Original article

Pattern of antibiotic sensitivity of bacteria causing urinary tract infection in a private Medical College Hospital in Dhaka

Sultana S[1], Khatun M[2], Khoybar Ali M[3], Mawla N[4], Akhter N[5]

Abstract:

Background: Urinary tract infections (UTI), being the most common infections diagnosed in community and hospital, are to be treated scrupulously considering the type of infecting organism and its antibiotic sensitivity and resistance pattern. ***Aims and objectives***: The aim of the present study was to observe the antibiotic sensitivity pattern of isolated uropathogens from urine samples of patients attending at Shahabuddin Medical College & Hospital, Dhaka, during the period of July 2008 to June 2009. ***Result***: A total of 555 urine samples were studied; of which 84 (15.13%) were culture positive. Among 84 culture positive cases, 84 isolates were identified. Among the isolates, E.coli was the most predominant 61 (62.88%) followed by Enterococci 11 (11.34%), proteus 4 (4.13%) and Pseudomonas 3 (3.09%). Whereas Staphylococcus saprophyticus and Klebsiella showed frequency rate of 2 (2.06%) for each. However Gram positive cocci showed lowest frequency rate of 1 (1.03%). All of the isolates were sensitive to Netilmicin. The majority of isolates were sensitive to Imipenam (92.3%) followed by Amikacin (91.1%), Meropenam (83.3 %), Tetracycline (70%). Sensitivity & resistance rate were same (50%) in Vancomycin & Cefodoxime. Where complete (100%) resistance was shown to Ampicillin, Azithromycin and Cefoxitin. However all isolates were poorly sensitive to cotrimoxazole (35.7%), ciprofloxacin (43%) and nitrofurantoin (44.8%). ***Conclusion***: So, routine urine culture and susceptibility before therapy should be encouraged and periodic evaluation of predominant organisms and their antimicrobial susceptibility pattern should be studied for appropriate selection of antibiotic for effective management of UTI cases.

Key words: uropathogen; antimicrobial sensitivity pattern

DOI: http://dx.doi.org/10.3329/bjms.v14i1.21562
Bangladesh Journal of Medical Science Vol. 14 No. 01 January'15. Page: 70-74

Introduction:

Urinary tract infection (UTI) infection is a serious health problem affecting millions of people each year.[1] It has been estimated that about six million patients visit out patient departments and about 300,000 are treated in the wards every year for UTI worldwide. Approximately, 10% of human population get UTI at some stage during their lives.[2] In Bangladesh , 20-35% females experience at least one episode of UTI in their lives.[3,4] Among school children the prevalence is 1% -4% in Bangladesh.[5] According to the annual report published by Department of health services, 0.46% of total out-door patients suffered from UTI and this was out of the total population of Nepal.[2] Escherichia coli is the principle pathogen causing UTI, accounting for 75 – 90% in both inpatients and outpatients followed by Klebsiella, enterobacter, proteus, pseudomonas

1. Dr. Shahin Sultana, Associate Professor & Head, Dept. of Microbiology, Delta Medical College, Dhaka, Bangladesh
2. Dr. Marium Khatun, Professor & Head, Dept. of Microbiology, Anwar Khan Modern Medical College, Dhaka
3. Md. Khoybar Ali , Associate Professor & Head, Dept. of Paediatrics, Ibn Sina Medical College, Dhaka
4. Dr. Nurunnahar Mawla , Assistant Professor, Dept. of Microbiology, Delta Medical College, Dhaka
5. Nayareen Akhter, Assistant Professor, Dept. of Microbiology, Delta Medical College, Dhaka

Corresponds to: Dr. Shahin Sultana, Associate Professor & Head, Dept. of Microbiology, Delta Medical College, Dhaka, Bangladesh, **Email:** sultana1998@gmail.com

and enterococcus were more often isolated from inpatients.[7] Elsewhere, coagulase negative Staphylococci saprophyticus may be a common cause of UTI in some reports.[8] At least 80% of the uncomplicated cystitis and pyelonephritis are due to E.coli. Whereas Proteus mirabilis and Klebsiella pneumoniae infection accounts 10% and 6% respectively. Also UTI caused by gram positive bacteria include Enterococcus, and streptococcus agalacticus. Staphylococcus especially coagulase negative staphylococci accounts for 5% to 15% of cases of uncomplicated cystitis.[9] The antibiotic susceptibility patterns of UTI causing pathogens have been varying from time to time and from place to place in both community and hospital settings.[10,11,12] Increasing drug resistance in pathogens is now a serious problem to treat diseases like malaria, Tuberculosis, diarrheal diseases, UTI etc.[13] The main cause of this issue is the improper and uncontrolled use of antibiotics as well as improper prescription, inappropriate dosage and duration of treatment.[14,15] The genetic causes of drug resistance in pathogenic microorganisms are horizontal gene transfer via plasmid, transposons and bacteriophages, recombination of foreign DNA in bacteria chromosome and mutations in chromosomal loci.[16] A large number of drug resistant bacteria have been discovered during the past decades as methecillin resistant Staphylococcus aureus (MRSA),[17] multi drug resistant Pseudomonas aeruginosa,[18] Serratia marcescens,[19] vancomycin resistant enterococci (VRE)[20] and extended spectrum beta lactamase (ESBL) resistant Enterococci,[21] which is a very serious public health issue mainly in developing countries where high level of poverty, poor hygienic conditions as well as fake and spurious drugs are in the circulation of medical practices.[12] For all of the above reasons, this study was aimed to identify the most common etiologic agents responsible for urinary tract infection with determination the antimicrobial sensitivity pattern to the commonly used antibiotics.

