Antibiotic sensitivity pattern of bacterial isolates from urine samples of admitted patients with urinary tract infection in a tertiary care teaching hospital of Tripura, India: a hospital record based study

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ABSTRACT

Background: Urinary tract infection (UTI) being one of the most common and a serious health problem both in the community and hospital settings each year worldwide, the emergence of antibiotic resistance in the management of UTI is a serious public health issue. The present study will analyse the antimicrobial sensitivity pattern of pathogens isolated from the urine samples of admitted patients suffering from UTI in Tripura Medical College and Dr. B.R. Ambedkar Memorial Teaching Hospital (TMC).

Methods: This was a hospital record-based study. The urine samples of clinically diagnosed UTI patients admitted in various departments of the hospital during the study period were included. The reports of culture and sensitivity testing of the samples were collected. The results were interpreted according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI).

Results: During the 12-month study period, a total of 752 urine samples were analysed. Enterococcus (43.75%) was the most frequently isolated bacteria, followed by E. coli (28.45%) and Klebsiella (14.89%). Enterococcus was highly sensitive (p<0.001) to vancomycin (95.33%), E. coli was mostly sensitive to nitrofurantoin (83.65%) and Klebsiella mainly sensitive to imipenem (75.49%).

Conclusions: The study showed that positive urine culture with the antibiotic sensitivity of the isolates is very important for antimicrobial therapy, as antibiotic resistance is a worldwide problem which causes ineffectiveness of treatment.

Keywords: Antibiotic resistance, Enterococcus, E. coli, Klebsiella, Urinary tract infection

INTRODUCTION

Urinary tract infection (UTI) is the most common and a serious health problem both in the community and hospital settings each year worldwide. It is the most important cause of morbidity in the world affecting all age groups across the life span and in both genders and usually requires medical treatment. About 150 million people are diagnosed with UTI each year, costing the global economy in excess of 6 billion dollars.1

The emergence of antibiotic resistance in the management of UTI is a serious public health issue, particularly in the developing world where apart from high level of poverty, ignorance and poor hygienic practices, there is also a high prevalence of fake and spurious drugs of questionable quality in circulation. To ensure appropriate treatment, knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory.2

Antibiotic resistance emerges commonly when patients are treated with empiric antimicrobial drugs. To overcome
these difficulties and to improve the outcome of serious infections, monitoring of resistance patterns in the hospital is needed.\textsuperscript{3}

The present study is an attempt to analyse the antimicrobial sensitivity pattern of pathogens isolated from the urine samples of admitted patients suffering from UTI in Tripura Medical College and Dr. B.R. Ambedkar Memorial Teaching Hospital (TMC).

**METHODS**

The study was carried out at TMC, a 560 bedded tertiary care hospital located in the north eastern region of India. This was a hospital record based study. Before initiating the study, proper approval was taken from the Institutional Ethics Committee (IEC). The duration of the study was for one year. The data from October 2015 to September, 2016 were collected and analysed.

**Inclusion criteria**

The urine samples of clinically diagnosed UTI patients admitted in various departments of the hospital during the study period were included.

**Exclusion criteria**

Antimicrobial agents that were used infrequently or rarely for sensitivity testing were excluded from the study. The samples with no bacterial growth were also excluded. The samples were processed for culture and sensitivity testing in the Department of Microbiology. The cultured plates were examined after 24 hours and organisms were identified by their colonial morphology, Gram staining and appropriate biochemical tests using standard techniques.\textsuperscript{4}

The reports of culture and sensitivity testing of the samples were collected. The results were interpreted according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI). Antibiotic susceptibility of the isolates was determined by Modified Kirby - Bauer disc diffusion method, according to CLSI recommendations. The zones of inhibition were measured, and the organisms identified as sensitive or resistant based on standard criteria.\textsuperscript{5} Control strains were used for checking the quality of discs and reagents.

**Statistical analysis**

The results were expressed in percentages and analysed for statistical significance by Chi square test using EPI6 software. P value <0.05 was considered statistically significant.

**RESULTS**

Table 1: Common pathogens in urine samples (n= 752).

| Common pathogens | Number (%) |
|------------------|------------|
| Enterococcus     | 329 (43.75) |
| E. coli          | 214 (28.45) |
| Klebsiella       | 112 (14.89) |
| Other pathogens  |            |
| Staph aureus     | 28 (3.73)  |
| Acinetobacter    | 22 (2.92)  |
| Pseudomonas      | 17 (2.26)  |
| Citrobacter      | 14 (1.86)  |
| Enterobacter     | 12 (1.6)   |
| MRSA             | 04 (0.53)  |

Table 2: Sensitivity pattern of Enterococcus.

