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Original Research Article

Bacteriological profile and sensitivity pattern of urinary tract infection patients in north east part of Bangladesh

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ABSTRACT

Background: Urinary tract infection (UTI) is one of the most important causes of bacterial infections across the globe. Increasing antibiotic resistance among urinary pathogens to commonly prescribed drugs has become a therapeutic challenge. Periodic evaluation of antimicrobial activity of different antibiotics is essential as the pattern of antibiotic sensitivity may vary over periods.
Methods: This cross-sectional study was undertaken in the Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet from January 2019 to June 2019 among 100 adult patients admitted Medicine indoor Department confirmed as UTI on the basis of symptoms, signs and compatible investigation, urine culture either positive or negative.
Results: Out of the total 100 urine samples 60 samples were positive for pathogenic organisms. *Escherichia coli* was isolated in 41 (68.3%) of the positive samples, followed by *Klebsiella sp* 13 (21.6%), *Pseudomonas sp* 3 (5%) *Proteus sp* 2 (3.3%) staph. Aureus 1 (1.66%). E coli was found to be most sensitive to nitrofurantoin (92.5%), meropenem (92.5%), amikacin (84.6%) and gentamycin (71.8%) and resistant to most commonly used drugs like cefixime (78%), cefuroxime (77.5%), ciprofloxacin (62.5%), ceftriaxone (62.5%).
Conclusions: Mainly gram-negative bacilli are found to be responsible for UTI and most frequent isolated bacteria was E-coli. The most sensitive antibiotics were nitrofurantoin, meropenem, and amikacin& gentamycin. Frequently usedantibiotic like cefixime, cefuroxime, cotrimoxazole, ciprofloxacin & ceftriaxone were mostly resistant to E-coli.

Keywords: Urinary tract infection, E-coli, Antibiotic sensitivity

INTRODUCTION

Urinary tract infection may be defined as inflammatory disorders of the urinary tract caused by abnormal growth of pathogens.[1] UTI is one of the most common bacterial infections among male and female affecting 150 million people worldwide.[2,3] In Bangladesh it is also one of the most important causes of morbidity at both outdoor and indoor setting. Lack of proper research, faulty diagnostic procedures, abuse of chemotherapeutic agents and little or no preventive measures are all common attributing factors.[4]

Clinically UTI may be either uncomplicated or complicated. When the infection occurs in otherwise healthy and has no structural or neurological urinary tract abnormalities, it is an uncomplicated UTI.[5] Complicated UTIs are defined as UTIs associated with factors that compromise the urinary tract or host defense, including urinary obstruction, urinary retention caused by neurological disease, immunosuppression, renal failure, renal transplantation, pregnancy, and the presence of foreign bodies such as calculi, indwelling catheters, or other drainage devices.[6,7]

The major pathogens causing UTI are E. coli and pseudomonas sp, proteus sp, klebsiella sp etc.[8]

Various studies done worldwide have shown changing pattern in etiology of UTIs.[3] Increasing antibiotic resistance among urinary pathogens, especially E. coli, to commonly prescribed drugs like cotrimoxazole has become a global reality.[9]

In Bangladesh, use of antibiotics is rampant resulting in increase in resistance to available antibiotics. Random and extensive use of broad spectrum of antibiotics contributed to changes in the microbiological and antibiotic susceptibility patterns of pathogens isolated from UTI. Therefore, for effective management of these infections, selection of antibiotics should be based on antibiotic susceptibility pattern. But it is often hampered by the lack of adequate facilities for proper microbial isolation as well as for their antimicrobial susceptibility testing.[10] Besides this, periodic evaluation of antimicrobial activity of different antibiotics is essential as the pattern of antibiotic sensitivity may vary over periods.[11] The present trends of the uropathogens and their susceptibility to various antibiotics are essential to formulate guidelines for the empirical treatment of UTIs while awaiting the culture sensitivity.[12]

The current study was undertaken to address the lacunae.

METHODS

This six-month cross-sectional observational study was undertaken in the Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet from January 2019 to June 2019. A total of 100 (hundred) willingly agreed patients admitted Medicine indoor Department with symptoms and signs of UTI, confirmed by other investigations (CBC, Urine R/E, USG of KUB in necessary cases, S Creatinine, RBS) including urine culture either positive or negative for urinary culture fulfilling the selection criteria were included for the study. Patients aged<13 years were excluded from the study.

