ORIGINAL ARTICLE

CAUSATIVE ORGANISMS AND ANTIMICROBIAL SENSITIVITY PATTERN OF PEDIATRIC URINARY TRACT INFECTIONS

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ABSTRACT

Background: The spectrum of pediatric uropathogens keeps on changing frequently, particularly in tertiary care settings catering a diverse patient population. The present study was conducted to determine the causative organisms and anti-microbial sensitivity pattern of uropathogens in children at Rehman Medical Institute Peshawar, Pakistan.

Material & Methods: This was a retrospective descriptive study from the patient records of 106 children aged 6 months to 14 years with confirmed diagnosis of urinary tract infection based on urine culture and sensitivity reports. The study was carried out from June 01 to July 15, 2013 and included data of children admitted to the Department of Pediatrics, Rehman Medical Institute, Peshawar, over a period of 6 years i.e. January 2007 to December 2012.

Results: The male to female ratio was 1:1.8 (34.9% males, 65.1% female). The common presenting symptoms were dysuria, flank pain, fever, restlessness due to pain and weakness. The most common isolated organism was E. coli (65.1%) followed by E. fecalis (20.8%). Regarding sensitivity pattern; Vancomycin, Amikacin, Nitrofurantoin and Impinime showed good sensitivity while Ampicillin and Ceftriaxone showed highest resistance.

Conclusion: The resistant pattern of uropathogens causing urinary tract infections to common antimicrobial agents is changing and it must be taken into consideration when selecting treatment strategies.

KEY WORDS: Urinary tract infections; Microbial sensitivity tests; Gram-Negative bacteria; Gram-Positive bacteria.

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INTRODUCTION

Urinary tract infection (UTI) is the most common disease of genitourinary system in children, and the second most common infection after respiratory tract infection during childhood.[1-3] It is estimated that at least 8% of girls and 2% of boys will have a urinary tract infection in childhood, and between 30-40% will have another episode within two years.[2,3] It can be symptomatic or asymptomatic and can result in serious morbidity and mortality in some cases due to severe sepsis, and pyelonephritis in childhood.[4] Recurrent UTI may cause serious long term complications such as end stage renal failure.[5-7]

Nowadays, due to unnecessary and excessive use of antibiotic, resistance to antibiotics is increasing especially in children with frequent recurrent UTI and re-infection. Error! Bookmark not defined. Antimicrobial resistance among uropathogen isolates has recently been reported with an increased frequency all over the world.[8-10] The importance of identification of infectious agent and its susceptibility to antibiotics and the detection of its resistance status are key factors in the diagnosis and proper treatment of UTI.[3]

Several studies done have demonstrated that the geographical variation of pathogens occur in cases of UTI among in-patients and out-patients, predominated by gram negative species usually Enterobactericeae and particularly E. coli and Enterobacter spp. in various regions of the world.[11,12] However, Pseudomonas aeruginosa and Enterococcus spp. are usually ranked among the top five pathogens and their resistant pattern can vary significantly between hospitals, countries and continents.[13]

In the present study, we aimed to investigate the most common microorganisms, antibiotic sus-

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ceptibility and resistance pattern and generate a basis for the rational antibiotic treatment of childhood UTI.

MATERIAL AND METHODS

The study was carried out at Rehman Medical College, Peshawar Pakistan from June 01 to July 15, 2013. In this study, 106 children with positive urine cultures were investigated through retrospective sampling of patient record databases. Patients aged 6 months to 14 years, admitted to the pediatric department of Rehman Medical Institute over a period of 6 years i.e. January 2007 to December 2012 with complaint of UTI confirmed on urine culture were included in the study. Ethical approval was obtained from the RMI Ethical Review Board regarding data collection and use for research purposes.

Table 1: Frequency of isolated organism from urine of children with urinary tract infection (n=106).

