Etiology and Antimicrobial Susceptibility Patterns of Urinary Tract Infection at Dhaka Shishu (children) Hospital

M A Islam[1], J Ahmed[2], B H N Yasmeen[3], M M Z Islam[4], N Nahar[5]

Abstract

Background : Urinary tract infection (UTI) is a common bacterial disease in infant and childhood period that can present as symptomatic or asymptomatic way.Antibiotic resistance of urinary tract pathogens has been known to increase worldwide, especially to commonly used antimicrobials. Knowledge of pathogens causing UTI and their antimicrobial resistance patterns in a specific geographical location may help clinicians in choosing the appropriate antimicrobial agent.

Objective : The objective of this study was to find out the pathogens in pediatric UTI and their antimicrobial susceptibility pattern.

Methods : A cross sectional study was done at Dhaka shishu Hospital during the period of Feb 2016 to Aug 2016. A total of 147 culture positive UTI patient were taken for analysis. Colony counts of these samples, were identified, and the profile of antibiotic susceptibility was identified. Here, samples with a colony count of 105 CFU/mL bacteria were considered positive.Twelve (12) antimicrobial agent were used for antimicrobial susceptibility testing.

Result : Among 147 culture positive UTI patients Escherichia coli (E-coli) was found as the most prevalent 103(70%) followed by Klebsiella spp. 13.6%, Enterobacterspp 3.40%, Pseudomonas 5.44%, Staphylococcus Aureus 3.40%, Enterococcus 1.36% and Proteus 2.72%. The most effective drugs found against urinary isolates was Imepenum (97.27%), followed by Colistin (94.55%), Meropenum (93.87%) and Amikacin (91.83%). E.coli was moderately sensitive to Ceftraxone, Ceftazidime, Nitrofurantoin and Ciprofloxacin.

Conclusion : In this study, Imipenum, Meropenum, Amikacin and Colistin shown to be the most sensitive antibiotics for the UTI pathogen. Antimicrobial drug resistance is increasing among urinary pathogens. Therefore, empirical antibiotic selection should be based on knowledge of the local prevalence of bacterial organism and their antibiotic susceptibility in a specific area rather than on universal or even national guidelines.

Key words : UTI; Antibiotic susceptibility; Urinary Pathogens; Resistance, Sensitive.

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[1] **Dr. Md. Atiqul Islam**
Registrar
Dept. of pediatric Infectious Diseases & Community Pediatrics
Dhaka Shishu Hospital

[2] **Dr. Jesmin Ahmed**
Coordinator, Vaccination Center
Square Hospital Ltd. Dhaka

[3] **Prof. B H Nazma Yasmeen**
Professor & Head
Dept. of Paediatrics
Northern International Medical College, Dhaka

[4] **Dr. Mirza Md. Ziaul Islam**
Assistant Professor
Dept. of pediatric Infectious Diseases & Community Pediatrics
Dhaka Shishu Hospital

[5] **Dr. Nurun Nahar**
Resident Medical Officer
Dept. of pediatric Infectious Diseases and Community Pediatrics
Dhaka Shishu Hospital

Correspondence
Dr. Md. Atiqul Islam
Registrar
Dept. of pediatric Infectious Diseases and Community Pediatrics
Dhaka Shishu Hospital
e-mail : roman.atique@yahoo.com

Introduction

UTI is the most common serious bacterial infection in infants and children both in community and hospital setting. It is an important cause of morbidity and mortality in children.[1-3] Boys are more susceptible during the first year of life; thereafter the incidence is substantially higher in girls.[4,5] Rapid diagnosis and prompt antimicrobial treatment are required to minimize the related complications, such as urosepsis, urolithiasis, and renal abscess, as well as the prevention of renal scarring and permanent renal parenchymal damage.

To achieve these aims an empirical antibiotic prescription is often endorsed even before the culture results are available. The Antibiotic resistance to UTI pathogens has been increasing worldwide, specially to commonly used antimicrobials.[6-8]

The increase antibiotic resistance trends are likely to have important clinical implication for the empirical use of antibiotics. This knowledge of etiology and resistance pattern in specific geographical area will help the clinician to select appropriate antibiotic[9-10]. Reporting of antimicrobial susceptibility testing of the urinary tract is usually achieved 48hr following sampling, and therefore, in the majority of UTI cases, the treatment decision is empirical, being influenced by available data reflecting antibiotic resistance. For the initiation of antimicrobial therapy in UTI

knowledge of the antimicrobial resistance patterns of common uropathogens in each region is essential to provide appropriate therapy. Hence, there exists a great need for antimicrobial resistance surveillance at the local, national, and international levels. The effect of resistant microorganism is obvious in hospitals and other healthcare facilities, when infections caused by the drug resistant microorganism. This results in a prolonged infectivity with related mortality and mortality especially among immune compromised patients.[11]

The aim of the present study was to determine the common causative organism of UTI and their antimicrobial susceptibility patterns of uropathogens among children subjected to urine culture at Dhaka Shishu Hospital, the largest children hospital in Bangladesh.

