

Clinico-Bacteriological Study and Antibiotic Resistance Pattern of Urinary Pathogens in Pediatric Patients in a Tertiary Care Center at Kanpur

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Abstract: ***Background:** UTI in children is an infection that occurs within the urinary tract system, which consists of the urethra, bladder and kidney. The infection is named after the location in the urinary tract. In the pediatric age group, incidence of morbidities of bacterial infections ranks second after that of upper RTI. Common uropathogens include Escherichia coli, Klebsiella, Pseudomonas aeruginosa Staphylococcus, saprophyticus, and Enterococcus. The aim of the study is to determine the Clinico-Bacteriological Study and Antibiotic Resistance Pattern of Urinary Pathogens in Pediatric Patients at a Tertiary Care Centre at Kanpur. **Material and Methods:** This study was conducted in children with suspected urinary tract infections from January 2017 December 2017 in Rama Medical College Hospital and Research Centre Kanpur. Urine samples were collected for urinalysis and culture. AST was performed as per the CLSI guidelines 2016. **Result:** Out of 100 children studied significant bacteriuria was detected in 47 cases. Male constituted (61.70%) and females were (38.30%). Escherichia coli, Klebsiella oxytoca Klebsiella pneumoniae, Pseudomonas aeruginosa, methicillin sensitive staphylococcus aureus and Enterococcus faecalis and yeast were the uropathogens. Common uropathogens isolated from this study showed high resistance to widely used antibiotics especially amoxicillin cefotaxime, ceftriaxone, ofloxacin, levofloxacin amikacin erythromycin, clindamycin, tetracycline, co-trimoxazole, nitrofurantoin. **Conclusion:** Males were more affected with UTI. Escherichia coli was the most commonly encountered uropathogen followed by Klebsiella species. Colistin, piperacillin tazobactam, gentamycin, imipenem, meropenem, norfloxacin vancomycin, tigecycline, tetracycline, co-trimoxazole linezolid, teicoplanin have lower antibiotic resistance rates and can be used in the treatment of UTI in children.*

Keywords: Children, Urinary Tract Infections, Uropathogens, Resistance Pattern.

1. Introduction

Urinary tract infection simply means the presence of bacteria undergoing multiplication in urine within the urinary drainage system. Urinary tract infections (UTIs) are among the frequently seen important infections in the pediatric age [1]. In the pediatric age group, incidence of morbidities of bacterial infections ranks second after that of upper respiratory infections [2]. Urinary tract infections in children are generally caused by a microbe, such as bacteria. Typically, infants between the ages of 6 to 12 months more likely develop the infection [3]. Urinary tract infection is one of the most common diseases in children. At least 8 % of girls and 2 % of boys will have urinary tract infection in childhood [4]. Urinary tract infection in children is an infection that occurs within the urinary tract system, which consists of the urethra, bladder and kidneys. The infection is named after the location in the urinary tract [3]. An infection of the lower urinary tract is referred to as cystitis while infection of the upper urinary tract is referred to as Pyelonephritis [5]. After the age of 2 years, UTI manifesting as cystitis is common among girls [6]. Incidence of pediatric UTI varies depending on the age, gender, and race of the child.

2. Materials and Methods

This prospective and observational study was conducted in the Department of Microbiology; Rama Medical College Hospital & Research centre Kanpur, Uttar Pradesh, India, on 100 pediatric patients. A suitable statistical analysis and ethical clearance was carried out according to the study from Institutional Ethical Committee of RMCH & RC, and

informed consent was also obtained from their parents. All the pediatric patients with suspected UTI and, whose urine culture showed one or two pathogens with colony counts greater than or equal to 10^5 colony forming units (CFU)/ml was included in the study and Growth with > 3 types of colonies, children who have taken medication (Antibiotics) in past one week were excluded from the study.