Microorganism	Male (n-34)	Female (n-72)	Total (%)
E. coli (n=67)	23	44	67 (63.21)
E. fecalis (n=22)	5	17	22 (20.75)
K. pneumonia (n=8)	3	5	8 (7.55)
P. aeruginosa (n=3)	1	2	3 (2.83)
Misc. (n=6)	2	4	6 (5.66)
Total	34 (32.1%)	72 (67.9%)	106 (100%)

RESULTS

Of the 106 patients, 34 (32.1%) were males and 72 (67.9%) females with a male to female ratio of 1:1.86. The most common isolated organism was E. coli (63.21%) followed by E. fecalis (20.8%).

Table 2 shows the sensitivity and resistance pattern. E coli, which comprised 67 (63.21%) of isolates; it showed highest sensitivity to Vancomycin 67 (100%), Imipenim 67 (100%), Nitrofurantoin 60 (89.55%) and Amikacin 61 (91.04%). E. fecalis showed sensitivity to Vancomycin 21 (95.45%), Nitrofurantoin 17 (77.27%) and Chloramphenicol 14 (63.63%) while looking at the resistance pattern the E. coli showed highest resistance to Ampicillin 58 (86.56%), Amoxicillin 58 (86.56%), Ciprofloxacin 54 (80.59%) and Ceftriaxone 52 (77.61%) while E fecalis showed highest resistance to Ampicillin 19 (86.36%) and Ceftriaxone 16 (72.7%).

Table 3 gives an overview of symptoms the patients presented with; dysuria was the most common symptom accounting for 64.15% of cases followed by flank pain 46.22%, fever 41.51% and restlessness 31.13%.

Table 2: Sensitivity pattern of bacterial isolates from children with urinary tract infection (n=106).

Isolates (n-106)	Ami S/R	Ceft S/R	Amo S/R	Aztr S/R	Vanc S/R	Amp S/R	Cefip S/R	Sulb S/R	Cefo S/R	Chlo S/R	Cefta S/R	Cipr S/R	Imp S/R	Nitro S/R	Total S/R
E. coli (n-67)	61/6	6/52	0/58	0/58	67/0	0/58	0/58	0/54	6/54	0/4	6/2	10/54	67/0	60/4	283/408
E. fecalis (n-22)	0/0	6/16	0/0	0/0	21/0	3/19	0/0	0/0	0/0	14/3	0/0	0/0	3/0	17/0	64/38
K. pneu m (n-8)	5/2	4/4	1/7	1/7	7/0	0/6	1/7	2/4	1/7	2/0	1/7	2/6	8/0	3/5	38/62
P aerug (n-3)	3/0	0/3	0/0	3/0	3/0	0/0	3/0	3/0	0/0	0/0	0/0	3/0	3/0	0/0	21/3
Misc. (n-6)	2/4	1/14	0/14	0/13	2/1	0/13	0/12	1/9	0/10	0/6	0/7	3/6	3/1	3/3	15/113
Total	71/12	17/89	1/79	4/78	100/1	3/96	4/77	6/67	7/71	16/9	7/16	18/66	84/1	83/12	421/624

Ami-Amikacin, Ceft-Ceftriaxone, Amo-Amoxacillin, Aztr-Aztreonam, Vanc-Vancomycin, Amp-Ampicillin, Cefip-Cefipime, Sulb-Sulbactum, Cefo-Cefotaxime, Chlo-Chloramhenicol, Cefta-Ceftazidim, Cipr-Ciprofloxacin, Imp-Imipinime, Nitro-Nitrofurantoin. S/R = Sensitivity / Resistance

Table 3: Symptoms of children with urinary tract infection (n=106).