Materials and methods:

This study was done in the department of Microbiology, Shahbuddin Medical College Hospital during the period of July 2008 to June 2009. The patients comprised both sexes and all age groups. Urine samples were collected by using sterile, dry, wide mouthed leak proof plastic container and analysed them for different organisms responsible for UTI.

Standard method for isolaton and identificationof the organisms were carried out with all urine samples. Blood agar and MacConkey agar media were plated using a calibrated loop withdrawing 0.001 ml of urine sample. The bacterial colonies were counted and multiplied by 100 to give an estimate of the number of bacteria present per milliliter of urine. Significant growth was determined as $\geq 10^5$ colony forming units (CFU)/ ml of midstream urine samples and $\geq 10^2$ CFU/ml of a catheter specimen.[22] Gram negative bacteria were idendified by morphological study, oxidase test, routine biochemical tests such as motility test, indole and urease production and Triple Sugar Iron reaction. Gram positive bacteria were identified by catalase, coagulase and Novobiocin tests. Samples which showed significant colony count were taken into consideration and sensitivity pattern of the isolated organisms was determined by modified Kirby-Bauer technique using Mueller-Hinton agar.[23] Interpretation of results was done measuring the sizes of zones of inhibition and reported according to "The Clinical Laboratory Standard Institute" (CLSI) guidelines.[24] Antibiotics for uropathogens were tested include imipenam, cefodoxime, ciprofloxacin, nalidixic acid, erythromycin, methicillin, tetracycline, amikacin, cotrimoxazole, nitrofurantoin, ceftriaxone, cloxacillin, vancomycin, meropenam, cefoxitin, netilmicin and azithromycin.

Results:

During July 2008 to June 2009 a total of 555 urine samples were tested from patients of all age groups in both sexes. Among them 84 (15.13%) were culture positive (Table 1).

Table 1. Distribution of specimens with or without culture positive

Urine culture	Number of patients	Percentage
Culture positive	84	15.13
Culture negative	471	84.87
Total	555	100

Among culture positive samples, Escherichia coli which was the most predominant 61 (72.62%), followed by Enterococci 11 (13.09%), proteus 4 (4.13%), Pseudomonas 3 (3.09%). Staphylococcus

saprophyticus 1 (2.06) and Klebsiella 2 (2.06%). However Gram positive cocci showed lowest frequency rate of 1 (1.03%) (Table 2) % (Figure 1).

Table 2. Distribution of bacteria in urine samples

Isolated bacteria	Number	Percentage
Escherichia coli	61	72.62
Enterococci	11	13.09
Proteus	4	4.47
Pseudomonas	3	3.57
Staphylococcus saprophyticus	2	2.38
Klebsiella	2	2.38
Gram positive cocci	1	1.19
Total	84	100

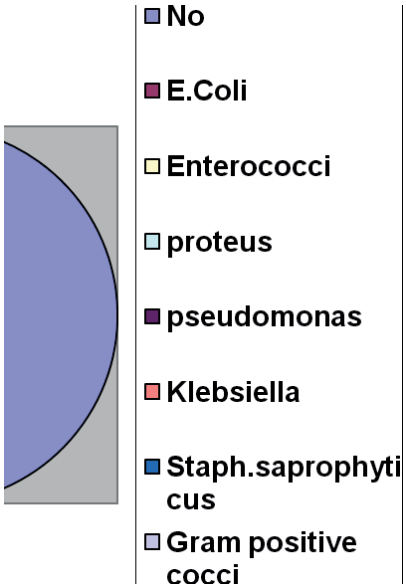

Figure 1: shows the percentage-wise distribution of organisms among UTI subjects

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All of the isolates were sensitive to Netilmicin. The majority of isolates were sensitive to Imipenam (92.3%) followed by Amikacin (91.1%)**,** Meropenam (83.3 %), Tetracycline (70%). Sensitivity & resistance rate were same (50%) in Vancomycin & Cefodoxime. Where complete (100%) resistance was shown to Ampicillin, Azithromycin and Cefoxitin. However all isolates were poorly sensitive to cotrimoxazole (35.7%), ciprofloxacin (43%), nitrofurantoin (44.8%) (Table 3).

