

Evaluation and Monitoring the Management of Urinary Tract Infection in the Department of Paediatric, Kempegowda Institute of Medical Sciences (Kims) Hospital and Research Centre, Bangalore, India

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Abstract

Objective: To assess various clinical manifestations of UTI in pediatric, to check for any ADR in drug utilization pattern of prescriptions. **Methodology:** 40 cases of suspected cases of UTI i.e. children below 18 yrs. of age with clinical features suggestive of UTI admitted to KIMS, Bangalore between December 2018 to May 2019 were studied. A detailed clinical history and physical examination was checked in case sheet. WHO classification and case definition were used. The data related to each of these cases was collected, compiled and analyzed. **Result:** The total number of 407 of all the infection cases that were admitted in hospital pediatric department during the period of January to June 2019 among them 40 cases were of UTI who satisfied the inclusion criteria and were included in the study among them 18 patients (45%) were female and remaining 22 patients (55%) were male. We found the utilization pattern of antibiotics drug in 40 UTI patients with culture growth and without culture growth about 45 prescriptions were prescribed for antibiotic drugs out of which Cephalosporins 26 (57.77%) prescriptions were for Ceftriaxone which was highest and commonly used, Penicillin seven (15.55%) prescriptions were for Amoxicillin + Clavulanic Acid, frequency of Fluoroquinolones prescribed was five of which four (8.88%) prescriptions were for Ofloxacin and one (2.22%) prescription was for Norfloxacin, under Aminoglycosides three (6.66%) prescriptions were for Amikacin, under Nitrofurantoin one (2.22%) prescription was Nitrofurantoin, under Carbapenem one (2.22%) prescription was Meropenem, under Macrolide antibiotics one (2.22%) prescription was Azithromycin, under Oxazolidinone one (2.22%) prescription was Linezolid were least prescribed. Considering the distribution of the antibiotic drugs used in only 33 UTI patients with and without culture growth in this study population which Ceftriaxone (22) was highly used and the next common used were Amoxicillin + Clavulanic acid (5), and Ofloxacin (4), Amikacin (3) and remaining Nitrofurantoin, Meropenem, Linezolid, Azithromycin and Norfloxacin as mentioned before were the least. We identify Ceftriaxone (4), Amoxicillin + Clavulanic acid (2) were used in mixed infections patient in our study population where the outcome was excellent. **Conclusion:** The clinical manifestation, examination finding, laboratory parameters. In our present study UTI without culture growth was most common presentation followed by UTI with growth culture. A focused history, detailed clinical examination and appropriate relevant investigations can aid for early diagnosis and treatment. Proper evaluation of the progress of the disease is a key in the management of disease.

Keywords: Pediatric; Urinary Tract Infection; E. coli; Cephalosporin; Antibiotics; Antimicrobial; Pyelonephritis; WHO

INTRODUCTION

Urinary Tract Infection (UTI) is one of the most widely recognized Pediatric infections. UTI is characterized as the nearness of microorganisms (infection) in the urinary tract that can't be represented by sully. The life forms present can possibly attack the tissue of the urinary tract and neighboring structures. Infection might be constrained to the development of microbes in the pee, which often may not create side effects. An UTI can present as a few disorders related with an incendiary reaction to microbial attack and can run from asymptomatic bacteriuria to pyelonephritis with bacteremia or sepsis.^[1] UTI happens in 3-10% of young ladies and 1-3% young men. Past onset, the rate of UTI is higher in young ladies. During infancy, UTI is equally common in boys and girls because the route of infection is often hematogenous

and boys have a higher incidence of urinary tract anomalies.^[2, 3]

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According to WHO in developed countries, it has been estimated that UTI is diagnosed in 1% of boys & 3-8% of girls. In the first year of life, UTI is more prevalent in boys with rates of 2.7% compared with 0.7% in girls. Most infection in boys occur in the first 3 months of life but by school age, the rate has decreased in boys and increased in girls. According to WHO, several studies to determine UTI prevalence in developing countries have been conducted predominantly in hospital settings and particularly in malnourished children. Studies have shown a higher UTI prevalence of 8-35% in malnourished children with the risk of bacteriuria increasing significantly with the severity of malnutrition.^[4]