Materials & Method

Study Design : This was a cross sectional study carried out in both inpatient and outpatient departments in Dhaka Shishu Hospital from February 2016 to August 2016. Total 147 urine culture positive patients were selected for the study. Clean catch midstream urine samples were collected from patients of suspected UTI samples then examined microscopically and were cultured on MacConkey agar plates and blood agar plates by calibrated loop method. UTI was considered by the presence of a pure bacterial growth of $>10^5$ colony forming units/mL in children. Urine culture was considered as negative when bacterial growth was lower than 10^3 CFU/ ml (exclusion criteria). Growth of two or more bacterial species (polymorphic bacterial growth) was consider as an exclusion criterion.

Anti bacterialsuceptibility testing

The common 12 antibiotics used in the UTI, were used for susceptibility testing. These Antibiotics were amikacin (AK), nalidixicacid (NA), ciprofloxacin (CP), cotrmoxzole (SXT), ceftazidime (CZM), ceftriaxone (CRO), imepenum(IP), meropenum (MP) and nitrofurantoin (FD), Cephradine (SD), azithromycin(AZ), colistin (CL) were used for susceptibility testing. In statistical analysis, bacteria with intermediate susceptibility were considered as resistant. The patients were interviewed using a pre-designed structure questionnaire to collect data and other relevant finding. Finally, the data were compiled and analyzed inMS Excel version 2010 and presented in tabular form.

Result

In this study, 147 Culture positive UTI cases were taken. Among them, 90 (61%) were girls and 57 (39%) were boys and 95 (64.6%) were from outpatients and 52 (35.4%) from inpatients. The most frequently isolated bacteria included *E.coli* (70%), *Klebsiella spp.*(13.6%), and *Enterococcus spp.* (3.40%), *Enterococcufaecalis spp* (1.36%), *Enterobacter spp.* (3.4%), and *Pseudomonas aeruginosa* (5.44%). Sex distribution of patients and the prevalence of significant bacteria shown in Table I and II

Table I : Distribution of patients by sex of Culture positive UTI

Age	Male	Female	Total
1-5 yrs	37	60	97
6-10 yrs	20	30	50
Total	57 (39%)	90 (61%)	147

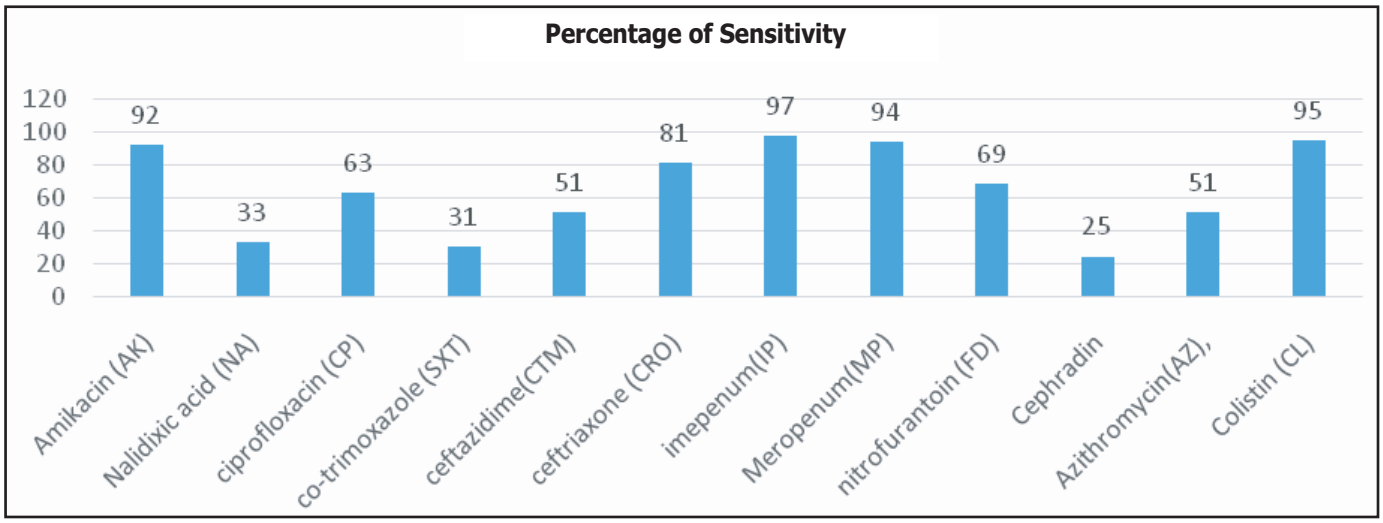
Table II : Frequency and types of bacterial isolates. (n=147).