3. Sample Processing

Mid-stream urine sample was collected with the strict aseptic precautions. Specimen was collected before the start of antibiotics, from inpatients and out- patients suspected to be having UTI. Samples were processed as soon as received in laboratory. In cases where a delay was expected, the samples were refrigerated for up to 4 hours at 4°C. Urine culture was done by semi-quantitatively methods on CLED agar, 5% sheep Blood Agar and MacConkey Agar plates. The plates were incubated at 37°C for 24 hrs. The bacterial isolates were identified based on colony morphology, gram stain and standard biochemical tests. Then the bacterial suspension and antibiotic disks were placed on Mueller-Hinton Agar plate by using Kirby-bauer disk diffusion method. Then the zone of inhibition was recorded according to the Clinical and Laboratory Standards Institute (CLSI) guidelines [7]. The following antibiotics were tested for bacterial isolates

Antibiotics for Gram Positive: Amoxicillin, Erythromycin, Clindamycin, Tetracycline, Linezolid, Vancomycin, Teicoplanin, Co-Trimoxazole, Nitrofurantoin.

Antibiotics for Gram Negative: Amoxicillin, Piperacillin tazobactam, Cefotaxime, Ceftriaxone, Gentamycin, Amikacin, Ofloxacin, Levofloxacin, Imipenem, Meropenem, Colistin, Nitrofurantoin, Tigecycline.

negative isolates while *Enterococcus* showed higher prevalence rate than MSSA in gram positive isolate. *Candida* Species were also found in our study showed in table no.2.

4. Results

Total of 100 Urine Samples were collected from the pediatric patients among them 55 were males and 45 were females Out of 100 cases 53% samples showed culture negative growth while 47 % samples showed culture positive growth in which we observed that gram negative bacteria had a higher frequency of occurrence than gram positive bacteria and yeasts showed in table no.1

Table 2: Gender Wise Distribution of Culture Positive Organism Isolated

S. No.	Isolates (n=47)	Male (n=29)	Female (n=18)	Percentage
1	<i>Escherichia coli</i> (18)	12	6	38.30
2	<i>Klebsiella pneumoniae</i> (7)	5	2	14.89
3	<i>Klebsiella oxytoca</i> (5)	3	2	10.64
4	<i>Pseudomonas aeruginosa</i> (3)	2	1	6.38
5	MSSA (3)	1	2	6.38
6	<i>Enterococcus faecalis</i> (7)	5	2	14.89
7	<i>C. tropicalis</i> (2)	1	1	4.26
8	<i>C. krusei</i> (2)	0	2	4.26

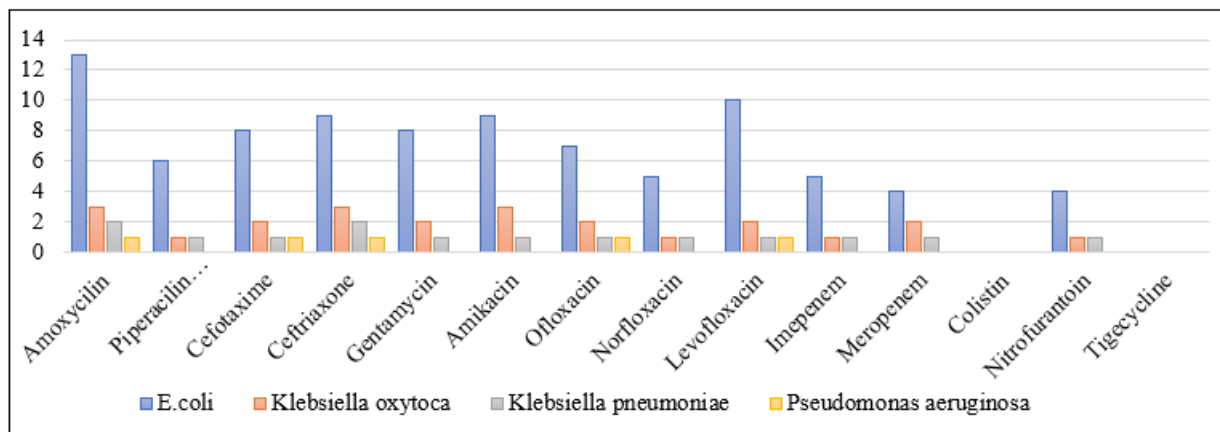
Table 1: Distribution of Culture Positive Organism Isolated

Sr. No.	Organism	Percentage
1	Gram Negative Bacteria	70.21
2	Gram Positive Bacteria	21.27
3	Total	8.52

Out of 47 Culture positive 29 were male and 18 were female. Among them *E. coli* showed higher prevalence rate than *klebsiella* species followed by *pseudomonas* in gram

Antibiotic Resistance Pattern of Gram-Negative Isolates

In case of *Escherichia. coli* amoxicillin showed maximum resistance followed by levofloxacin. In case of *Klebsiella* Species amoxicillin ceftriaxone showed maximum resistance followed by amikacin. In case of *Pseudomonas aeruginosa* amoxicillin, cefotaxime, ceftriaxone, ofloxacin, levofloxacin was resistant (Graph.1).

