Antibiotic Susceptibility Pattern of Uropathogens in Pediatrics Patients

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Abstract: Background & Objectives: To identify the pathogens and their antibiotic susceptibility patterns in UTI cases in Paediatric patients.To help in implementation of better therapeutic strategies to reduce morbidity and mortality in Paediatric patients. Methods: Urinary isolates were analyzed retrospectively, data was collected and analysed. Isolation and identification of pathogens was done by standard microbiological method and antibiotic susceptibility test was done using modified Kirby-Bauer disk diffusion method according to current Clinical and Laboratory Standard Institute (CLSI) guidelines. Results: Out of total 1001 urine samples uropathogens were isolated from 334(33.4%) samples. The pathogensisolated were:219/334(65.6%) Enterobacteriacae, 52/334(15.6%) Nonfermenters, 41/334(12.3%) Candida spp, 22/334 (6.5%) GPC (Gram positive cocci).In the Enterobacteriacae group most common pathogen isolated wasE. colifollowed byKlebseilla spp. Most of these isolates were resistant to commonly used antibiotics like 2nd and 3rd generation cephalosporins, fluoroquinolones and were sensitive to carbapenams, nitrofurantoin and newer fluoroquinolones like levofloxacin. Among the nonfermenters,Pseudomonas were resistant to 3rd generation cephalosporins and sensitive to imipenam and polymyxin B. Conclusion: In the spectrum of paediatric UTI, Enterobacteriacaeare the most common etiology and they exhibit high degree of drug resistance to commonly used antibiotics. Suitable antibiotic policy can help in minimising drug resistance. [Padaria N NJIRM 2017; 8(2):51-54]

Key Words: Children, urinary tract infection, uropathogens

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Introduction: Urinary tract infection (UTI) is defined as bacteriauria along with urinary symptoms [1.] UTI is the third most common bacterial infection in childrenin developing countries after those of the gastrointestinal and respiratory tract[2].One of the important causes of morbidity and mortalityduring childhood, especially in the first 2 years of life, is urinary tract infection (UTI). The incidence of UTI has been reported as 7% in girls and 2% inboys during the first 6 years of life[3].Enterobacteriaecae are most common uropathogens among paediatric patients.Recently, Enterococcus spp,yeast and staphylococcus aureus have emerged as important paediatric uropathogens[4].UTI in infants and children if untreated may lead to long term complications like chronic kidney disease, proteinuria, hypertention and growth failure. Understandingof susceptibility pattern of uropathgoens helps in empirical antibiotic therapy in UTI. Increasing rates of resistance among bacterial uropathogens has become a major public health problem in both developed and developing countries. Several factors are associated with the rise of antibiotic resistance of bacterial uropathogens including misuse of antimicrobials, frequent oral use of wide-spectrum antimicrobials that may change the intestinal flora,(which is usually a common cause of urinary tract infection [UTI]) and inappropriate dosages and duration of treatment.[5.]This current study provides information regarding the main uropathogens in children and their antimicrobial susceptibility patterns.

Methods: This retrospective study was carried out in Microbiology Department to analyse urinary isolates from paediatric patients attending Civil hospital Ahmedabad during July-2016 to September-2016.

Inclusion criteria for selection of paediatric patients: Urine samples were obtained from children with suspected UTI. All children up to 14 years of age with urinary symptoms alone (frequency, dysuria, suprapubic pain) or fever with urinary symptoms or fever without urinary symptoms or pain in abdomen with no previous history of UTI were included. Neonates with features of sepsis (i.e., poor feeding, jaundice or altered sensorium) were also included.

The processing of urinary samples consisted of culture by semiquantitative method which was done on 5% sheep blood agar and MacConkey's agar and incubated aerobically at 37°C for 24hr Urine microscopy and gram staining was done. The culture isolates were identified by standard microbiological methods. All culture media were procured from HiMedia Laboratories, Mumbai, India. After identification of organism, the antibioticsensitivity testing was performed on Muller Hinton agar by Kirby–Bauer disc diffusion method as per current

Clinical and Laboratory Standard Institute (CLSI) guidelines. After 18hr- 24hr of overnight incubation inhibition zones were measured. The quality control strains used were E. coli American type culture collection (ATCC) 25922, Pseudomonas aeruginosa ATCC 27853, Enterococcus fecalisATCC 29212 and Staphylococcus aureus ATCC 25923.

