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PAEDIATRIC UTI: POINTS OF CONCERN: A CLINICOBACTERIOLOGICAL ANALYSIS IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Paediatric UTI is a matter of grave concern particularly at less than two years of age due to predisposition to serious future complications and limited treatment options resulting from ever-increasing antibiotic resistance. This study included 392 established cases of paediatric UTI. Gram negative bacteria were isolated in 68.9% cases, predominated by *Escherichia coli* (34.7%). It was followed by *Klebsiella species* (27.3%), *Enterococcus faecalis* (12.2%), *Acinetobacter species* (7.4%), *Pseudomonas aeruginosa* (4.3%), and other GNB. *Staphylococcus saprophyticus* (4.1%) and *Staphylococcus aureus* (3.1%) were less common. Antibiograms of the isolates showed very low sensitivity to all commonly prescribed antibiotics, namely, ampicillin, amoxyclav, ceftriaxone, cefotaxime, gentamicin, cotrimoxazole, nitrofurantoin, ciprofloxacin and levofloxacin- making them practically irrational to choose. Most of the GNB were susceptible to imipenem, whereas, gram positive cocci were uniformly susceptible to vancomycin and linezolid.

KEYWORDS

Paediatric UTI, Bacterial Aetiology, Uropathogens, Antibiotic Resistance

INTRODUCTION

Urinary tract infections are one of the commonest infections in paediatric age group. It was said that, by the age of seven, 8.4% of girls and 1.7% of boys would have suffered at least one episode of UTI and symptoms might include fever, lethargy, anorexia, and vomiting.[1] Over the last two decades, antibiotic resistance has increased significantly owing to emergence of resistant bacteria initially in hospital environment followed by successive spread into the community.[2,3]

Among the independent risk factors for UTI, renal abnormalities, septicemia, metabolic diseases, malignancies and other systemic diseases, hospitalization within the previous 3 months, age less than 1 year, high recurrence rate of UTI, and recent antibiotic treatment were pointed out.[2]The diagnosis of UTI in paediatric age group was established following AAP standard recommendations of pyuria and significant bacteriuria(in midstream clean catch urine),[4] significant count for catheter specimens was considered as– more than 10,000 CFU/ml; and for suprapubic aspiration specimen – more than 1000 CFU/ml.[5]

The commonest uropathogen is *Escherichia coli* followed by *Klebsiella pneumoniae. Proteus, Enterobacter, Pseudomonas, Enterococcus species, Staphylococcus aureus* and CONS were also reported.[5]

There are limited data regarding long term follow up and complications, but it is almost certain that UTI at a younger age possesses high risk of developing renal scarring and other defects.[6]

Commonly recommended empirical antibiotics are amoxicillin-clavulanate, trimethoprim-sulfamethoxazole (TMP-SMX), cephalexin, and cefixime in OPD, with nitrofurantoin and ciprofloxacin as reserve drugs. In IPD, ceftriaxone, cefotaxime, ampicillin and gentamicin are used.[5]

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

METHODS

Within the time period of January to December 2018, in the Microbiology laboratory, 988 paediatric patients were evaluated for UTI. Routine urine analysis and bacterial culture sensitivity were done. Pyuria was diagnosed by the presence of >10 WBCs /cu.mm.[7] Urine specimens were inoculated in routine media like CLED (Cysteine lactose electrolyte deficient media) and Blood agar. Among the 988 urine specimens, 392 were culture positive with significant count. All the isolates were identified by standard microbiological methods and subjected to sensitivity testing by Kirby- Baűer disc diffusion method following CLSI guidelines.[8] Isolates were tested against ampicillin, amoxyclav, ceftriaxone, cefotaxime, gentamicin, cotrimoxazole, nitrofurantoin, ciprofloxacin, ofloxacin; imipenem (only GNB);vancomycin and linezolid (only GPC).

RESULTS

Altogether 988 mid- stream urine specimens were included in this study, out of which 392 showed pyuria with positive bacterial culture with a significant count.

Table – 1 Age Wise Distribution Of Male And Female Patients With Diagnosed UTI Attending OPD And IPD

(n=392)

Age (yrs)	Male			Female			Total pop.
	O	I	T	O	I	T	
<1	6	40	46	3	29	32	78
1- 5	18	34	52	14	47	61	113
6-18	17	41	58	77	66	143	201
Total	41	115	156	94	142	236	392

Keys: O=OPD, I=IPD, T=Total, Pop.= population

Table-2 Prevalence Of Uropathogens Among OPD And IPD Isolates

(n=392)