| Antimicrobial agents | Total urine samples | Sensitive (%) | Resistant (%) | Remarks |
|----------------------|---------------------|---------------|---------------|---------|
| Levofloxacin\textsuperscript{**} | 320 | 31(9.69) | 289(90.31) | R |
| Nitrofurantoin\textsuperscript{**} | 304 | 185(60.86) | 119(39.14) | S |
| Vancomycin\textsuperscript{**} | 300 | 286(95.33) | 14(4.67) | S |
| Gentamicin\textsuperscript{**} | 285 | 64(22.46) | 221(77.54) | R |
| Linezolid\textsuperscript{**} | 282 | 264(93.62) | 18(6.38) | S |
| Gatifloxacin\textsuperscript{**} | 238 | 16(6.72) | 222(93.28) | R |
| Ampicillin\textsuperscript{**} | 189 | 21(11.11) | 168(88.89) | R |
| Teicoplanin\textsuperscript{**} | 129 | 127(98.44) | 2(1.55) | - |
| Cefotaxime\textsuperscript{*} | 81 | 29(35.80) | 52(64.20) | R |
| Ciprofloxacin | 53 | 03(5.66) | 50(94.34) | - |
| Amoxiclav | 43 | 05(11.63) | 38(88.37) | - |
| Ceftriaxone | 42 | 05(11.90) | 37(88.10) | - |
| Cefuroxime | 23 | 01(4.34) | 22(95.66) | - |
| Cotrimoxazole | 14 | 11(78.57) | 03(21.43) | - |
| Cefoxitin | 10 | 01(10) | 09(90) | - |
| Norfloxacine | 05 | 02(40) | 03(60) | - |

\textsuperscript{**}p<0.001, \textsuperscript{*}p<0.05, S- Sensitive, R- Resistant
During the 12 month study period, a total of 752 urine samples were analysed. *Enterococcus* (43.75%) was the most frequently isolated bacteria, followed by *E. coli* (28.45%) and *Klebsiella* (14.89%). The common pathogens that were isolated from the urine sample are shown in Table 1.

Antibiotic sensitivity pattern of *Enterococcus* is as per Table 2. *Enterococcus* was highly sensitive (p<0.001) to vancomycin (95.33%), linezolid (93.62%) and nitrofurantoin (60.86%). The organism was highly resistant (p<0.001) to gatifloxacin (93.28%), levofloxacin (90.31%), ampicillin (88.89%), gentamicin (77.54%), cefotaxime (64.20%).

Antibiotic sensitivity pattern of *E. coli* is shown in Table 3. *E. coli* was mostly sensitive to nitrofurantoin (83.65%), imipenem (73.37%), amikacin (72.55%). The microorganism was resistant to amoxycillin (93.02%), cefuroxime (92.96%), levofloxacin (90.67%), ciprofloxacin (83.42%), cefotaxime (82.5%), gatifloxacin (82%), ceftaxime (81.63%), cefepime (71.21%).
Antibiotic sensitivity pattern of *Klebsiella* is as per Table 4. The organism was mainly sensitive to imipenem (75.49%) and resistant to ceftriaxone (77.78%), cefotaxime (72.73%), nitrofurantoin (67.29%).

**DISCUSSION**

The present study showed the types of bacterial pathogens and the antibiotic sensitivity pattern of these pathogens isolated from urine sample of admitted patients suffering from UTI. Enterococcus was the predominant microorganism isolated from these samples (43.75%). This was comparable to the findings of Atray D et al.\(^6\) Chakraborthy al, conducted a study in Kolkata which also showed enterococcus was the predominant organism (66%) isolated from urine samples.\(^7\) In this study, the other common pathogens isolated were *E. coli* (28.45%) and *Klebsiella* (14.89%). These finding correlates with the findings of Bharti et al, where the prevalence of *E. coli* and *Klebsiella* was found to be 36.84% and 7.66% respectively.\(^8\)

In this study, *Enterococcus* was mostly sensitive to vancomycin (95.33%) and linezolid (93.62%) which was similar to the findings of other studies.\(^9,10\)

In the present study *E. coli* was sensitive to nitrofurantoin, imipenem and amikacin which was contrary to the findings of Pattanayak C et al, who found that the organism was mainly sensitive to polymyxin B, gentamicin, ceftizoxime.\(^10\) In this study, *E. coli* was mostly resistant to cephapirinum which is consistent with the findings of other studies.\(^11\)

*Klebsiella* was also resistant to most of the antibiotics including cephapirinum and sensitive to imipenem. Similar findings regarding drug resistance pattern of *Klebsiella* was also observed by other researchers.\(^12\) The most effective antimicrobial agents in this study were imipenem, nitrofurantoin, amikacin, for Gram negative bacilli. However, isolated Gram positive *coccii* were fully sensitive to vancomycin, linezolid and nitrofurantoin.

**CONCLUSION**

The study showed that positive urine culture with the antibiotic sensitivity of the isolates is very important for antimicrobial therapy, as antibiotic resistance is a worldwide problem which causes ineffectiveness of treatment. Early and proper treatment can decrease the antibiotic resistance. This study will also help in assuming the emerging trends in resistance at the local level to support clinical decision making, infection - control interventions, and antimicrobial - resistance containment strategies.

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**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

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