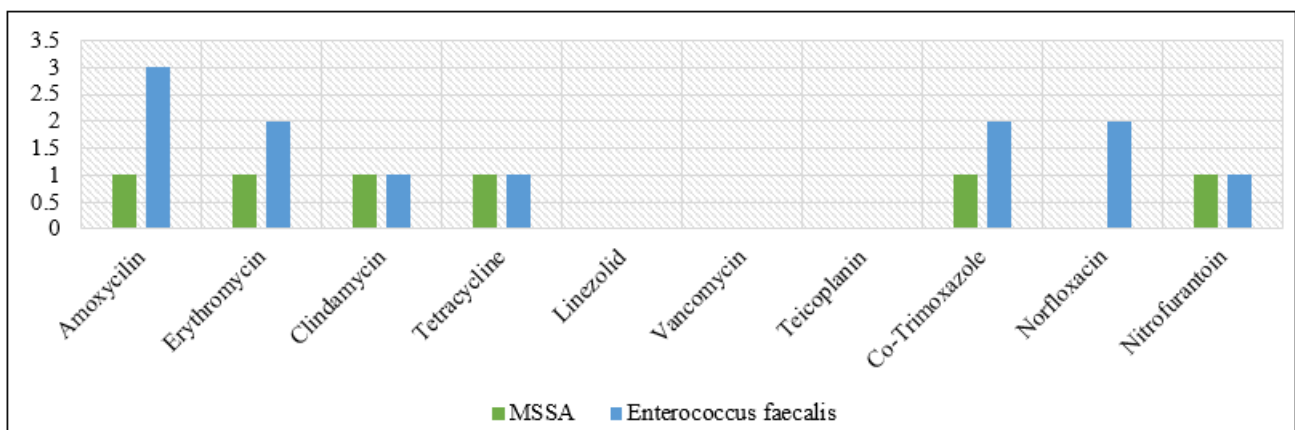


Graph 1: Antibiotic Resistance Pattern of Gram Negative Isolates

Antibiotic Resistance Pattern of Gram-Positive Isolates

In case of *Enterococcus faecalis* amoxicillin showed maximum resistance in case of MSSA amoxicillin,

erythromycin, clindamycin, tetracycline, co-trimoxazole, nitrofurantoin showed maximum resistance (Graph.2).



Graph 2: Antibiotic Resistance Pattern of Gram Positive Isolates

5. Discussion

Any part of the urinary tract can be infected during UTI including kidneys (pyelonephritis), bladder (cystitis) and urethra. Usually, UTI in children occurs due to ascending infection but in the first year of life hematogenous spread may be more common. It is one of the common infections in children but difficult to diagnose because symptoms are nonspecific [8,9]. Particularly children with renal diseases are

more susceptible to UTI due to the disease process and drugs causing immunosuppression and also some congenital abnormalities causing obstruction. The pediatric age group is very sensitive to different types of infections and UTI is considered an important cause of childhood morbidity [10]. Considering the high degree of morbidity and mortality of UTIs, the subject of uropathogenic *Escherichia coli* was receiving increasing attention [11].

a) Culture Results of Cases Studied

S. No.	Study	Culture Negative	Culture Positive	Total
1	Mahmut Abuhandan et al [11]	0	107 (100%)	107
2	Chang-Teng Wu et al [4]	4851(88.7%)	619(11.3%)	5470
3	Neelam Taneja et al [12]	1416(71.7%)	558(28.3%)	1974
4	NirmalJit et al [13]	901(81.31%)	207(18.69%)	1108
5	Present Study	53 (53%)	47 (47%)	100

