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Original Article

Paediatric Urinary Tract Infection: Microbiologic Profile and Antibiotics Sensitivity in Children Presenting with UTI

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ABSTRACT

Background: *This study was designed to determine the microbiologic profile and Antibiotics Sensitivity in Children presenting with UTI.*

Methods: *This hospital based prospective study was conducted in 28 patients Patients from 2 months to 12 years were admitted to the pediatric ward and visited in outpatient department (OPD) with diagnosis of UTI based on history with routine and microscopic examination of urine were considered for this study. The UTI investigation protocol recommended ultrasound, voiding cystourethrography (VCUG), and DMSA scan. Clinical and laboratory parameters at the index infection, including highest measured temperature, highest C-reactive protein (CRP), bacterial findings, and the number of febrile recurrences, were recorded.*

Results: *Fever was the most common symptom accounting for 76.4% of patients with nausea and vomiting (42.8%), dysuria (53.6%), abdominal pain (57.1%) and anorexia (46.4%). Urine analysis was done in all suspected cases of UTI. Among all urine samples 60.7% had WBC >10/hpf, followed by 87 (28.6%) which had WBC between 6-10/hpf. Only 6 (10.7%) had WBC 5 or less. Among all urine analyses 68 (57.1%)*

Conclusion*: E. coli (82%) was the most common organism found followed by Klebsiella pneumonia (12%), Proteus mirabilis (5%) and 1% were other pathogens like Enterococcus species (Table 4, Fig 1). All isolated E. coli was sensitive to Imipenem, Nalidixic acid, Netilmicin and Vancomycin. E. coli were 80-90% sensitive to Amikacin, Ceftriaxone, Cefuroxime, Ofloxacin, Gentamicin and Nitrofurantoin.*

Key words: *UTI, Voiding Cystourethrography (VCUG), DMSA Scan, E. coli.*

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INTRODUCTION

Acute UTIs are relatively common in children. By seven years of age, 8 percent of girls and 2 percent of boys will have at least one episode.[1] In a study of infants presenting to pediatric emergency departments, the prevalence of UTI in infants younger than 60 days with a temperature greater than 100.4°F (38°C) was 9 percent.[2] The reference standard for the diagnosis of UTI is a single organism cultured from a specimen obtained at the following concentrations: suprapubic aspiration specimen, greater than 1,000 colony-forming units per mL; catheter specimen, greater than 10,000 colony-forming units per mL; or clean-catch, midstream specimen, 100,000 colony-forming units per mL or greater.[3-5] Use of lower colony counts in symptomatic patients has been advocated,[6] although this has not been included in established guidelines.

Up to 85% of infants and children with febrile UTI have visible photon defects on technetium Tc 99–labeled dimer captosuccinic acid (DMSA) scanning, and 10–40% of these children have permanent renal scarring[7-9] that may lead to poor renal growth, recurrent pyelonephritis, impaired glomerular function, early hypertension, end stage renal

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disease, and preeclampsia.[10-13]

Urinary tract infection (UTI) in children can be associated with renal damage. The risk of renal damage may be increased in children with malformations, high-grade vesicoureteral reflux (VUR), and recurrent febrile UTI.[14-16] Moreover, there seems to be a gender variation, where boys more often have congenital renal damage associated with VUR, whereas in girls acquired focal damage related to recurrent UTI is more common.[17] Infections may cause transient inflammatory changes in the kidney that resolve within 3–6 months.[7,18,19]

Fever remain a more common presentation in neonates, infants and younger children, whereas older children present with classic signs of UTI.[20] Renal scarring has been cited as one of the most common causes of end stage renal disease in both adults and children.[21] Seventy to ninety percent of female children are suffering with UTI, the causative organism is usually *Escherichia coli* (*E.coli*) followed by *Klebsiella* and *Proteus* while in males older than one year *Proteus* is as common as *E. coli* as a bacterial cause of UTI. Early diagnosis is critical to preserve renal function of the growing kidney.[22] Antibiotic therapy is the main stay of treatment.[23]

Our purpose was to determine the clinical, microbiologic profile and antibiotic sensitivity in Children presenting with UTI.

This was a hospital-based study conducted in Teerthanker Mahaveer Hospital, Moradabad, Uttar Pradesh. This hospital based prospective study was conducted in 28 patients After taking ethical approval from institutional review Committee. Written consent was taken from the parents before enrolling them in study. Patients from 2 months to 12 years were admitted to the pediatric ward and visited in outpatient department (OPD) with diagnosis of UTI based on history with routine and microscopic examination of urine were considered for this study.

