

## Current Trends of Urinary Pathogens and their Antimicrobial Susceptibility Pattern in a Tertiary Care Hospital

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### Abstract

**Introduction:** Urinary Tract Infection (UTI) is one of the most common bacterial diseases worldwide that can present as asymptomatic or symptomatic characterized by a wide range of symptoms from mild irritative voiding to bacteremia, sepsis or even death. Increase in resistance of urinary pathogens to conventional antimicrobial agents is gaining the attention of many microbiologists worldwide in respect to treatment of urinary tract infection. Since the pattern of bacterial resistance is continuously changing, the monitoring of antibiotic susceptibility pattern becomes more important.

**Objective:** The objective of this study was to update the distribution of current urinary pathogens and to find out their antimicrobial susceptibility pattern.

**Methods:** A Cross sectional descriptive study was conducted at Border Guard Hospital (BGB Hospital) Peelkhana, Dhaka during the period of February 2013 to September 2013. A total of three hundred ninety urine samples were collected from patients with suspected UTI. All the samples were clean catch mid stream urine. Urine samples were cultured on MacConkey agar medium and blood agar medium. Colony counts yielding single type of bacterial growth of 10<sup>5</sup> CFU/ml were deemed significant.

**Results:** Out of 390 samples, 49(12.56%) samples were culture positive. The isolated organisms were identified by conventional methods and were subjected to determine antimicrobial susceptibility testing by Kirby Bauer's disc diffusion method. Escherichia coli (E.coli) was found as the most prevalent isolates 31(63.26%) followed by Klebsiella

spp 06(12.24%), Enterobacter spp 04(8.17%), Pseudomonas aeruginosa 04(8.17%), Staphylococcus aureus (Staph aureus) 02(4.08%) and Enterococcus spp 02(4.08%). Eight antimicrobial agents namely Amoxicillin, Co-trimoxazole, Levofloxacin, Nitrofurantoin, Gentamicin, Ceftriaxone, Imipenem and Amikacin were used for antimicrobial susceptibility testing. The most effective drug found against urinary isolates was Imipenem (95.91%), followed by Amikacin (81.63%) and Ceftriaxone (69.38%). None of the drug found was 100% effective against urinary pathogens. E.coli was found to be fairly sensitive to Ceftriaxone, Gentamicin and Nitrofurantoin.

**Conclusion:** Urinary tract infection remains one of the most common bacterial infections. Antimicrobial drug resistance is increasing among urinary pathogens. This study updated the current occurrence of urinary pathogens and their antibiotic sensitivity pattern. We recommend periodical determination of antimicrobial sensitivity pattern of urinary pathogens in a particular hospital or area.

**Key-words:** Urinary Tract infection, Antibiotic Susceptibility, Urinary Pathogens, Imipenem Resistance.

### Introduction

Urinary Tract Infection (UTI) remains one of the most common bacterial infections in human both in community and hospital setting. In almost all cases there is a need to start treatment before the final microbiological results are available. Area specific monitoring studies aimed to gain knowledge about

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the type of pathogens responsible for UTI and their antimicrobial resistance patterns may help the clinicians in choosing the right empirical treatment<sup>1</sup>. Factors such as the changing patient population, extensive use and misuse of antimicrobial agents can all contribute to bacterial profile change trend<sup>2</sup>. The impact of resistant microorganisms is obvious in hospitals and other health care facilities, when infection caused by drug resistant microorganisms fails to respond to standard drug therapy. This results in a prolonged infectivity with the related morbidities and deaths specially among immunocompromised patients<sup>3</sup>.

### Materials and Methods

A total of 390 samples were analyzed. The cases were randomly selected from those patients who reported to Children Welfare Centre (CWC), Gynecology Out Patient Department (GOPD), Medical Inspection Room (MI ROOM) and Intensive Care Unit (ICU) of BGB Hospital, Peelkhana Dhaka during the period of February 2013 to September 2013. The study was carried out in the department of Pathology BGB Hospital, Peelkhana Dhaka. Clean catch mid stream urine samples were collected from patients of suspected UTI. Samples were examined microscopically and were cultured on MacConkey agar plates and Blood agar plates by calibrated loop method.

Pipette was auto adjustable one delivering 0.002ml of urine. The plates were incubated aerobically at 37°C for 24 hours. Colony counts yielding bacterial growth of 10<sup>5</sup> CFU/ml or more were deemed significant. Suspected colonies were identified by colony morphology, Gram staining and Biochemical testing. Antimicrobial susceptibility test was performed by modified Kirby Bauer disc diffusion method on Mueller Hinton plates. Urine samples producing mixed growth and non-significant growth did not have the test repeated. Eight antimicrobial agents namely Amoxycillin 30mcg, Trimethoprim Sulfamethoxazole 1.25/23.75mcg, Ceftriaxone 30mcg, Imipenem 10mcg, Gentamicin 10mcg, Nitrofurantoin 300mcg, Levofloxacin 5mcg and amikacin 30mcg were used for susceptibility testing. The patients were interviewed using a pre-designed structured questionnaire to collect data and other relevant findings. Finally data were compiled and analyzed manually and presented in tabular form.

### Results

Out of 390 urine samples processed, only 49 (12.56%) showed significant bacterial growth. They were further processed for identification and antibiotic susceptibility testing. Sex distribution of patients and the prevalence of significant bacteriuria have been presented in Table-I.

**Table-I:** Distribution of patients by sex and the prevalence of significant bacteriuria (n=390).

Sex	Number of specimen	Number of isolates
Male	20 (5.13%)	4 (1.02%)
Female	370(94.87%)	45 (11.54%)
<b>Total</b>	<b>390(100%)</b>	<b>49 (12.56%)</b>

E.coli was the most frequently isolated pathogen, Klebsiella spp being the second. The species of bacterial isolates recovered have been demonstrated in Table-II.

