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Paediatric UTI: Recent Trends of Aetiology and Sensitivity: A Tertiary Care Hospital Study

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Abstract: ***Paediatric Urinary Tract Infections are not uncommon, and having an episode of UTI in the early childhood leads to future complications. With ever-increasing antibiotic resistance, the treatment options become more restricted to reserved drugs. This study, including 509 patients and expanded over one year in a tertiary care hospital in Eastern India, tries to throw some light on the recent trends of UTI in paediatric age group. Escherichia coli was the commonest isolate identified in 61.9% cases, followed by Klebsiella pneumoniae-12.4%. Staphylococcus aureus (10.4%), Enterococcus faecalis (6.9%) and Staphylococcus saprophyticus (5.9%) were also quite common isolates. Antibiograms of the isolates showed significant resistance to the commonly prescribed first line drugs like cephalosporins, amoxy-clav, and even with fluoroquinolones, narrowing the list of drugs to injectable preparations like Amikacin, Gentamicin, Netilmicin and Imipenem. The only drugs showing uniform sensitivity were Colistin for gram negative bacteria and Linezolid for gram positive ones, respectively.***

Keywords: paediatric UTI, bacteria, antibiotic sensitivity

1. Introduction

Urinary tract infections (UTIs) are quiet common in children. By seven years of age, at least 8% of girls and 2% of boys have an episode of UTI.[1] Microbiological reference standard for diagnosis stands as: a single organism in the following concentrations – for midstream urine – more than 1,00,000 colony forming units (CFU)/ml; for catheter specimens – more than 10,000 CFU/ml; and for suprapubic aspiration specimen – more than 1000 CFU/ml.[2-4]

Most commonly the source is endogenous gut flora; the commonest causative agent is *Escherichia coli* followed by other gut pathogens. Among the others, *Staphylococcus aureus* and *Enterococcus species* are quite common, too.[5] Regarding complications, long term follow up data are limited, but it is almost certain that children with UTI at less than 2 years of age are at high risk of developing renal parenchymal defects.[6,7]

The uropathogens, once highly sensitive to Cotrimoxazole, gradually gained resistance against it. Cephalosporins and other cell wall effective antibiotics are preferred to fluoroquinolones as the later causes some adverse effects and hence being kept aside only for multidrug resistant bacteria.

As the guidelines and treatment regarding UTI in children are continuously evolving, this study, expanded over one year, tries to throw some light on recent trends regarding aetiology and drug sensitivity pattern of uropathogens in children from eastern India.

2. Methods/ Approaches

This study included 509 symptomatic UTI patients within paediatric age group in the time period of January to December 2016. Urine specimens were inoculated in routine media like CLED (Cysteine lactose electrolyte deficient media) and MacConkey's agar. Among the 509 urine specimens, 202 were culture positive, and these bacterial isolates were identified by biochemical methods. Antibiotic sensitivity testing was done on those by Kirby- Bauer disc diffusion method using commonly prescribed antibiotics, following CLSI guidelines.[8]

3. Results/ Discussion

Altogether 509 mid- stream urine specimens were included in this study, out of which 202 were culture positive. The list of uropathogens was led by *Escherichia coli* (61.9%), followed by *Klebsiella pneumoniae* (12.4%). Gram positive bacteria like *Staphylococcus aureus* (10.4%), *Enterococcus faecalis* (6.9%) and *Staphylococcus saprophyticus* (5.9%) were also quite common among the isolates. Remaining places were shared by other Enterobacteria like *Proteus mirabilis* and *Klebsiella oxytoca*.

Table 1: Prevalence of uropathogens in paediatric age group, n=202

Name of bacteria	*Total number*	*Percentage*
Escherichia coli	125	61.9
Klebsiella pneumoniae	25	12.4
Staphylococcus aureus	21	10.4
Enterococcus faecalis	14	6.9
Staphylococcus saprophyticus	12	5.9
Proteus mirabilis	4	2
Klebsiella oxytoca	1	0.5

The commonly used and easily available drugs in the locality were used for antibiotic sensitivity testing and the results obtained are cited below in the tables.

