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Original Research Article

Retrospective study of bacteriological profile and their antibiotic sensitivity pattern in urine of pediatric patients (0-12 years) in a tertiary care hospital of South Gujarat

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ABSTRACT

Background & Aim: Urinary Tract Infections are common bacterial infections in pediatric age group. The diagnosis of UTI is very often missed in lower pediatric age group due to minimal and nonspecific symptoms. Etiological agents of UTI are variable and commonly depend on time, geographical location and age of patients. However E.coli and Klebsiella pneumoniae account for most of the cases. Present study aims at to determine prevalence and to evaluate changing trends of etiology and antibiogram of urinary isolates in children of 0-12 year age group attending Tertiary care hospital, of South Gujarat.

Materials and Methods: A retrospective study was carried out in the Microbiology department of Tertiary care hospital of South Gujarat including all indoor pediatric patient's urine samples received over duration of 6 months. Urine samples were processed according to routine protocol of the microbiology laboratory. Different bacterial isolates from urine samples were identified by using various biochemical reactions. Antibiotic-Susceptibility Testing was done using Kirby bauer disc diffusion method according to CLSI guidelines, 2018 for particular year. Qualitative data were presented as a proportion.

Results: Total 59 samples showed bacterial growth out of 595 indoor pediatric urine samples. Gram positive cocci were the predominant causative group of pediatric UTI accounting for 52.45%. Whereas Gram negative bacilli were 47.54%. Enterococcus group was the predominant etiological agent for 45.90% with maximum resistance to Primary line of drugs like Penicillin G and Ampicillin.

Conclusion: Drug resistance pattern amongst urinary isolates of pediatric patients indicates that antibiotic selection should be based on knowledge of the local prevalence of bacterial organisms and antibiotic sensitivities rather than empirical treatment.

1. Introduction

Urinary tract infection (UTI) is one of the most common infection in children. It is defined as the presence of bacteria in urine in significant amount. The incidence of UTI differs with the age and sex of the children. Approximately 5-10% of all children less than two years of age with fever experience UTI. UTI in pediatric age group is different in all the way from adults mainly by following congenital abnormalities of urinary tract namely posturethral valves, pelvi-ureteric junction obstruction, neurogenic bladder, stricture urethra, vesicoureteral reflux which is very true in infants (<1-year age group).[1]

UTIs are often difficult to diagnose in lower pediatric age group because of nonspecific signs and vague symptoms. It is more important to diagnose the condition timely and accurately as it could be the first presentation of an underlying urological anomaly or it may itself can lead to significant morbidity from renal scarring, hypertension and eventually end-stage renal disease. In community and hospital settings the etiology of UTIs and antimicrobial susceptibility pattern of uropathogens have been changing over the years.[2]

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The bacterial pathogens causing urinary tract infections (UTI) in children are well known. Escherichia coli is the predominant pathogen in the community-acquired urinary tract infection and hospital-acquired urinary tract infection and it is solely responsible for more than 80% of these infections.[3] The other bacteria which are also responsible for urinary tract infections are Proteus, Klebsiella, Enterobacter, Pseudomonas, Enterococcus and Staphylococcus species.

Factors such as changing patient population, extensive use, and misuse of antimicrobial agents could all contribute to changes in the bacterial profile of UTI. Knowledge of antimicrobial resistance pattern of common uropathogens according to local epidemiology is essential for providing clinically appropriate and cost-effective therapy for UTI.[4]

2. Materials and Methods

A retrospective study was carried out in the microbiology department of tertiary care hospital of South Gujarat. A total of 595 urine samples collected from suspected indoor pediatric patients received in the duration over 6 months from May-2018 to October-2018 at microbiology department of tertiary care hospital was assessed. Clean catch, mid-stream urine samples were received in sterile universal containers. Urine samples were processed within 2 hour of collection and in case of delay, the sample were refrigerated at 2-8°C.