In the present study 47 specimens were culture positive and 53 were culture negative, and the culture results were comparable to Neelam Taneja et al, Nirmaljit et al, And

Chang Teng et al and contrasting with Mahmut et al.

b) Sex Wise Distribution

S. No.	Study	Male	Female	Total
1	Mahmut Abuhandan et al [11]	14 (13.1%)	93(86.9%)	107
2	Chang-teng Wu et al [4]	331(53.48%)	288(46.52%)	619
3	Neelam Taneja et al [12]	434(77.8%)	124(22.2%)	558
4	NirmalJit et al [13]	144(69.56%)	63(30.44%)	207
5	Present Study	29(61.70%)	18(38.30%)	47

Males were more affected than females in the present study. the findings accordance with Nirmaljit et al And Chang Teng et al and contrasting with Mahmut et al, Neelam Taneja et al.

c) Uropathogens In Different Studies

Study	Common Isolates
Mahmut Abuhandan et al [11]	<i>E. coli, Proteus mirabilis, Klebsiella pneumoniae, Pseudomonas aeruginosa, Methyline Sensitive Coagulase Negative Staphylococcus aureus, Acinetobacter and Enterococcus faecalis.</i>
Chang-Teng Wu et al [4]	<i>E. coli. Klebsiella pneumoniae</i>
Neelam Taneja et al [12]	<i>E. coli Klebsiella and Candida</i>
Nirmaljit et al [13]	<i>E. coli Klebsiella and Candida</i>
Present Study	<i>E. coli, Klebsiella oxytoca, Klebsiella pneumoniae, Pseudomonas aeruginosa, MSSA and Enterococcus faecalis, C.tropicalis, C.krusei.</i>

This table is showing organism isolated in present study which are comparable to Mahmut et al and contrast to Nirmaljit, Chang teng and Neelam taneja et al.

Antibiotic Susceptibility Pattern of Gram-Negative Bacteria

In our study *Escherichia. coli* showed maximum resistance to amoxicillin followed by levofloxacin while Chang teng wu et al study showed resistance to amikacin and piperacillin. Nirmaljit et al study showed resistance to norfloxacin followed by cefotaxime, ceftazidime, co-trimoxazole and ampicillin respectively. In case of *Klebsiella* Species Amoxicillin Ceftriaxone showed maximum resistance followed by amikacin while chang teng wu et al study showed resistance to ampicillin, Nirmaljit et al study showed resistance to ampicillin followed by cefotaxime, ceftazidime co-trimoxazole and amoxy-clavulanic acid respectively. In case of *Pseudomonas aeruginosa* amoxycilin cefotaxime, ceftriaxone, ofloxacin, levofloxacin was resistant where Nirmaljit et al study showed similar results to us in resistance to ciprofloxacin followed by, amikacin, gentamycin, ampicillin and ceftazidime

Antibiotic Susceptibility Pattern of Gram-Positive Bacteria

In case of *Enterococcus faecalis* Amoxicillin showed maximum resistance. While Amit et al [14] study showed resistance to Ciprofloxacin, Gentamycin, Clindamycin, Erythromycin and Nitrofurantoin respectively. In case of MSSA amoxicillin, erythromycin, clindamycin, tetracycline, co-trimoxazole, nitrofurantoin showed maximum resistance.

6. Conclusion

Urinary tract infection is found to be more in children. Males were more affected with urinary tract infections. *Escherichia coli* was the most commonly encountered uropathogen followed by *Klebsiella* species *Pseudomonas aeruginosa*, *Enterococcus faecalis*, MSSA and Candida in the pediatric age group. There is a high antibiotic resistance to commonly used antibiotics among children, Common uropathogens isolated from this study showed high resistance to widely used antibiotics especially amoxycilin, cefotaxime, ceftriaxone, ofloxacin, levofloxacin amikacin, erythromycin, clindamycin, tetracycline, co-trimoxazole, nitrofurantoin.

Colistin, piperacilin tazobactam, gentamycin, imepenem, meropenem, norfloxacin vancomycin, tigecycline, tetracycline, co-trimoxazole linezolid, teicoplanin have lower antibiotic resistance rates and can be used in the treatment of UTI in children.

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Conflict Of Interest

The authors declare that there are no conflicts of interest associated with this manuscript.

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