Table 2: Antibiotic sensitivity pattern of GNB, n=155

Antibiotics	*Sensitive (%)*	*Resistant (%)*
Amikacin	121(78)	34 (22)
Gentamicin	68(44)	87(56)
Netilmycin	85(55)	70(45)
Nitrofurantoin	52(34)	103(66)
Doxycycline	68(44)	87(56)
Amoxycillin-clavulanic acid	35(23)	120(77)
Ampicillin-sulbactam	35(23)	120(77)
Ceftriaxone-sulbactam	68(44)	87(56)

Cefotaxime	35(23)	120(77)
Cefuroxime	35(23)	120(77)
Ceftriaxone	17(11)	138(89)
Cefixime	35(23)	120(77)

Table 3: Antibiotics sensitivity pattern of gram positive bacteria, N=47

Antibiotics	*Sensitive (%)*	*Resistant (%)*
Amikacin	34 (72)	13(28)
Gentamicin	30 (64)	17 (36)
Netilmicin	46(98)	1 (2)
Nitrofurantoin	38 (81)	9 (19)
Doxycycline	30 (64)	17 (36)
Amoxycillin- Clavulanic acid	9 (19)	38 (81)
Ampicillin-Sulbactam	26 (55)	21(45)
Ceftriaxone-sulbactam	30 (64)	17 (36)
cefotaxime	21(45)	26 (55)
Ceftriaxone	9 (19)	38 (81)
Ofloxacin	21 (45)	26 (55)
Linezolid	47 (100)	0 (0)

This study analysed 509 urine specimens from symptomatic paediatric UTI patients in a tertiary care hospital of Eastern India from January to December 2016. Significant bacteriuria was present in 202 cases. Gram negative Enterobacteria were the predominant uropathogens ruled by *Escherichia coli* -125 isolates (61.9%), whereas *Klebsiella pneumoniae* was isolated in 25 cases. Gram positive organisms were also present in significant numbers, 21 isolates of *Staphylococcus aureus*, 14 of *Enterococcus faecalis*, and 12 of *Staphylococcus saprophyticus*.

These results were in harmony with the findings of Gupta et al in their study in South India where out of 524 children with suspected UTI, 186 (35.4%) were found to be culture positive. The major uropathogens isolated were *Escherichia coli* (68.3%), and *Klebsiella pneumoniae*; *Enterococcus faecalis* and *Staphylococcus aureus* were other common isolates. [9]

This study found that there is a significant resistance of the uropathogens to the commonly prescribed first line drugs like cephalosporins, Amoxy-clav, and even reserve drugs like fluoroquinolones narrowing the list of drugs to injectable and more expensive ones.

The overall sensitivity of Gram negative enterobacteria to cell wall active antibiotics like Penicillin group and cephalosporins, is very low- 23% only , even combination of Ceftriaxone- sulbactam or Piperacillin- tazobactam were effective only in 44% and 34% of cases respectively. Similarly, sensitivity to fluoroquinolones and aminoglycosides was grossly reduced from their previous expectation. Nitrofurantoin sensitivity was quite low –only 34%. Injectable drugs like Amikacin and Imipenem retained their sensitivity to some extent, leaving the only option to switch over to Colistin which was still 100 per cent sensitive in vitro.

The scenario for gram positive bacteria was neither very hopeful. Cell wall active antibiotics and fluoroquinolones showed a significant level of resistance, although Nitrofurantoin and Doxycycline showed a better response with 81% and 64 per cent sensitivity. Aminoglycosides were still quite effective and Linezolid showed uniform sensitivity in vitro.

4. Conclusion

Once again, this study signifies the prime importance of rational antibiotic therapy in the paediatric age group. With ever increasing resistance to the first line drugs, the choice of the clinician is restricted to Nitrofurantoin and Doxycycline for gram positive bacteria. Aminoglycosides should be used with caution, and, linezolid, the only cent percent sensitive drug must be treated as a reserved drug. For gram negative bacteria, even Nitrofurantoin resistance being quite high, aminoglycosides should be considered as the initial choice, whereas Imipenem and Colistin should be spared as far as possible.

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