Common antibiotics: usedwere Cefuroxime (30mcg), Cefotaxime (30mcg), Levofloxacin (5mcg), Piperacillin-Tazobactum(110mcg),Gentamicin(10mcg),Cotrimoxazole(25mcg),Tetracycline(30mcg),ceftazidime(30mcg),cefoperazone(75mcg),Aztreonam(30mcg),Piperacillin(100mcg),Amoxicillin-Clavulanicacid (30mcg),Teicoplanin (30mcg) and Linezolid(30mcg).

Results: From July-2016 to September-2016, total 1001 urine samples were received from paediatric department. Out of these 1001 urine samples urinary isolates were found in 334(33.4%) samples (Table 1).

Table 1 : The pathogens isolated were as follows:

Pathogen	Number(n)	Percentage (%)
Enterobacteriacae	219	65.6
Nonfermenters	52	15.6
GPC (Gram positivecocci)	22	6.5
Candida spp.	41	12.3
Total	334	100

In the Enterobacteriacaegroup most common pathogen isolated was E.coli153/219(69.8%) followed by Klebseilla spp.50/219(22.8%).Among the nonfermentersPseudomonas spp. 37/219(16.8%) and Acinetobacter spp. were 15/219(6.8%). Among all the isolates E.coli was most common 153/334(45.8%) followed by Klebseilla spp.50/334(15%).Among the Nonfermenters, Pseudomonas spp. was most common 37/334(11.1%) followed by Acinetobacterspp.15/334(4.5%).

Table 2 : The age distribution was as follows:

Age	<1 month	1 month-1 year	1 to 5 years	6 to 10 years	11 to 14 years	Total
E.coli	1	7	26	25	94	153
Klebseillaspp.	0	2	13	20	15	50
Pseudomonas spp.	0	3	7	16	11	37
Acinetobacter spp.	0	1	4	3	7	15
Enterococcus spp.	0	1	4	0	13	18
Staphylococcus aureus	0	3	0	1	0	04
Enterobacter spp.	0	0	0	0	16	16
Candida spp.	1	3	8	1	28	41
Total	2	20	62	66	184	334

Table 3 : The sex distribution was as follows

Pathogen	Male	Female	Total
E.coli	83	70	153
Klebseilla spp.	29	21	50
Pseudomonas spp.	24	13	37
Acinetobacter spp.	05	10	15
Enterococcus spp.	10	08	18
Staphylococcus spp.	02	02	04
Enterobacter spp.	07	07	16
Candida spp.	14	27	41
Total	174	160	334

Maximum incidence of UTI was seen in the age group of 11 to 14 years(Table 2).. The incidence was found to be higher in males 174/334(52.1%) than females 160/334 (47.9%). Most of these isolates were resistant to commonly used antibiotics like 2nd and 3rd generation cephalosporins, fluroquinolones and were sensitive to carbapenems, nitrofurantoin and newer fluroquinolones like levofloxacin. Among the nonfermenters, Pseudomonas were resistant to 3rd generation cephalosporins and sensitive to imipenam and polymyxin B. (Table 3).

Figure1: Antibiotic resistance pattern of E.coli and Klebseilla

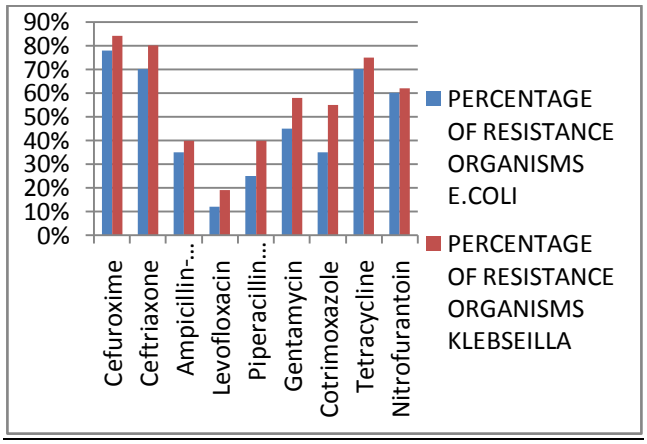

Figure 1 shows that both E.coli and Klebseilla were least susceptible to 2nd and 3rd generation cephalosporins and fluoroquinolones .Resistance to levofloxacin was less compared to all the other fluoroquinolones.