In India, UTI is one of the most common bacterial illness among febrile infants and preschool children with a reported prevalence between 4.1% and 7.5%.^[5] The true incidence of pediatric UTI is difficult to determine because there are varying presentations that range from an absence of specific urinary complaints to fulminant urosepsis. During the first year of life, the incidence of UTI in girls is 0.7% compared with 2.7% in boys.^[6]

During the first 6 months, uncircumcised boys have a 10 to 12-fold increased risk for developing UTI.^[7] In children aged 1 to 5 years, the annual incidence of UTI is 0.9% to 1.4% for girls and 0.1% to 0.2% for boys.^[7] The incidence of a UTI is largely unchanged from age 6 to 16 years, with an annual incidence of 0.7% to 2.3% for girls and 0.04% to 0.2% for boys.^[8]

Children who have UTI often do not necessarily present with the characteristic signs and symptoms are seen in the adult population. The physical assessment is likewise every now and again of constrained worth in light of the fact that the costovertebral point and suprapubic delicacy are not solid signs in the pediatric populace. There are different clinical introductions for kids with UTI dependent on age.^[9] UTI is a significant reason for fever without a center, particularly in youngsters under 2 years old.^[10] In neonates, UTI is typically a piece of septicemia and presents with fever, retching, dormancy, jaundice and seizures. Babies more youthful than 60 to 90 days may have obscure and vague indications of disease that are hard to decipher, for example, inability to flourish, loose bowels, peeishness, laziness, foul pee, fever, asymptomatic jaundice, and oliguria or polyuria^[11] actually, it has been suggested that testing for UTI be a piece of the assessment of asymptomatic jaundice in newborn children more youthful than 8 weeks.^[12]

There is restricted proof that escalated imaging and ensuing administration modifies the drawn-out result of kids with reflux nephropathy analyzed after an UTI. With accessibility of antenatal screening, most significant irregularities have just been identified and overseen after birth. In this manner, there is significant discussion in regards to the need and power of radiologic assessment in youngsters with UTI.^[13]

The Expert Group surveyed the present writing, keeping in see that in our nation the finding of UTI is regularly missed or postponed, and there are impediments of framework and shortage of assets for routine antenatal screening. In light of the abovementioned, it presumed that all youngsters with the first UTI ought to experience radiological assessment. The identification of critical scarring, high evaluation VUR or obstructive uropathy may empower mediations that forestall dynamic kidney harm in the long haul. Since newborn children and little youngsters are at the most elevated hazard for renal scarring, it is vital that this gathering experience centered assessment. It is suggested that all newborn children with UTI be screened by ultrasonography, trailed by MCU and DMSA scintigraphy. Since more seasoned patients (1-5-year-old) with huge reflux and scars or urinary tract inconsistencies are probably going to show variations from the norm on ultrasonography or scintigraphy, a MCU is exhorted in patients having irregularities on both of the above examinations. Youngsters more seasoned than 5 years are screened by ultrasonography and further assessed just if this is unusual. It is stressed that patients with intermittent UTI at any age ought to experience point by point imaging with ultrasonography, MCU and DMSA scintigraphy. Ultrasonography ought to be done not long after the analysis of UTI. The MCU is suggested 2 after 3 weeks, while the DMSA examine is completed 2-3 months after treatment. An early DMSA check, performed not long after an UTI, is not recommended in routine practice. Patients showing hydronephrosis in the absence of VUR should be evaluated by diuretic renography using 99mTc-labeled diethylenetriaminepentaacetic acid (DTPA) or mercaptoacetylglycine (MAG-3). These techniques provide quantitative assessment of renal function and drainage of the dilated collecting system.^[14] Adequate fluid intake and frequent voiding are advised; constipation should be avoided.^[15]

In children with VUR who are toilet trained, regular and volitional low-pressure voiding with complete bladder emptying is encouraged. Double voiding ensures emptying of the bladder of post-void residual urine. Circumcision reduces the risk of recurrent UTI in infant boys, and might therefore, have benefits in patients with high grade reflux.^[16]

METHODOLOGY

Our study was conducted in Department of Pediatrics, Kempegowda Institute of Medical Science (KIMS) Hospital and Research Centre, Bangalore. It is 1200 beds tertiary care teaching and super specialty hospital, with Outpatient and Inpatient facility. The hospital provides specialize healthcare services to all strata of people in and around Bangalore. A sample size of 40 inpatients admitted in the Dept. of Pediatrics were taken to the study. The study was conducted for periods of 6 months from December 2018 to May 2019. data was collected from patient case sheet, Medication Chart. The data was documented in a suitably designed patient data collection form. A detailed demographic data, clinical history, physical examination and laboratory data, prescribed

drug used for each patient were undertaken as per the pro forma.