Name of bacteria	OPD	IPD	TOTAL (Percentage)
Escherichia coli	52 (13.3)	84 (21.4)	136 (34.7)
Klebsiella species	52 (13.3)	55(14)	107 (27.3)
a) Klebsiella oxytoca	a)30(7.6)	a)30 (7.6)	a)60 (15.3)
b) Klebsiella pneumoniae	b)22(5.5)	b)25 (6.4)	b)47 (11.9)
Enterococcus faecalis	2(0.5)	46 (11.7)	48 (12.2)
Acinetobacter species	12 (3.06)	17 (4.3)	29 (7.4)
Pseudomonas aeruginosa	0(0)	17 (4.3)	17 (4.3)
Citrobacter species	0 (0)	17(4.3)	17 (4.3)
Staphylococcus saprophyticus	8 (2.04)	8 (2.04)	16 (4.1)
Staphylococcus aureus	8 (2.04)	4 (1.02)	12 (3.1)
Proteus species	1 (0.25)	9 (2.3)	10 (2.6)
Total	135 (34.4)	257 (65.6)	392 (100)

Table -3 Antibiotic Sensitivity Pattern (in %) Of GNB In OPD And IPD

(N=316)

Antibiotics	*OPD*	*IPD*
Ampicillin	44.4	4.25
Amoxycillin-clavulanic acid	16.7	8.5
Piperacillin-tazobactam	50	25.5
Ceftriaxone	38.9	12.8
Cefotaxime	38.9	12.8
Gentamicin	83.3	57.4
Doxycycline	44.4	21.3
Nitrofurantoin	55.6	51.1
Co-trimoxazole	44.4	34.04
Ciprofloxacin	33.3	12.8
Ofloxacin	44.4	38.3
Imipenem	100	86.9

Table- 4 Antibiotic Sensitivity Pattern (in %) Of GPC

(N= 76)

Antibiotics	*OPD*	*IPD*
Ampicillin	25	0
Amoxycillin-clavulanic acid	50	0
Ceftriaxone	50	0
Cefotaxime	50	0
Gentamicin	50	35.7
Doxycycline	50	21.7
Nitrofurantoin	55.6	24.3
Co-trimoxazole	44.4	5.5
Ciprofloxacin	33.3	12.2
Ofloxacin	44.4	12.2
Vancomycin	100	100
Linezolid	100	100

DISCUSSION

Out of 988 urine specimens, 392(39.7%) were culture positive, with a female preponderance of 60.2%, but male predominance of 59% was observed among the infants. In this particular age group of <1 year, 86.9% of boys and 90.6% of girls were from indoor wards commonly presenting with complicated UTI.(Table: 1)

A study in South India found 35.4% of positive growth among all suspected UTI cases.[9] Hanna Wakim et.al. observed an overall female predominance of 77.7% but males outnumbered females with 60.9% prevalence among infants <2 months of age.[2]

Gram negative enterobacteria were the predominant uropathogens isolated in 68.9%. *Escherichia coli* was the commonest isolate followed by *Klebsiella species* in both OPD and IPD. Although, in comparison to previous studies, we found a lower rate of isolation of *Escherichia coli*(34.7%) and a higher rate of isolation of *Klebsiella species*(27.3%) (Table-2).[10] The prevalence wise distribution of uropathogens in OPD was- *Escherichia coli* and *Klebsiella species* in equal percentage (both in 38.5% of all OPD isolates); followed by *Acinetobacter*(8.9%), *Staphylococcus saprophyticus* (5.9%), *Staphylococcus aureus* (5.9%), *Enterococcus* (1.48%) and *Proteus species* (0.74%).

Among IPD isolates, *Escherichia coli* was the leading cause of UTI (32.7%) followed by *Klebsiella* (21.4%), *Enterococcus*(17.9%), *Acinetobacter* (6.6%), *Pseudomonas aeruginosa*(6.6%), *Citrobacter*(6.6%), *Proteus species*(3.5%), *Staphylococcus saprophyticus* (3.1%) and *Staphylococcus aureus*(1.6%). *Klebsiella oxytoca* was found to be more common and more drug resistant than *Klebsiella pneumoniae* in both IPD and OPD settings. (Table:2)

Hanna Wakim found *Escherichia coli*, *Klebsiella* and *Proteus* species in prevalence of 79.4, 7.9 and 3.9% respectively, whereas, *Pseudomonas, Enterococcus, and Enterobacter* were relatively rare.[2] Gupta et.al. found *Escherichia coli* in 68.3% cases, *Klebsiella* (21.1%), *Proteus* and *Acinetobacter* (4.22% each), *Pseudomonas* and *Citrobacter* in relatively rare occasions. *Enterococcus faecalis* and *Staphylococcus aureus* were common Gram positive isolates. [9] Another study found *E. coli* (66%), *Klebsiella, Proteus, Acinetobacter, Pseudomonas, Enterococcus* and *Staph. aureus* as the prime causative organisms.[11]

We observed that, the overall efficacy of beta lactam antibiotics against gram negative bacteria was reduced to 50% or lower for OPD isolates and practically almost nil for IPD ones. Similarly, susceptibility to fluoroquinolones and aminoglycosides was grossly reduced from their previous expectation. Nitrofurantoin sensitivity was only 55.6% in OPD and much lower in IPD (24.3%). All OPD isolates and 86.9% of IPD isolates were susceptible to imipenem. (Table:3) Gupta et.al. highlighted better efficacy of aminoglycosides, cefoperazone-sulbactam and nitrofurantoin *in vitro* compared with meropenem against gram–negative uropathogens which was not in corroboration with our findings.[9]