Complaints	Number	Percentage
Vomiting	24	22.64
Dysuria	68	64.15
Fever	44	41.51
Urgency	17	16.03
Restlessness	33	31.13
Pollakiuria	24	22.64
Flank pain	49	46.22
Incontinence	24	22.64
Color/smell changes	21	19.81
Low urine output	6	5.66
Constipation	13	12.26
Abnormal flow	6	5.66

irrationally not only by the medical practitioners but also antibiotics are purchased directly from chemist without any prescription.[19] Therefore, periodic evaluation of sensitivity pattern is essential for rational and appropriate use of antibiotics.[20] In our study Ampicillin showed the highest resistance (90.56%) followed by Ceftriaxone (83.96%), Amoxicillin (74.52%), Cefotaxime (66.98%), Ciprofloxacin (62.26%) and Gentamycin (61.32%). These findings of our study are almost in consistent with other studies done.[12,18,21]

Epidemiological and antimicrobial resistance studies carried out in various countries are shown in Table 4. As expected, the most common causative agent was E. coli, which has been isolated at varying rates between 47% and 93.3% followed by Enterococcus spp. (1-20.75%) and Klebsiella spp. (1.5-15.2%). The highest rate of resistance to Ampicillin was found in the studies; this might be due to the fact that it is the most common self-medication and non-prescribed medicine in most of the countries.[5]

Table 4: Urinary tract infection related epidemiological studies carried out in various countries among pediatric age groups.

Pathogens	Our study (n-106)	Younis Jordan (n-336)[22]	Rabasa Nigeria (n-529)[21]	Tseng Taiwan (n-368)[23]	Guidoni Nepal (n-100)[24]	Rai Nepal (n-538)[25]	Anatoliotaki Greece (n-262)[26]	Yuksel Turkey (n-165)[27]	Lutter USA (n-361)[28]	Pape Germany (n-100)[29]	Ghiro Italy (n-1333)[30]
E. coli	63.21	58	65	81	77	93.3	79.4	87	87	47	89.9
Klebsiella	7.55	15.2	15	6.5	3	1.5	8.4	10	3	4	2.1
Enterococcus	20.75	4.8	NT	6	1	NT	1.9	NT	2	23	1.3
Pseudomonas	2.83	15	NT	NT	NT	0.7	1.5	NT	2	5	1.4
Staph aureus	1.9	0.3	10	NT	NT	0.7	NT	NT	NT	NT	NT

Key: NT - Not tested.

DISCUSSION

Urinary tract infection in children is a significant source of morbidity. It is generally agreed that children with UTI require further investigation and continuing surveillance to minimize future complications.[14] In our study most of the infections were observed in the female, with a female to male ratio of 1.86:1; different studies reported female predominance, with a variable ratio ranging from 6:1 to 1.33:1, depending upon different sample size, different socioeconomic status and age groups being studied.[15-18]

The pattern of antimicrobial sensitivity and resistance changes frequently especially in the developing countries, where antibiotics are prescribed

Since E. coli is the leading cause of UTI, empiric treatment should be based on E. coli susceptibility patterns. For our region, Amikacin (88.05%), Vancomycin (100%), Imipenim (100%) and Nitrofurantoin (89.55%) seem the best choices for initial therapy. In the published literature, E. coli has generally been reported to have a low resistance rate (0-6%) to Nitrofurantoin, except for the findings of Gokce[31] who reported it to be 15% and Al-Mardeni[22] reported 20.7%. In our study E coli showed highest resistance to Ampicillin (86.56%) and Ceftriaxone (77.61%) while E coli resistance to other antibiotic such as Ampiclox, Gentamycin and Ceftriaxone, was also remarkably high in the study done by Al-Mardeni.[22] Our study also recommended Nitrofurantoin for empiric therapy in uncomplicated UTIs, due to its

low resistance rate.

Increasing antibiotic resistance among urinary tract isolates is a worldwide problem. As the habit of uncontrolled antibiotic use plays an important role in the emergence of resistance isolates, current interventions aimed at reducing unnecessary antibiotic prescribing, especially in the underdeveloped and developing countries, must be supported. It is crucial to establish an international surveillance system to assess uropathogens frequencies and resistance pattern among pediatric patients.

CONCLUSION

The resistant pattern of uropathogens causing urinary tract infections to common antimicrobial agents is changing and it must be taken into consideration when selecting treatment strategies. Appropriate prescription of antibiotics will not only cure the disease properly but will also help in prevention of increasing resistance pattern.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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