In patients with negative results on dipstick, microscopic, or automated urinalysis, urine culture is unnecessary if there is an alternative cause of the fever or inflammatory signs. However, if the dipstick and/or urinalysis are positive, confirmation of UTI by urine culture is mandatory. The UTI investigation protocol recommended ultrasound, voiding cystourethrography (VCUG), and DMSA scan. Clinical and laboratory parameters at the index infection, including highest measured temperature, highest C-reactive protein (CRP), bacterial findings, and the number of febrile recurrences, were recorded. The diagnosis of UTI required bacteriuria of a single species of at least 100,000 colony-forming units (CFU)/ml in two midstream or bag samples, 10,000 CFU/ ml or more in one catheter sample or any bacterial growth in urine obtained by suprapubic aspiration. Febrile recurrence was defined as UTI with temperature of 38.5 °C or more. Data were collected using a questionnaire regarding demographic and clinical data. A clean catch mid-stream specimen in wide mouthed container to hold around 20ml specimen was collected. In routine and microscopic examination of urine report if white blood cell count were more than 5 per high power field then it is considered as significant pyuria and culture will be send. Clinical signs and symptoms of a UTI depend on the age of the child. Newborns with UTI may present with jaundice, sepsis, failure to thrive, vomiting, or fever. In infants and young children, typical signs and symptoms. include fever, strong - smelling urine, hematuria, abdominal or flank pain, and new-onset urinary incontinence. School-aged children may have symptoms similar to adults, including dysuria, frequency, or urgency.

Treatment with appropriate drug, response to the drug and complication were also recorded. Data analysis was done with SPSS version 21.0 program. Data were presented as mean±SD (standard deviation) Categorical data were analyzed by using Chi-square test. Continuous data were analyzed by using independent sample T test. The p value was considered significant if it is less than 0.05.

RESULTS

Out of 28 patients who were subjected to routine urine and culture, there were (39.2%) males and (60.7%) females (Table 1). Fever was the most common symptom accounting for 76.4% of patients with nausea and vomiting (42.8%), dysuria (53.6%), abdominal pain (57.1%) and anorexia (46.4%) (Table 2).

Urine analysis was done in all suspected cases of UTI. Among all urine samples 60.7% had WBC >10/hpf, followed by 87(28.6%) which had WBC between 6-10/hpf. Only 6 (10.7%) had WBC 5 or less. Among all urine analyses 68 (57.1%) sample revealed RBCs in the urine. In terms of urine culture, (42.9%) subjects had positive urine culture (Table 3). *E. coli* (82%) was the most common organism found followed by *Klebsiella pneumonia* (12%), *Proteus mirabilis* (5%) and 1% were other pathogens like *Enterococcus species (*Table 4, Fig 1). In USG findings only 21% had abnormal finding like hydronephrosis, calculi, intra renal pelvis, enlarged and inflamed kidney, thicken bladder wall and multiple internal echoes. All isolated *E. coli* was sensitive to Imipenem, Nalidixic acid, Netilmicin and Vancomycin. *E. coli* were 80-90% sensitive to Amikacin, Ceftriaxone, Cefuroxime, Ofloxacin, Gentamicin and Nitrofurantoin. Only 13.9% of *E. coli* was sensitive to Ampicillin. Though Co-trimoxazole was drug of choice for UTI, only 41.9% of *E. coli* cases were sensitive to it. *Klebsiella* and *Proteus* were 100% sensitive to Amikacin and Imipenem. *Proteus* was even more sensitive to the Cephalosporin group of drugs in comparison to *Klebsiella*, while *Klebsiella* is more sensitive to the Penicillin group of drug (p=0.003). The sensitivity patterns of different organisms to the drugs Gentamicin and Amikacin were slightly significant. Among all of the drugs used, Amoxicillin and Norfloxacin responded quickest.

