common (59%) etiological agent followed by Proteus (12%), Staphylococcus aureus (9%), Pseudomonas (7%), Klebsiella (5%), Coagulase

negative staphylococcus (2%), Staphylococcus saprophyticus(2%), Enterococcus (2%) (tablelV). According to age group E.coli, klebsiella and Proteus was found mostly in neonates and infant and E.coli, Proteus, Pseudomonas ,Enterococcus were found mostly in children (table ll). E.coli was sensitive mostly to Ampicillin (70%),Nitrofurantoin (68.5%),Meropenem (61.5%) and Amikacin (61.5%). Klebsiella was 100% sensitivetoAmikacin and Nitrofurantione and 90% sensitive to Emipenem, Meropenem. Proteus was mostly sensitive to Meropenem (84%),Imipenem (73%), Piperacilin-Tazobactum (81%),ceftriaxone (75.5%). Pseudomonas was 100% sensitive to Piperacillin-Tazobactum and Meropenem (66.7%), Amikacin (84%) Ceftriaxone, Ciprofloxacin. Enterococcus was 100% sensitive to Linezolid and vancomycin (90%). Staphylococcus aureus sensitive to Nitrofurantoin (98%) and Gentamycin (75%),Vancomycin (50%). Coagulase negative staphylococcus was 100% sensitive to Vancomycin, 91% sensitive to Gentamycin. Acinetobacter was 90% sensitive to Piperacilli-Tazobactum combination and 85% toNitrofurantoin. Staphylococcus saprophyticus was 90% sensitive to Linezolid, Vancomycin.(table lll).

Table 1: Clinical presentation according to age category (n=44)

| Symptoms | Neonate & infant | | Toddler | | Preschool | | Children | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N=3 | % | N=7 | % | N=12 | % | N=22 | % | N=44 | % |
| Fever | 2 | 66.66% | 5 | 71.29% | 10 | 83.33% | 21 | 95.45% | 38 | 86.36% |
| Dysuria | - | - | - | - | 2 | 16.66% | 13 | 59% | 15 | 34% |
| Frequency | - | - | 4 | 57.14% | 8 | 66.66% | 20 | 90.9% | 32 | 72.72% |
| Urgency | - | - | - | - | 3 | 25% | 13 | 59% | 16 | 36.36% |
| Abdominal Pain | - | - | 2 | 28.57% | 10 | 83.33% | 17 | 77.27% | 29 | 65.9% |
| Vomiting | 1 | 33.33% | 2 | 28.57% | 7 | 58.33% | 4 | 18.18% | 14 | 31.82% |
| Poor feeding | 2 | 66.66% | 3 | 42.86% | 3 | 25% | 8 | 36.36% | 16 | 36.36% |
| Irritability | 1 | 33.33% | 3 | 42.86% | 2 | 16.66% | 5 | 22.72% | 11 | 25% |

Table 2: Distribution and frequency of uropathogens according to age category

| Neonatesandinfants | | | Toddler | | Pre-school | | Children | |
|---|---|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % | Count | % |
| Enterococci | 0 | 0.0% | 1 | 2.3% | 0 | 0.0% | 1 | 2.3% |
| Staphylococcusaureus | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 4 | 9.1% |
| Coagulase–ve staph | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 1 | 2.3% |
| Escherichiacoli | 1 | 2.3% | 6 | 13.6% | 9 | 20.5% | 10 | 22.7% |
| Klebsiella | 1 | 2.3% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Proteus | 1 | 2.3% | 0 | 0.0% | 2 | 4.5% | 2 | 4.5% |
| Pseudomonas | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 3 | 6.8% |
| Acinetobacter | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 1 | 2.3% |
| S.saprophyticus | 0 | 0.0% | 0 | 0.0% | 1 | 2.3% | 0 | 0.0% |

Table 3: Antimicrobial sensitivity pattern for gram positive organism%

| | Enterococci | Staphylococcus aureus | Coagulase –ve staphylococcus | Staphylococcussaprophyticus |
|---|---|---|---|---|
| Ampicillin | 50% | 35% | 25% | 25% |
| Gentamycin | 71% | 75% | 91% | 91% |
| Nitrofurantoin | 76% | 98% | 10% | 0% |
| Linezolid | 100% | 10% | 20% | 99% |
| Vancomycin | 90% | 50% | 98% | 90% |