Table 3. Overall sensitivity and resistance of different antibiotics

Name of antibiotics	Sensitive %	Resistant %
Imipenam	92.3	7.7
Cefodoxime	50	50
Ciprofloxacin	43	57
Nalidixic acid	27.5	72.5
Erythromycin	33.3	66.7
Methicillin	16.7	83.3
Tetracycline	70	30
Amikacin	91.1	8.9
Cotrimoxazole	35.7	64.3
Nitrofurantoin	44.8	55.2
Ceftriaxone	50	50
Cloxacillin	5	95
Vancomycin	50	50
Meropenam	83.3	16.7
Cefoxitin		100
Netilmicin	100	
Azithromicin		100
Ceftazidime	36.4	63.6
Ampicillin		100

Discussion:

Urinary tract infection is one of the serious issues which needed an urgent medical attention in community.[25] The most effective management of UTI patients is the identification of pathogens and selection of effective antimicrobial agents against them.[26]

A total of 84 isolates were obtained from our study. Out of 84 isolates E.coli was significantly the most common isolated organism accounted 61 cases (72.62%) followed by Enterococci 11 cases(13.09), Proteus in 4(4.77%) patients, Pseudomonas in 3 cases (3.57%),Staphylococcus saprophyticus & Klebsiella 2(2.38%) in each cases and Gram positive cocci in 1(1.19%) case were isolated in this study. The present finding was in accordance with many other studies who showed predominance of Gram negative bacilli specially E.coli ranged between 75-90-%.[6] A study done in BSMMU, Dhaka by Anis showed E.coli (92%) as the commonest organism followed by Pseudomonas, Enterococci, Klebsiella and Proteus.[27]Another study done by Ronald showed that E.coli remains the predominant

uropathogens (80%) followed by Staph.saprophyticus (10-15%), Klebsiella, Enterobacter, Proteus.[28]The reason for the highest rate of E.coli is that they are the normal fecal flora and uropathogenic strains of Esch. Coli posses a variety of virulence characteristics that facilitate their intestinal carriage, persistence in vagina and then ascension and invasion of the anatomically normal urinary tract.[29]

A study done by Hasan in Bangladesh showing E.coli (74%) followed by Klebsiella spp 17.7% and Pseudomonas 2.5% .[30]The differences in bacterial distribution pattern among different area in the world may be explained by the geographic differences which affect the types of bacterial isolates as well as the changes that occur on bacterial isolates over the years.[1]

In our study antibiogram of isolated uropathogens reveals overall very good sensitivity against Netilmicin, Imipenam, Amikacin and Meropenam. Near about similar result was obtained by other workers who found sensitivity to imipenem was 95% [31] and amikacin 89%[32]. This low resistance of pathogens to these antibiotics might be attributed to the fact that imipenem and amikacin are relatively newer antibiotics and have not been extensively used to warrant resistance developing against them by pathogens.

Highest resistance was recorded against cotrimoxazole (83%), ampicillin (81%), trimethoprim (80%), followed by cefoxitin (71%), nalidixic acid (69%), gentamicin (68%), cefotaxime (67%), ciprofloxacin (57%), norfloxacin (54%) in decreasing order[1].

This finding was not similar to our study, in which (100%) resistance was recorded against Ampicillin, Azithromycin and Cefoxitin followed by Cloxacillin 95%, Cotrimoxazole 64.3%, Erythromycin 66.7%, Nalidixic acid 72.5%, Methicillin 83.3%, Nitrofurantoin 55.2%. But our finding is consistant to other report who showed hundred percent resistant to Ampicillin and high degree of resistance to Nalidixic acid, Nitrofurantoin, Cotrimoxazole followed by Ciprofloxacin and Gentamicin.[33]

High incidence of resistance to these drugs specially Ampicillin has also reported by other workers in developing countries[34]. This may be due to inadequate dosages of these antibiotics used during self medication in our community is like to be a factor contributing to development of resistance.

Therefore drug resistance is a common problem and need is for judicious use of antimicrobial agents after laboratory monitoring.

Conclusion:

In this present study, the main organism causing UTI is E.coli followed by Enterococci . Highest sensitivity was found to Netilmicin, Imipenem, Amikacin and Meropenam. We should use these drugs rationale so that they remain effective for treatment of UTI. As the commonly used drugs shows less sensitivity, further study is needed for newer drugs to fight against urinary tract infection.

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