Thattil et.al. found that all gram negative isolates were highly susceptible to imipenem(>98%), amikacin (>81%), and piperacillin-tazobactam(>75%); and to fluoroquinolones, cefaperazone, amoxyclav piperacillin and cotrimoxazole in less than 50% cases.[11]

The scenario was neither very hopeful for gram positive bacteria. With Enterococcus species more prevalent in IPD and methicillin resistant Staphylococci (both MRSA and MRCONS) well –established in the hospital milieu; the sensitivity to ampicillin, amoxy-clav, and cephalosporins was reported to be nil. A significantly lower sensitivity to gentamicin (35.7%), nitrofurantoin (24.3%), doxycycline (21.7%), quinolones (12.2%) and cotrimoxazole (only 5.5%) was observed. Among the OPD isolates, a high degree of resistance to all groups of antibiotics was observed, too. All gram positive isolates were uniformly sensitive to vancomycin and linezolid in vitro(Table 4). A similar susceptibility pattern of *Staphylococci* against vancomycin and linezolid was observed in a South Indian study.[11]

CONCLUSIONS

Once again, this study signifies the prime importance of rational antibiotic therapy in treating pediatric UTI. The varied and wider spectra of uropathogens and their ever-increasing antibiotic resistance- not only in hospital set up, but also its spread to community-made it a really critical condition to choose an empirical antibiotic. Our observation highlighted an alarming trend of antibiotic resistance to almost all available treatment options save imipenem for GNB and vancomycin and linezolid for GPC. Be it in IPD or OPD, the resistance to ampicillin, cotrimoxazole, nitrofurantoin, cephalosporins and even reserve drugs like fluoroquinolones were observed to be far below 50 percent. Hence, the question of choosing an empirical antibiotic without culture sensitivity report becomes impertinent. At the same time, apprehension to treat asymptomatic bacteriuria or bacteriuria without pyuria in paediatric patients has forced them to unnecessarily harbour resistant bacteria by selection pressure. The only rational approach to fight this war is to choose the right antibiotic guided by in vitro urine culture and sensitivity report, only in right cases sorted by presence of pyuria with significant bacteriuria; otherwise it would be a tough battle to win.

REFERENCES:

[1] Williams GJ, Wei L, Lee A, Craig JC. (2006). Long-term antibiotics for preventing recurrent urinary tract infection in children. Cochrane Database Syst Rev,(3):CD001534.

[2] Hanna-Wakim RH, Ghanem ST, El Helou MW, Khafaja SA, Shaker RA, Hassan SA, Saad RK, Hedari CP, Khinkarly RW, Hajar FM, Bakhash M, El Karah D, Akel IS, Rajab MA, Khoury M and Dbaibo GS. (2015). Epidemiology and characteristics of urinary tract infections in children and adolescents. Front. Cell. Infect. Microbiol. 5:45. doi: 10.3389/fcimb.2015.00045

[3] Pitout, J. D., and Laupland, K. B. (2008). Extended-spectrum beta-lactamase-producing Enterobacteriaceae: an emerging public-health concern. Lancet Infect. Dis. 8, 159–166. doi: 10.1016/S1473-3099(08)70041-0

[4] Urinary tract infection: clinical practice guideline for the diagnosis and management of the initial UTI in febrile infants and children 2 to 24 months. (2011, Sep). Subcommittee on Urinary Tract Infection, Steering Committee on Quality Improvement and Management., Roberts KB. American Academy of Paediatrics, Clinical Practice Guidelines. Pediatrics.; 128(3):595-610.

[5] UTI Guideline Team, Cincinnati Children's Hospital Medical Center.(2006,Nov.). Evidence-based care guideline for medical management of first urinary tract infection in children 12 years of age or less.Guideline-7:1-23.Retrieved from http://www.cincinnatichildrens. org/svc/alpha/h/health-policy/uti.htm.

[6] Larcombe J. (1999). Urinary tract infection in children. BMJ (Clinical research ed.), 319(7218), 1173–1175. doi:10.1136/bmj.319.7218.1173

[7] Doern CD, Richardson SE. (2016). Diagnosis of Urinary Tract Infections in Children. J Clin Microbiol,54(9):2233–2242. doi:10.1128/JCM.00189-16

[8] Clinical and Laboratory Standards Institute. (2018).Performance standards for antimicrobial susceptibility testing; M10028th Ed. Wayne, PA:CLSI.

[9] Gupta P, Mandal J, Krishnamurthy S, Barathi D, Pandit N. (2015).Profile of urinary tract infections in paediatric patients. Indian J Med Res,141:473-7

[10] Hooton TM. (2012).Uncomplicated urinary tract infection. New Engl J Med,366:1028–1037

[11] Santhosh John Thattil, Sumitha Santhosh.(2018). Prevalence of UTI in different age groups in a tertiary care hospital and their antibiogram. International Journal of Contemporary Medical Research,5(1):3-6.