Table 1: Gender Distribution of UTI

Sex	Number(%)
Male	11 (39.2%)
Female	17 (60.7%)
Total	28 (100%)

Table 2: Clinical Manifestation

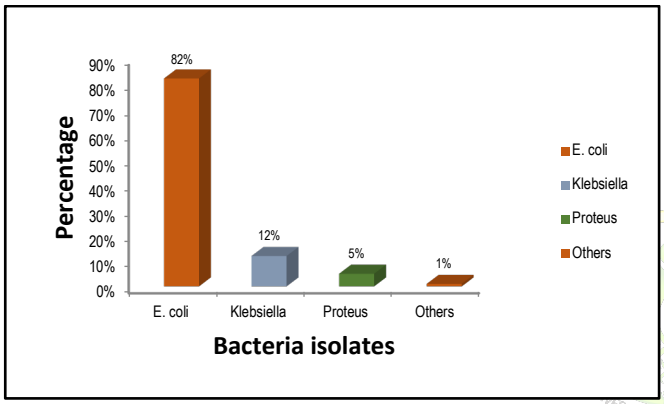
Symptoms	Total	Percentage
Fever	27	96.4
Headache	9	32.1
Nausea/vomiting	12	42.8
Abdominal Pain	16	57.1
Dysuria	15	53.6
Dribbling	4	14.3
Anorexia	13	46.4
Myalgia	2	7.1

Table 3: Outcome of Urine Analysis and Urine Culture

Urine RME and Culture	Number (%)
WBC < 5/HPF	3 (10.7)
WBC 6-10/HPF	8 (28.6)
WBC > 10/HPF	17 (60.7)
Urine RBC	
Present	16 (57.1)
Absent	12 (42.9)
Urine Epithelial Cell	
Present	18 (64.3)
Absent	10(35.7)
Urine Culture	
Positive	12 (42.9)
Negative	16 (57.1)

Table 4. Bacteria isolates in UTI

Bacteria isolates	%
E. coli	82%
Klebsiella	12%
Proteus	5%
Others	1%



DISCUSSION

The most common pathogen is *Escherichia coli,* accounting for approximately 82 percent of urinary tract infections in children. Clinical signs and symptoms of a urinary tract infection depend on the age of the child, but all febrile children two to 24 months of age with no obvious cause of infection should be evaluated for urinary tract infection (with the exception of circumcised boys older than 12 months). Evaluation of older children may depend on the clinical presentation and symptoms that point toward a urinary source (e.g., leukocyte esterase or nitrite present on dipstick testing; pyuria of at least 10 white blood cells per high-power field and bacteriuria on microscopy). Other treatment options include amoxicillin/clavulanate and cephalosporins. Prophylactic antibiotics do not reduce the risk of subsequent urinary tract infections, even in children with mild to moderate vesicoureteral reflux. Constipation should be avoided to help prevent urinary tract infections. Ultrasonography, cystography, and a renal cortical scan should be considered in children with urinary tract infections.[24]

Although amoxicillin has traditionally been a first-line antibiotic for UTI, increased rates of *E. coli* resistance have made it a less acceptable choice, and studies have found higher cure rates with trimethoprim/sulfamethoxazole (Bactrim, Septra). Other choices include amoxicillin /clavulanate (Augmentin) or cephalosporins, such as cefixime (Suprax), cefpodoxime, cefprozil (Cefzil), or cephalexin (Keflex).[2] In our study, UTI was found in a significantly higher proportion of girls. In Burbige study, 75% of UTI patients had anatomical abnormalities, most commonly VUR, and more than 25% had obstructive lesions.[25]

UTI is recognized increasingly as a common cause of fever in young children.[26-28] Dysuria and vomiting were the predominant symptoms. Urinary symptom like dysuria and dribbling of urine were noted. Other studies also indicate high association of these symptoms and urinary tract infection.[28-30] Other symptoms were pain abdomen, nausea and vomiting, anorexia, back pain and myalgia. Another study done by Bayin Philippine and Sharma in Nepal also found abdomen pain in almost half of the cases.[27,29] These findings indicate that clinical presentation plays a very important role in diagnosing UTI. Although clinical presentation are very strong enough, urine culture and sensitivity is essential to diagnose UTI.

CONCLUSION

E. coli was the most common organism cultured in the urine of these children. The drug of choice used in UTI treatment was Co-trimoxazole and Amoxicillin. The sensitivity to the isolated organisms to these commonly used drugs is low. Amikacin, Ceftriaxone and Norfloxacin were the antibiotics with the highest sensitivity. Though Co-trimoxazole and Amoxicillin can be used for empirical therapy in UTI, the urine of all suspected cases of UTI should be cultured and sensitivity pattern determined for appropriate treatment.

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