Table 4: Antimicrobial sensitivity pattern for gram negative organism%

| | E.coli | Proteus | Pseudomonas | Klebsiella | Acinetobacter |
|---|---|---|---|---|---|
| Ampicillin | 70% | 76% | 0% | 0% | 0% |
| Ceftazidime | 35% | 32% | 33.3% | 0% | 7.7% |
| Cefuroxime | 11% | 50% | 33.3% | 30% | 0% |
| Cefotaxime | 19% | 20.8% | 19% | 36% | 0% |
| Ceftriaxone | 30.8% | 75.5% | 33.3% | 80% | 0% |
| Cefixime | 26.9% | 0% | 33.3% | 0% | 0% |
| Amikacin | 61.5% | 72% | 84% | 100% | 0% |
| Gentamycin | 50% | 60% | 21% | 0% | 10% |
| Cotrimoxazole | 60% | 0% | 33.3% | 0% | 15% |
| Nitrofurantoin | 68.5% | 60% | 0% | 100% | 85% |
| Piperacillin+ Tazobactum | 46.2% | 81% | 100% | 0% | 90% |
| Ciprofloxacin | 42.3% | 20% | 33.3% | 20% | 410% |
| Imipenem | 36% | 73% | 33.3% | 90% | 72% |
| Meropenem | 61.5% | 84% | 66.7% | 90% | 72% |

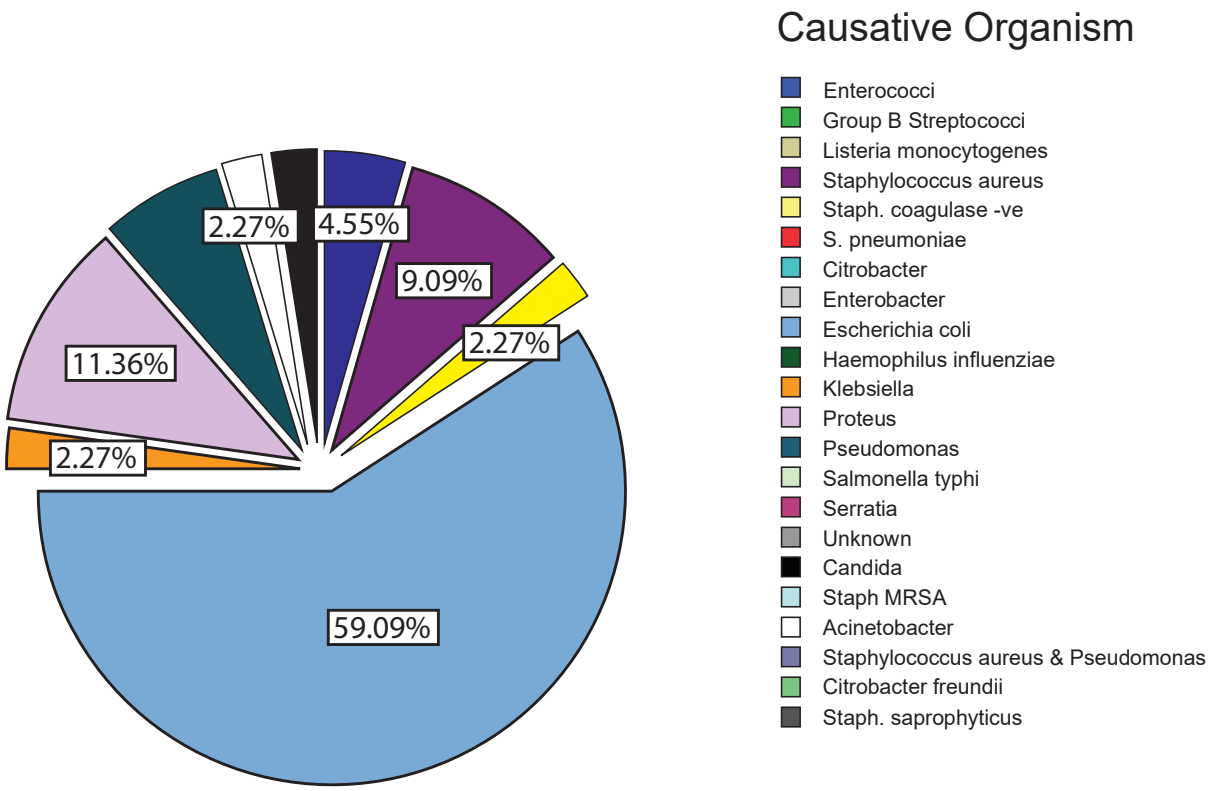


Figure: Causative organism (%)