Clean catch midstream urine samples were collected into a wide mouthed sterile container. Then urine inoculated on Mac Conkey's and blood agar media using calibrated platinum loop following standard bacteriological technique and incubated at 37^0C for 72 hours. After 72 hours the plate was examined for bacterial pathogen. Pure bacterial colony counting 100,000 or more was considered as significant and was subjected to identification based on colony characters and biochemical tests. In this study culture was considered positive when the culture of a single microorganism found at a concentration of >105 colony forming units (CFU)/ml. Commercially available discs (supplied by hi media, india) were used to find the sensitivity of the organism on mueller-hinton agar media after overnight incubation at 37^0C.

Data were processed manually and analyzed with the help of SPSS version 22. Quantitative data were expressed as mean and standard deviation, qualitative data were expressed as frequency and percentage.

RESULTS

Among 100 patients of UTI, maximum were females (67%) and the male to female ratio was 0.49: 1. The most common age group was 46–60 years (34%). The mean age was 54.19 years. The median age was 55 years and ranged between 17 to 100 years. Most of the patients completed primary education (52%). 21% did not receive any institutional education. Most (54%) of the patients belong to income range of 10,000 to 20,000 taka per month (Table 1).

Table 1: Baseline characteristics of study participants.

Traits	Subgroups	Values
Age	Minimum	17
	Maximum	100
	Mean	54.19
Gender	Male	33
	Female	67
Educational Status	None	21
	Primary	52
	Secondary	24
	Tertiary	3

Out of 100 urine samples 60 were positive for pathogenic organisms (Figure 2). *Escherichia coli* was isolated in 41 (68.3%) of the positive samples. This was followed by *Klebsiella sp* 13 (21.6%), *Pseudomonas sp* 3 (5%) *Proteus sp* 2 (3.3%) *Staph. Aureus* 1 (1.66%) (Table 2).

Table 2: Microbiological pattern of UTI patients.

Traits	Frequency	Percentage
Organism		
Present	60	60
Absent	39	39
Gram Stain		
Gram +ve	1	1.7
Gram -ve	59	98.3
Individual Bacteria		
E Coli	41	68.3
Klebsiella	13	21.6
Pseudomonas	3	5
Proteus	2	3.3
Staph Aureus	1	1.6

E. coli was found to be most sensitive to nitrofurantoin (92.5%), meropenem (92.5%), amikacin (84.6%) and gentamycin (71.8%) and resistant to most commonly used drugs like cefixime (78%), cefuroxime (77.5%), ciprofloxacin (62.5%), ceftriaxone (62.5%) (Table 3).

Table 3: Antibiotic sensitivity pattern of *E coli* sp.

Antibiotic	Sensitive (%)	Resistant (%)
Amoxicillin	58.6	41.4
Levofloxacin	47.2	52.8
Cefixime	22	78
Cotrimoxazole	40.5	59.5
Cefuroxime	22.5	77.5
Nitrofurantoin	92.5	7.5
Ciprofloxacin	37.5	62.5
Ceftriaxone	37.5	62.5
Meropenem	92.5	7.5
Amikacin	84.6	15.4
Gentamycin	71.8	28.2

As a whole all organisms are mostly sensitive to nitrofurantoin (86.2%), meropenem (93.1%), amikacin (77.2%), and gentamycin (64.9%) and mostly resistant to cefixime (83.3%), cefuroxime (81.4%), and ceftriaxone (66.9%) (Figure 1).

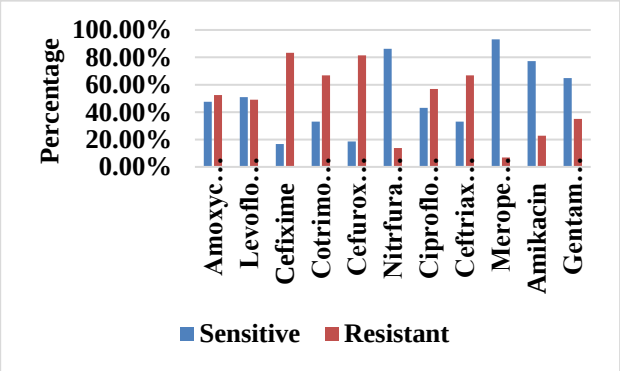

Figure 1: Sensitivity of antibiotics in UTI patients (as a whole).