**Table-II:** Frequency of bacterial isolates (n=49).

Bacterial isolates	Frequency
E.coli	31 (63.26%)
Klebsiella spp	06 (12.24%)
Enterobacter spp	04 (8.17%)
Pseudomonas aeruginosa	04 (8.17%)
Staph aureus	02 (4.08%)
Enterococcus spp	02 (4.08%)
<b>Total</b>	<b>49 (100%)</b>

Antimicrobial susceptibility pattern of bacterial isolates have been presented in Table-III.

**Table-III:** Antimicrobial susceptibility pattern of bacterial isolates.

Anti-biotic	N=49	Bacterial isolates with numbers.					
		E.coli	Entero-bacter	Klebsiella SPP	Pseudomonas aeruginosa	staph aureus	Entero-coccus
	N=49	31	06	04	04	02	02
AM	S	02(6.45)	0(0)	01(25)	0(0)	02(50)	0(0)
SXT	S	12(38.70)	1(16.66)	01(25)	0(0)	0(0)	01(50)
LE	S	19(61.29)	03(50)	02(50)	02(50)	02(100)	01(50)
FM	S	21(67.74)	02(33.33)	02(50)	03(75)	01(50)	01(50)
CRO	S	22(70.58)	04(66.66)	02(50)	02(50)	02(100)	02(100)
IPM	S	29(93.54)	06(100)	04(100)	04(100)	02(100)	02(100)
AK	S	27(87.09)	05(83.33)	02(50)	02(50)	02(100)	02(100)
GM	S	21(61.74)	04(66.66)	3(75)	03(75)	01(50)	01(50)

N=Total of isolates

AM-Amoxycillin

SXT - Trimethoprim-Sulfamethoxazole

IPM - Imipenem

GM-Gentamicin

S= Number of sensitive isolates

CRO - Ceftriaxone

LE - Levofloxacin

AK-Amikacin

FM - Nitrofurantoin

The overall sensitivity (percentage) of urinary isolates to selected antimicrobial agents has been presented in Table-IV. All the isolates were highly sensitive to Imipenem (95.91%) and Amikacin (81.63%).

**Table-IV:** Total Sensitivity of urinary isolates to the antimicrobial agents.

Name of Antibiotics	No of sensitive isolates out of total number(n)	Sensitive isolates (Percentage)
AM	05 (49)	10.20
SXT	15 (49)	30.61
LE	29 (49)	59.18
F/M	30 (49)	61.22
GM	33 (49)	67.34
CRO	34 (49)	69.38
IPM	47 (49)	95.91
AK	40 (49)	81.63

None of the organisms were found 100% sensitive to any of the tested antimicrobial agents. All the isolated organisms were found almost resistant to Amoxycillin. Most of the isolates were found fairly sensitive to Ceftriaxone, Gentamicin, Nitrofurantoin and Levofloxacin.

## Discussion

Uropathogens 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 from country to country<sup>1,2</sup>. Constant survey of antimicrobial resistance plays a very important role in the empiric treatment of UTI and understanding of etiology and antimicrobial susceptibility of major bacteria that cause UTI and also provides essential information regarding the selection of antibiotic therapy for infected patients<sup>3,4</sup>. The present study shows the distribution of microbial species isolated from patients of UTI and their antimicrobial susceptibility pattern. This study revealed that E.coli is still the most common (63.26%) cause of UTI and the Klebsiella being the second (12.24%).

In a study conducted in BSSMU by Abu Saleh Ahmed et al showed that the incidence of E.coli, Klebsiella spp, Enterobacter spp and Pseudomonas aeruginosa in UTI patients were 60.02%, 9.73%, 11.38% and 4.04% respectively<sup>2</sup>. Another study

conducted in Bangladesh by Rahman Farjana et al in 2009 reported the frequency as for E.coli 66.92%, for Klebsiella 13.45%, Proteus 6.77% and Pseudomonas spp 6.77%<sup>4</sup>. In a study conducted in India in 2007 has shown the distribution of urinary pathogens as follows: E.coli 63%, klebsiella spp 15.9% and Pseudomonas aeruginosa 5.30%<sup>5</sup>. The prevalence reported in the present study well correlate with the studies of earlier workers. Similar results have also been obtained from other studies conducted in Bangladesh and other countries<sup>6,7,8,9</sup>.

In the present study, the result of antibiotic susceptibility test revealed that all the urinary isolates were sensitive to Imipenem except E.coli, which was only 95.91% sensitive. Previous studies showed that the sensitivity of E.coli to Imipenem ranged from 98 to 100%<sup>4,7,10,11</sup>. Now a days the resistance of E.coli to Imipenem is increasing globally. In recent years this sensitivity has been reported from 80% to 96% in different studies conducted in Bangladesh, India and Globally<sup>4,12-17</sup>.

The result of this study was in accordance with the above studies. In the present study, most of the isolates were found fairly sensitive in Amikacin, Ceftriaxone, Nitrofurantoin and Gentamicin. All the isolates showed poor sensitivity to Amoxicillin and Cotrimoxazole but the overall sensitivity of levofloxacin and Nitrofurantoin was good and it was over 59% against all the isolates (Table-III). This results also well correlates with the other studies<sup>7,18</sup>. Considering the above findings Levofloxacin and Nitrofurantoin 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.

## Conclusion

This study provides valuable information regarding current distribution of urinary pathogens and their antimicrobial susceptibility pattern. An important finding in the study is that the resistance of E.coli to imipenem which is higher than that reported in earlier studies. This study emphasize on the periodical monitoring of urinary pathogens in a particular area and to establish their antimicrobial susceptibility pattern for an optimal empiric treatment as well as definitive therapy for patients suffering from UTI.

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