It was prospective, observational study conducted on pediatric patients with UTI treated, admitted to the Department of Pediatrics, KIMS hospital and Research Centre, Bangalore who are on antibiotic drugs. This was an observational study done using a prospective case notes review methodology. The researchers visited the Pediatric department of the hospital daily and review the case records on patient age 1month to 18years who had been admitted on the particular day. Data was collected from the case sheet, medication chart of the patients from the day of admission until the patient was discharged from the hospital. Patient details were entered into a specially designed pro forma.

- Demographic details: age, gender, weight, past medication history, socioeconomic status.
- Laboratory data: Sample type, Urinalysis data containing details and urine culture findings to identify the type of organism responsible for UTI
- Prescribed drug data: drugs prescribed, dose of drugs, dose frequency, route of administration, duration.

RESULT AND DISCUSION

Urinary tract infection (UTI) is one of the most common pediatric infections. It distresses the child, concerns the parents, and may cause permanent kidney damage. Occurrences of a first-time symptomatic UTI are highest in boys and girls during the first year of life and markedly decrease after that. UTI is a problem in all age groups, although its prevalence varies markedly. In infants up to the age of 6 months, symptomatic UTI has a prevalence of about two cases per 1000 and is much more common in boys than in girls. In addition to these cases, asymptomatic UTI is much more common than this, occurring in around 2% of boys in their first few months of life. In preschool children, UTIs become more common and the sex ratio reverses, such that the prevalence of bacteriuria is 4.5% in girls and 0.5% in boys. In older children, the prevalence of bacteriuria falls to 1.2% among girls and 0.03% among boys. Overall, about 3–5% of girls and 1–2% of boys will experience a symptomatic UTI during childhood. However, in girls, about two-thirds of UTIs are asymptomatic. The occurrence of bacteriuria during childhood appears to correlate with a higher incidence of bacteriuria in adulthood. Urine infection is one of the most common bacterial infections and its occurrence in childhood may carry special significance. Making the diagnosis is difficult particularly in young children and infants. This is because in this age group the clinical presentation of urine infection is often with non-specific clinical signs such as fever, irritability and vomiting that are also commonly seen in many acute self-limiting childhood viral illnesses. It is important to recognize the clinical signs and symptoms, alterations in the biochemical parameters, radiological findings and the multi system involvement pattern to manage UTI cases effectively. The current study is undertaken to study the various clinical

presentation, laboratory parameters of UTI and to evaluate prescription pattern in our hospital which may help us in early diagnosis and better case management. The total number of 407 of all the infection cases that were admitted in hospital pediatric department during the period of January to June 2019 among them 40 cases were of UTI who satisfied the inclusion criteria and were included in the study among them 18 patients (45%) were female and remaining 22patients (55%) were male.

Table 1: Distribution of Uropathogens in the Study Population

Uropathogen	Female	Male	Number of Patients (N=18)
E. coli	6	6	12
Klebsiella sp.	1	1	2
Proteas Vulgaris	0	1	1
Streptococci	0	1	1
Enterococcus sp.	1	1	2
TOTAL	8	10	18

Table (1) represents the gender and distribution of uropathogens in the study population. It was found that the presence of pathogen in 12 patients [Female :6, Male :6] was E.coli, Two patients [Female:1, Male:1] were infected by Klebsiella species, One male patient was infected by Proteas vulgaris, One male patient and one female patient was infected by Enterococcus species and One male patient was found to be infected by Streptococci.