2.1. Inclusion criteria

1. Children at the and below the age of 12 years
2. Patients with clinical suspicion of having UTI

2.2. Exclusion criteria

1. Children above the age of 12 years

2.3. Sample processing

A calibrated loop method (semi quantitative method)[5] was used for the isolation of bacterial pathogens from urine samples. A loopful urine sample was plated on Mac-Conkey agar & Blood agar. The inoculated plates were incubated at 37°C for 18-24 hours. The number of isolated bacterial colonies was multiplied by 1000 for the estimation of bacterial load/mL of the urine sample. A specimen was considered positive for UTI if growth detected at a concentration of $\geq 10^5$CFU/mL.[6] Significant isolates were identified by conventional methods according to the standard laboratory protocol, including colony morphology, gram staining and biochemical reactions. All gram-negative bacilli were identified to species level by their characteristic appearances on the media, Gram's stain, Oxidase test, Motility and biochemical reactions as per standard laboratory protocol. All gram positive organisms were identified to species level by their characteristic appearances on the culture media, Gram's stain, Catalase test followed by Coagulase test. Enterococcus was identified by Bile Esculin disc test and it was also confirmed by Salt tolerance test (6.5% NaCl.)

2.4. Antimicrobial susceptibility testing

The antibiotic sensitivity test was performed by Kirby Bauer disc diffusion technique with commercially available Hi-Media antibiotic discs according to Central Laboratory Standard Institute (CLSI) guidelines 2018 on Mueller Hinton agar plates. The antibiotics which were used in our study were based on the standard protocol of the hospital and departmental policies. (as per CLSI guidelines 2018)

2.5. Statistical analysis

The qualitative data were expressed in proportion and percentages and the quantitative data expressed as mean and standard deviations. The difference in proportion was analyzed by using chi square test. Significance levels for tests were determined as 95% ($P< 0.05$).

3. Results

A total of 59 samples showed bacterial growth out of 595 pediatric urine samples which were analysed at Microbiology department of Tertiary care hospital of South Gujarat during time period of 6 months (May-2018 to October-2018). Total bacterial isolates were 61 because two urine samples has two bacterial isolates.

Table 1 shows the age and gender wise distribution of urinary isolates. Out of total 59 positive cases in which 27 cases (45.76%) belong to Female and 32 cases (54.23%) belong to Male category and the majority of cases among male category 11 (34.37%) found in the age group of 4 to 6 years followed by 0 to 1 years 7 (21.8%) and 10 to 12 years 7 (21.8%) and the least was 9.3% in 1 to 3 years of age.

Table 1: Age and gender wise distribution of the culture positive urine samples (n=59)

Age group in years	Male		Female	
	No.	%	No.	%
0 to 1 years	7	21.8%	2	7.4%
1 to 3 years	3	9.3%	9	33.3%
4 to 6 years	11	34.3%	9	33.3%
7 to 9 years	4	12.5%	3	11.1%
10 to 12 years	7	21.8%	4	14.8%
Total	32	100%	27	100%

Gram positive cocci were the predominant causative group of pediatric UTI accounting for 32(52.45%). Whereas Gram negative bacilli were 29(47.54%). Among all the positive cases, in gram positive bacteria, Enterococcus group was the predominant etiological agent accounting

for 28(45.90%). Other Gram positive cocci isolated were Staphylococcus aureus 4(6.5%). Among Gram negative bacilli isolates E.coli 15(24.59%) was the predominant followed by Klebsiella pneumoniae 10(16.39%) and Pseudomonas aeruginosa 4(6.5%). Distribution of the same is described in Figure 1.

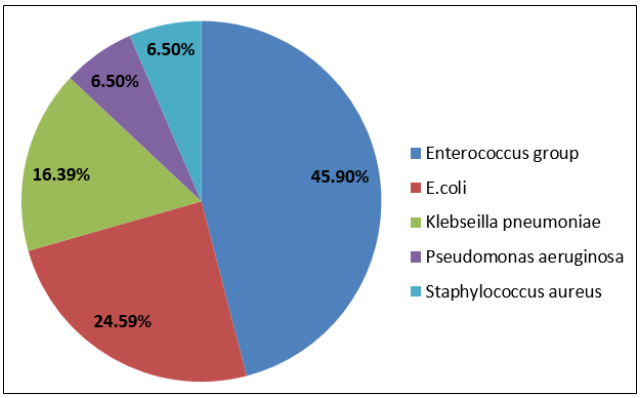

Fig. 1: Organism wise distribution of urinary isolates

In this study Enterococcus group of organism showed almost equal (78.57%, 71.42%) resistance to Primary line of drugs like penicillin G and ampicillin. Other higher drugs like linezolid(17.87%) vancomycin (17.87%) and teicoplanin(10.71%) showed resistance to enterococcus group, while this drugs were 100% sensitivity in S aureus. Among urinary drugs S. aureus showed 100% senisitivity to nitrofurantoin while enterococcus group showed resistance (39.28%) to this drug.