DISCUSSION

UTI is a common clinical problem in both the community and health care associated settings. Epidemiologically urinary tract infections account for seven million office visits and one million emergency department visits, resulting in 100,000 hospitalizations yearly, making them the most common bacterial infections in outpatient and emergency department setting. Financially, the estimated annual cost of UTI is significant, at approximately $1.6 billion.[13]

The prevalence of UTI varies according to sex and age.[14] It has been usually observed that UTI most commonly occurs in females and up to one-third of all women experience a UTI at some point during their lifetimes.[15] In the current study majority of the cases were in the age group of 46-60 year.

Out of 100 participant's urine sample, 60 (60%) had significant bacterial growth. The frequency is different to the incidence reported in a study in India that was 12.7%.[16] The discrepancy is most likely due to small sample size.

The prevalence of UTI growth positive cases was recorded higher in females than in males. Females were predominant with UTI showing 75% of urine culture positivity whereas the male subjects showed only 15% of culture positivity. Among the 60 isolates obtained, 45 were from females while only 15 were from males. Similar observations were also recorded by another 2 studies.[17,18] In Bangladesh, another study reported 16.4% UTI in the female garment's workers of Dhaka City.[19]

Bacteriological studies usually reveal the involvement of gram-negative enteric organisms that commonly cause urinary tract infections, such as E. coli, the Klebsiella species, and the Proteus species.[20] where E. coli is the most predominant.[21] Findings in our study also coincide with the previous studies, gram negative bacilli was more common and *Escherichia coli* constituted the largest group with a prevalence of 68.3%, followed by *Klebsiella sp* 21.6%, *Pseudomonas sp* 5%, *Proteus sp* 3.3% and *Staph Aureussp* 1.6%. Other investigators also reported higher association of E. coli (66.67% and 77.8% cases respectively) in UTI patients.[22,23] The study conducted in 2014 in Lahore; Pakistan shows the prevalence of UTI with the highest prevalence of E-coli (80%) followed by *Staphylococcus Aureus* (9.4%), proteus species (5.4%) and pseudomonas species (5.2%).[10] In most of the studies *Escherichia coli* was the prevalent organism in UTI.[21]

The pattern of antimicrobial resistance of the micro-organisms causing UTI infections vary in their susceptibility to antimicrobials from place to place and from time to time.[24] In this study E. coli was found to be most sensitive to nitrofurantoin (92.5%) meropenem (92.5%), amikacin (84.6%) and gentamycin (71.8%) and resistant to most commonly used drugs like Cefixime (78%), cefuroxime (77.5%), ciprofloxacin (62.5%), ceftriaxone (62.5%). This finding is supported by study in Bangladesh which reported a good sensitivity for imipenem, ceftazidime and amikacin against UTI-isolates of E. coli.[25] A study in Philippines also reported sensitivity of the UTI-isolates of E. coli for amikacin.[26] This finding suggests the use of drugs that are less commonly prescribed by practitioners for arresting the pathogens in UTI patients may be beneficial. In contrary to these findings western countries practicing rational use of antimicrobials shows that susceptibility percentages to most antimicrobial agents tested were stable over 10 years' period although the prevalence of E. coli and ESBLs significantly increased.[27]

Overall antimicrobial sensitivity and resistance of isolated uropathogens in this study showed relatively high resistance to amoxicillin (52%), cotrimoxazole (66.90%) cefixime (83.30%), cefuroxime (81.40%) and ceftriaxone (68.90%) which correlates with a previous study done by Haque et al in Bangladesh.[28] Meropenem 93.1%, nitrofurantoin 86.20%, amikacin 77.20%, and

gentamycin 64.90% were found to be sensitive to identified uropathogens. These findings are quite consistent to the findings of another study done in King Fahad Hospital Saudi Arabia.[29]

CONCLUSION

UTI among female is more prevalent and the most predominant uropathogen was E-coli. Most effective antimicrobial agents for E coli are nitrofurantoin, meropenem, amikacin and gentamycin. It is resistant to most commonly used drugs like cefixime, cefuroxime, ciprofloxacin, levofloxacin and ceftriaxone. Therefore, the choice of antibiotic therapy should integrate the local sensitivity pattern of the infecting organisms. Periodic evaluations of predominant organisms and their antibiotic susceptibility pattern are essential as it is changing over time.

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