Table 2: Drug Utilization of Antibiotics in Study Population

Class of Anti Biotics	Utilization of Antibiotics	Frequency of Prescription	Percentage (%)
Cephalosporins	Ceftriaxone	26	57.77
Penicillins	Amoxicillin +Clavulanic Acid	7	15.55
Fluoroquinolones	Ofloxacin	4	8.88
Aminoglycosides	Norfloxacin	1	2.22
Nitrofurantoin	Amikacin	3	6.66
Carbapenem	Nitrofurantoin	1	2.22
Macrolide	Meropenem	1	2.22
Antibiotics	Azithromycin	1	2.22
Oxazolidinone	Linezolid	1	2.22
Total		45	99.96

Table (2) represents the utilization pattern of antibiotics in 40 patients diagnosed with UTI and mixed infection. About 45 prescriptions were prescribed for antibiotic drugs. Under Cephalosporins 26 (57.77%) prescriptions were for Ceftriaxone, Penicillin seven (15.55%) prescriptions were for Amoxicillin+ Clavulanic Acid, the frequency of Fluoroquinolones prescribed were five of which four of

(8.88%) prescriptions were Ofloxacin and one (2.22%) prescription was for Norfloxacin, under Aminoglycosides three (6.66%) prescriptions were for Amikacin, under Nitrofurantoin, one (2.22%) prescription was Nitrofurantoin, under Carbapenem one (2.22%) prescription was Meropenem, under Macrolide antibiotics one (2.22%) prescription was Azithromycin, under Oxazolidinone one (2.22%) prescription was Linezolid.

Table 3: Anti Biotics Used in Uti in Study Population

Drugs Used in Uti	Number	Percentage (%)
Ceftriaxone	22	56.41
Amoxicillin +Clavulanic Acid	5	12.82
Ofloxacin	4	10.25
Amikacin	3	7.69
Nitrofurantoin	1	2.56
Meropenem	1	2.56
Linezolid	1	2.56
Azithromycin	1	2.56
Norfloxacin	1	2.56
Total	39	99.97

Table (3), represents the utilization pattern of antibiotic drugs in 33 UTI patients with culture growth and without culture growth. About 22 (56.41%) prescriptions were prescribed for Ceftriaxone, Amoxicillin + Clavulanic acid was used in 5 (12.82%) prescriptions, Ofloxacin was used for 4 (10.25%) prescriptions, Amikacin was prescribed in 3 (7.69%) prescriptions and Nitrofurantoin, Meropenem, Linezolid, Norfloxacin, Azithromycin were prescribed for one (2.56%) prescription.

Table 4: Average Hospital Stay Based on Class of Antibiotics Used in the Study Population

Drugs Name (By Class)	Hospital Stay (By Days)
Carbapenam	18
Macrolide	18
Oxazolidinone	18
Aminoglycoside	10.33
Penicillins	8.14
Fluoroquinolones	7.6
Cephalosporins	7.5

Table (4) represents the average number of hospitals stay for the study population according to the class of antibiotic drugs. Average hospital stays for a patient used combined therapy of Ceftriaxone, Carbapenam, Macrolides, Oxazolidinone, Azithromycin was 18 days, for Aminoglycosides prescribed was 10.33days, Penicillin was 8.14 days, fluoroquinolones was 7.6 days, Cephalosporins was 7.5days in this study population.

The pediatric population is on the rise worldwide. These populations are vulnerable to many diseases which UTI is one of the most common pediatric infection. It distresses the child, concerns the parents, and may cause permanent kidney damage. Occurrences of a first-time symptomatic UTI are highest in boys and girls during the first year of life and markedly decrease after that. UTI is a problem in all age groups, although its prevalence varies markedly. Asymptomatic UTI is much more common than symptomatic UTI, occurring in around 2% of boys in their first few months of life. According to WHO in developed countries, it has been estimated that UTI is diagnosed in 1% of boys & 3-8% of girls Limited data are available in general, and in India in particular for pediatric UTI infection. We undertook this study in order to understand the prevalence of UTI in study pediatric population, UTI pathogenesis, the pattern of drug prescribed and compliances.

Hospital based prospective study was conducted to study the pattern of management of Urinary Tract Infection for Pediatric Population in the pediatric department for a period of 6months. The total number of 407 of all the infection cases that were admitted in hospital pediatric department during the period of January to June 2019 among them 40 cases were of UTI who satisfied the inclusion criteria and were included in the study among them 18 patients (45%) were female and remaining 22patients (55%) were male, depicted .Hence the prevalence of UTI in overall infection cases was 9.82% in our study which is highly significant. Considering the gender with condition distribution of the study population, it was found that 16 patient (40%) was diagnosed with UTI with culture growth among them E.coli growth was with 75%, Enterococcus growth was with 12.5%, Klebsiella and Streptococcus was with 6.25% respectively, 17 patients (42.5%) was diagnosed with UTI without culture growth, 7 patients (17.5%) was diagnosed with mixed infection among them 2 patients (28.57%) has culture positive with Klebsiella cystitis and Proteas vulgaris and remaining 5 patients (71.42%) has UTI without culture growth along with other infections like 5 with Bronchopneumonia, 1 with enteric fever ,1 with viral fever. Among overall study population, 30% case was of UTI with E. coli culture positive.