Bacterial Isolates	Frequency
E. Coli	103 (70%)
Klebsiella spp.	20 (13.6%)
Pseudomousaeruginosa	8 (5.44%)
Enterobactor Spp.	5 (3.40%)
Staph aureus	5 (3.40%)
Protius Spp.	4 (2.72%)
Enterococcufaecalis Spp.	2 (1.36%)
Total 147 (100%)	

Table III : Bacterial Isolates with number

Antibiotic	N-147	Bacterial isolates with Numbers						
		E. Coli	*Klebsiella spp.*	*Pseudomous aeruginosa*	*Enterobactor Spp.*	*Staph aureus*	*Protius Spp.*	*Enterococcus Spp.*
	147	103	20	8	5	5	4	2
Amikacin (AK)	S	90	13	4	2	1	2	2
Nalidixic acid (NA)	S	30	8	2	1	2	0	1
ciprofloxacin (CP)	S	66	11	3	2	2	2	2
co-trimoxazole (SXT)	S	34	5	0	0	0	0	1
ceftazidime(CTM)	S	53	8	3	2	1	2	1
ceftriaxone (CRO)	S	84	14	4	2	5	3	2
imepenum(IP)	S	98	18	7	4	5	4	2
Meropenum(MP)	S	95	16	7	4	5	4	2
nitrofurantoin (FD)	S	75	9	4	3	2	2	1
Cefradine (SF)	S	79	11	5	3	3	3	2
Azithromycin(AZ),	S	51	8	5	2	2	1	1
Colistin (CL)	S	97	16	6	4	5	4	2

Table IV: Antimicrobial Susceptibility (%) of Isolated Uropathogenic Bacteria



None of the organisms were found 100% sensitive to any of the tested antimicrobial agents. Most of the pathogens are sensitive to imepenum, Colistin, Meropenum and Amikacin and fairly sensitive to Ceftriaxone, Nitrofurantoin and Ciprofloxacin. This study shows, the common pathogens of UTI e.g *E. Coli* is less sensitive to Cephradine, Co-Trimoxazole, Nalidixic Acid, Azithromycin and Ceftazidime. All the isolated organisms were found almost resistant to Cephradine (73.49%).

Discussion

This is a comprehensive study to estimate the most common uropathogens and their susceptability pattern in pediatrics. Uropathogen are gaining resistance at an increased rate to commonly used antimicrobial agents. The sensitivity pattern is changing day by day and it varies from hospital to hospital even in the same city and therefore from country to country. Constant survey of antimicrobial resistance is very important for empirical treatment of UTI.[12-13] This study showed the prevalence of sensitivity and antibiotic succeptibility pattern of uropathogenic bacteria in a referral pediatric hospital, Dhaka shishu Hospital during 07 months period.

In different studies, *E coli* and *Klebsiella spp*. have been isolated as the most common pathogens responsible for UTI among children.[14-15] In our study *E coil* is still the most common (70%) cause of UTI and the *klebsiella* being the second (13.6%). In a study conducted in BSMMU by Abu salehahmed et al showed that the incidence of *E coil*, *Klebsiella spp, Enterobacter spp* and *Pseudomonas aeruginosa* in UTI patients were 60.02%, 9.73%, 11.38% and 4.04% respectively.[16] Another study conducted in Bangladesh by Rahaman Farzana et al in 2009 reported thatthe frequency as for *E coil* was 66.92% for *Klessiella* 13.45% Proteus 6.77% and *Pseudomoas spp* 6.77%. In a study conducted in India in 2007 has shown that the distribution of urinary pathogen were as follows. *E coil* 63%, *Klebsiella spp* 15.9% and *Pseudomonas aeruginosa* 5.30%.[17] Another study conducted at Border guard Hospital (BGB Hospital Peel khana Dhaka) by Lt Col. Syed Nurun Nobi et al in 2013 Showed that *E-coli* 63.26%, *Klebsiella* 12.24% *Proteus* 2.77% and *Pseudomonas spp* 8.17%.

In this study result of antibiotic susceptibility test reveal that no one urinary isolate were 100% sensitive to imepenum, meropenum, colistine, amicacin and *E.coil* which was sensitive to the above mentioned antimicrobials were 97.27%, 93.87%, 94.55% and 91.83% respectively. Previous study showed that the susceptibility of *E.coli* to Impenum ranged from 98-100%.[18] Now a days, globally the resistance of *E. coil* to Impenumis increases gradually. In recent years the sensitivity to Impenumhas been reported 80-96% in different study.[19]

In this study, most of the isolates were found fairly sensitive in Ceftriaxone (80.95), nitrofuration (68.70) co-trimoxazole (51.02) and ceftazidime (51.02). All the isolates showed poor sensitivity to Cephradine.

Limitation of this study : This study was done in a single center with limited number of sample and within a limited period of time.

Conclusion

This study provides valuable information regarding current prevalence of urinary pathogens and their antimicrobial susceptibility pattern. We suggest that empirical antibiotic selection should be based on knowledge of the local prevalence of bacterial organism and antibiotic susceptibility rather than on universal or even

national guidelines for specific therapy. Considering this study findings imepenam, colistin and amikacin should highly sensitive to uropathogens, can be used for empiric treatment of UTI in our country at present time but the choice of definitive antibiotic should however be based on urine culture and sensitivity report.

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