**Discussion**

UTI is a common health problem in children and most common cause of morbidity and mortality especially in 2 years of life.[22] Urinary culture positive rate was 13.8% in this study which was similar to rates of 19.3% and 22.2% in previous studies. [23,24] Fever and abdominal pain was the most common symptoms in children which was similar to other studies.[25-27] Children with UTI usually present with non-classical clinical features and these are difficult to diagnose.[28] In our study, fever, poor feeding and irritability were the common clinical features in neonates while the older children presented with fever and urinary symptoms which agree with other reports where fever, abdominal pain, vomiting, dysuria, poor feeding, and irritability are reported as frequent signs and symptoms of UTI. [29,30] Diagnosis of UTI is really challenging due to its vague presenting symptoms, especially in young children. Thus, a high index of suspicion is appropriate when a young child presents with fever.[28]

E. coli was the most common organism isolated (59.1%) in our study. This was in accordance with other studies in which E. coli was isolated from 61.0% to 72.8%.[26,31-34] However, Yüksel et al and Chakupurakal et al reported a very high percentage (87.0%) and (92.0%) of E. coli in their study.[35,36] Proteus was second isolate of our study which was occupying 11.4% of the total isolates. Different studies have shown the growth of Proteus in urine from 5.8% to 12.4%.[37,38] In this study Pseudomonas was isolated in only 6.8% cases , Enterococci in 4.5% and Klebsiella 2.3%. E. coli was followed by Enterobacter spp. (16.7%), and Pseudomonas (11.1%) in a study of Philippine39 and followed by Proteus (20%), Klebsiella (5.4%) and Pseudomonas (1.8%) in a study of Nepal.[23] E.coli was sensitive mostly to Ampicillin (70%),Nitrofurantoin (68.5%), Meropenem and Amikacin (61.5%) in our study while Shrestha et al. reported E. coli as most sensitive to Nitrofurantoin (84.6%), Amikacin (80.7%), Gentamicin (73%) and Ofloxacin(53.8%).[23] Klebsiella was 100% sensitive to Amikacin, Nitrofurantione and 90% sensitive toEmipenem, Meropenem in this study while In a study done in S.S.G hospital India, Klebsiella was the second most common organism and was found to be most sensitive to Ofloxacin, Amikacin and Piperacillin+Tazobactum.[21] Proteus was mostly sensitive to Meropenem (84%),Imipenem (73%), Piperacilin-Tazobactum (81%),ceftriaxone (75.5%), Nitrofurantoin (60%) where Proteus was sensitive to nitrofurantoin and norfloxacin in 33.1% and 25.0% respectively in another study.[40] Pseudomonas was sensitive to Piperacillin-Tazobactum (100%) and Meropenem (66.7%), Amikacin (84%),Ceftriaxone, Ciprofloxacin and it is similar to a study done in Gujarat, India.[41] As like our studyGram-positive organisms like Coagulase negative Staphylococcus, Staphylococcus aureus, Streptococci have also been reported by other authors. Lok et al and Muoneke et al reported Staphylococcus aureus as the second most common uropathogen isolated in their study.[14]

**Limitation**

Study group was very small.

**Conclusion**

As the UTI in children usually presents with non-specific features, it demands the urine test for the diagnosis. Though, our data is small, it suggests providing treatment only after the proper microbiological investigations. E. coli being the commonest bacteria and exhibiting the changing drug resistance pattern, it is advisable to perform the antibiotic susceptibility testing as well. Finally, this type of study should be repeated periodically to assess the pattern of microorganisms causing UTI and then antimicrobial susceptibility which will guide in choosing antibiotics for the empiric treatment.

**Conflict of interest**

The authors thereby declare no conflict of interest.

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