Considering the age with gender distribution table of the study population, it was found that one female patient was below one year and two males was below one year. 15 patients were between 1 to 6 years, of which eight were female and seven were male. 18 patients were found between 7 to 12 years, out of which six were female and twelve were male. Four patients were found between 13 to 18years, out of which three were female and one was male. There was not any similarity to the study done by present researchers.

Considering the overall distribution of uropathogens in the study population, it was found that 12patients [Female :6, Male :6] was infected with E.coli, Two patients [Female:1, Male:1] were infected by Klebsiella species, One male patient was infected by Proteas vulgaris, One male patient and one

female patient was infected by *Enterococcus* species and One male patient was found to be infected by *Streptococci*. We found the utilization pattern of antibiotics drug in 40 UTI patients with culture growth and without culture growth about 45 prescriptions were prescribed for antibiotic drugs out of which Cephalosporins 26 (57.77%) prescriptions were for Ceftriaxone which was highest and commonly used, Penicillin seven (15.55%) prescriptions were for Amoxicillin + Clavulanic Acid, frequency of Fluoroquinolones prescribed was five of which four (8.88%) prescriptions were for Ofloxacin and one (2.22%) prescription was for Norfloxacin, under Aminoglycosides three (6.66%) prescriptions were for Amikacin, under Nitrofurantoin one (2.22%) prescription was Nitrofurantoin, under Carbapenem one (2.22%) prescription was Meropenem, under Macrolide antibiotics one (2.22%) prescription was Azithromycin, under Oxazolidinone one (2.22%) prescription was Linezolid were least prescribed. Considering the distribution of the antibiotic drugs used in only 33 UTI patients with and without culture growth in this study population which Ceftriaxone (22) was highly used and the next common used were Amoxicillin + Clavulanic acid (5), and Ofloxacin (4), Amikacin (3) and remaining Nitrofurantoin, Meropenem, Linezolid, Azithromycin and Norfloxacin as mentioned before were the least. We identify Ceftriaxone (4), Amoxicillin + Clavulanic acid (2) were used in mixed infections patient in our study population where the outcome was excellent.

Considering the average number of hospital stay based on antibiotics prescribed in the study population it was found that the hospital stay for patients who were under the treatment with Carbapenem, Macrolide and Oxazolidinone were 18days, patient under treatment with Amino glycosides hospital stay was 10.33days, penicillin was 8.14days, Fluoroquinolones was 7.6 days and Cephalosporins was 7.5days. Among all the cases only one male patient (1 year old) which diagnosed to UTI with *E.coli* growth culture, was treated with 5 antibiotics and the highest hospital stay was rated for this patient the treatment was started by [ceftriaxone for first 2 days ,and added amikacin on the 3rd day and continued the combined therapy for 5 days and stopped] since fever was not subsiding new drug meropenem for 4 days, then linezolid and azithromycin was added and combined therapy of 3 drugs continued for 5 days. The therapy was given is called Blanket therapy.

CONCLUSION

Our study was aimed to find prevalence of UTI and monitor the management in the pediatric population admitted in KIMS, we found prevalence of UTI was 9.82% which is highly significant, with male female ratio of 1.1:1 and we found 7 to 12 years were more prone to UTI due to low socio-economic status, poor hygiene practice like using dirty hands for washing, common washrooms, improper washing technique.

In our study we found 75% was *E. coli*, 12.57% was *Enterococcus*, 6.25% was *Klebsiella* and *Streptococcus* respectively. Ceftriaxone was commonly used antibiotic drug for *E. coli* culture positive patients which also reduced the hospital stay other common drug used was Fluoroquinolones on UTI patients without culture growth also had the least average hospital stay comparing to all other prescribed antibiotics. There was no drug interaction in any patients. To great extent good hygiene practice at home and school, proper toilet training will help to prevent the urinary tract infection in children. Ceftriaxone is a broad-spectrum antibiotic which covers both gram positive and negative bacteria hence it's a good drug of choice in UTI.

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