Figure 2: Antibiotic resistance pattern of Pseudomonas

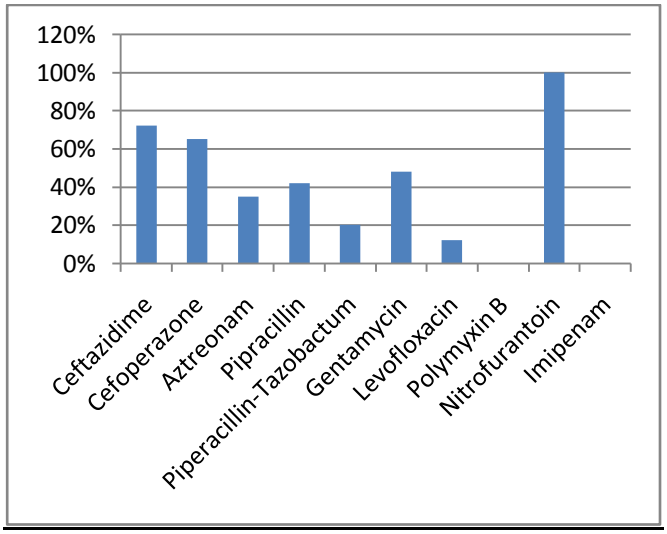

Figure 2 shows that pseudomonas was highly resistant to nitrofurantoin and 2nd and 3rd generation cephalosporines while sensitive to polymyxin B and Imipenam.

Discussion: Many studies have been done on pediatric urinary tract infections in the past. However, the significance of similar studies is that ongoing monitoring should be there to note any changes in the uropathogens and their antibiotic resistance pattern. Therefore, this retrospective study was conducted to describe the susceptibility profile of uropathogens in children suspected with UTI. In our study, 334 urine samples from children suspected of having UTI were analyzed and 33.34% had a UTI. Another study in North India[6]reported urinary isolates were found in 28.3%pediatric samples. Ourcivil hospital is atertiary care centreand 33% culture positivity indicates a high incidence of UTI because often the children are admitted for prolonged duration in the hospital due to the underlying clinical condition. In our study urinary isolates were Gram‑negative bacilli (GNB), with Ecoli. being the most common uropathogen(69.8%).In our study there was a minor difference in the prevalence of UTI in males and females while in other studies prevalence of UTI in male was high[6].However, many other studies have reported female preponderance in pediatric patients with UTI aged beyond 2 years[7].This implies the role of gender in the etiology of UTI and shouldbe considered before the management of UTI.

After E.coli and Klebseilla spp., Candida spp. was the next commonuropathogen. In relation to UTI in children, the resistance pattern of uropathgoens has been evolving. Since UTI in children at our centrewas thought to be nosocomial mostly in origin asthechildren were hospitalized, a high drug resistance was observed among uropathogens. For Pseudomonasspp., carbapenems were the most sensitive, Proteus spp. was most susceptible to aminoglycosides and Enterococcus spp. was 100% susceptible to teicoplanin and linezolid. All theGram‑negative bacilli were100% resistant to nitrofurantoin. Resistance to nitrofurantoin for E.coli was 60% and for Klebseilla was 62%.Resistance to fluoroquinoloneswas also very high among the uropathogens. Rapidly increasing ratesof highly fluoroquinolone-resistant E. coli isolates from urine have been reported from 1998-2001[8].

Increasing drug resistance among uropathogens in paediatric patients is a therapeutic challenge.

Conclusion: Our study was a regional retrospective study showing a high antibiotic resistance level among uropathogens in children of a tertiary care hospital. Although in our study there was a minor difference in the prevalence of UTI among male and female, gender plays an important role in the etiology of UTI according to other studies. Uropathogens are most resistant to Cephalosporins and fluoroquinolones and therefore, not recommended for empirical therapy of UTI in children. Empirical therapy of UTI in children should be based on the local prevalence of the type of the uropathogen and its antibiotic resistance pattern along with the age and gender of the children. We recommend larger nationwide research to determine the true prevalence, demographic characteristics, etiology, and resistance pattern of pediatricuropathgoens and suitable control measures.

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