E. coli and K pneumoniae showed equal resistance to urinary drug nitrofurantoin (1.2%), while both were 100% sensitive to fosfomycin. E. coli and K pneumoniae were almost equally resistant to amoxy-clav (100%, 99% respectively), and 3rd generation cephalosporines –ceftriaxone (90%, 88%).

Table 2: Antibiotic sensitivity pattern of gram-positive bacteria (n=32)

Antibiotic	Enterococcus Group % (n=28)	Staphylococcus aureus % (n=4)
Penicillin G	21.42%	00%
Ampicillin	28.57%	-
Vancomycin	82.14%	100%
Linezolid	78.57%	100%
Teicoplanin	85.71%	100%
Tetracyclins	17.85%	75%
Fluoroquinolones	10.71%	25%
Fosfomycin	100%	-
Nitrofurantoin	57.14%	100%
Rifampin	32.14%	100%
Erythromycin	10.71%	75%

Table 3: Antibiotic sensitivity pattern of gram-negative bacteria (n=29)

Antibiotic	E.coli % (n=15)	Klebsiella pneumoniae % (n=10)	Pseudomonas aeruginosa % (n=4)
Amoxyciline/sulbactam	13.33%	40%	-
Ceftriaxone	6.66%	10%	-
Cefepime	6.66%	10%	50%
Aztreonam	26.66%	20%	75%
Imipenem	60%	60%	50%
Meropenem	60%	70%	50%
Fluoroquinolones	6.66%	10%	50%
Tetracyclines	33.33%	50%	-
Nitrofurantoin	40%	40%	-
Fosfomycin	100%	100%	-

4. Discussion

Urinary tract infection in the pediatric patient is a significant source of morbidity and considerable mortality. It is generally agreed that pediatric patient with UTI requires further investigation and treatment to minimize future complications, since UTIs in pediatric patients can be due to congenital abnormality of renal system also.[7] The present study documents distribution and susceptibility patterns of various bacterial isolates from urine of pediatric patients over a period of six months at, Tertiary care hospital of South Gujarat.

The prevalence of culture- positive isolates observed in our study was 9.91% which was lower to findings of (14.7%) Mohanty et al[8] In this study Enterococcus was the predominant uropathogen, accounting for approximately 45.90% which shows similar results with previous study done in same institute by Mulla et al.[9] The reason could be predominance of Enterococccci in endogenous flora of the body.

In this study we found a high prevalence of UTI in males (54.23%) than in females (45.76%) which is in contrast to Beena et al.[1] and Pal N et al.[10] This may be due to the relatively more number of male children coming to the hospital and might have been attributed to the preference given to the male children in the Indian society. Similarly Patel P et al. (M: 52.45% and F:47.55%)[11] and GK Rai et al. (M:51.7% and F:48.3%)[12] also observed higher positive rate among male children compared with female children. In our study majority of growth positive cases were in the age group of less than 6 years our results are consistent with Patel P et al.[11] also reported maximum number of patients in this age group.

Uropathogens are showing trend of increase in the antimicrobial resistance pattern in entire part of the world which can be explained by the fact that drugs are easily available over the counter in many countries, where prescription is not monitored and regulated leading to misuse of many antimicrobials. This problem is especially

of concern in the developing countries where majority of patients often are unable to afford the consultation of a physician or have a laboratory analysis made.[13]

With regard to the antibiotic sensitivity pattern of isolates Enterococcus were found to be most sensitive to Fosfomycin (100%), followed by Teicoplanin (85.71%), Vancomycin (82.14%) and linezolid (78.57%) our findings are not consistent with the Mulla S et al.[9] This finding emphasizes the geographical variation seen in the susceptibility patterns of uropathogens to different drugs. E. coli was the second most common organism was found to be most sensitive to fosfomycin (100%) followed by Nitrofurantoin (80%), Meropenem (60%), and the least sensitive was Penicillin group of drugs. Klebsiella pneumoniae constitute the third most common agent for UTI and was found to be most sensitive to Fosfomycin, meropenem and norfloxacin.

5. Conclusion

Drug resistance pattern amongst urinary isolates of pediatric age group patients indicates that antibiotic selection should be based on knowledge of the local prevalence of bacterial organisms and antibiotic sensitivities rather than empirical treatment. This study emphasize the need for the development of protocol for rational use of antibiotics and clinicians should be trained for importance of rational use of antibiotics.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest

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