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Original Research Article

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.[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.[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.[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	
Organisms	**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*.

Anitimicrobial agents	Total urine samples	Sensitive (%)	Resistant (%)	Remarks
Levofloxacin**	320	31(9.69)	289(90.31)	R
Nitrofurantoin**	304	185(60.86)	119(39.14)	S
Vancomycin**	300	286(95.33)	14(4.67)	S
Gentamicin**	285	64(22.46)	221(77.54)	R
Linezolid**	282	264(93.62)	18(6.38)	S
Gatifloxacin**	238	16(6.72)	222(93.28)	R
Ampicillin**	189	21(11.11)	168(88.89)	R
Teicoplanin	129	127(98.44)	02(1.55)	-
Cefotaxime*	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(95.65)	-
Cotrimoxazole	14	11(78.57)	03(21.43)	-
Cefoxitin	10	01(10)	09(90)	-
Norfloxacin	05	02(40)	03(60)	-

** p<0.001, *p<0.05, S- Sensitive, R- Resistant

Table 3: Sensitivity pattern of *E. coli*.

Antimicrobial agents	Total urine samples	Sensitive (%)	Resistant (%)	Remarks
Nitrofurantoin**	208	174(83.65)	34(16.35)	S
Imipenam**	199	146(73.37)	53(26.63)	S
Piperacillin/Tazobactam	189	102(53.97)	87(46.03)	-
Ciprofloxacin**	187	31(16.58)	156(83.42)	R
Amoxyclav**	172	12(6.98)	160(93.02)	R
Amikacin**	153	111(72.55)	42(27.45)	S
Gatifloxacin**	150	27(18.00)	123(82.00)	R
Cefuroxime**	142	10(7.04)	132(92.96)	R
Cefotaxime**	120	21(17.50)	99(82.50)	R
Ceftriaxone**	98	18(18.37)	80(81.63)	R
Gentamycin	98	59(60.20)	39(39.80)	-
Levofloxacin**	75	7(9.33)	68(90.67)	R
Cefepime*	66	19(28.79)	47(71.21)	R
Meropenem	27	17(62.96)	10(37.04)	-
Cefpodoxime	22	1(4.55)	21(95.45)	-
Norfloxacin	9	1(11.11)	8(88.89)	-

** p<0.001, *p<0.05, S- Sensitive, R- Resistant

Table 4: Sensitivity pattern of *Klebsiella*.

Antimicrobial agents	Total urine samples	Sensitive (%)	Resistant (%)	Remarks
Nitrofurantoin**	107	35(32.71)	72(67.29)	R
Imipenem**	102	77(75.49)	25(24.51)	S
Ciprofloxacin	98	44(44.90)	54(55.10)	-
Piperacillin/Tazobactam	95	54(56.84)	41(43.16)	-
Amikacin	90	51(56.67)	39(43.33)	-
Amoxyclav	90	2(2.22)	88(97.78)	-
Gatifloxacin	82	43(52.44)	39(47.56)	-
Cefotaxime**	66	18(27.27)	48(72.73)	R
Cefuroxime	53	5(9.43)	48(90.57)	-
Gentamycin	49	26(53.06)	23(46.94)	-
Ceftriaxone*	36	8(22.22)	28(77.78)	R
Cefepime	26	11(42.31)	15(57.69)	-
Levofloxacin	25	8(32)	17(68)	-
Cefpodoxime	10	1(10.00)	9(90)	-
Meropenem	10	7(70)	3(30)	-
Norfloxacin	3	2(66.67)	1(33.33)	-

** p<0.001, *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 amoxyclav (93.02%), cefuroxime (92.96%), levofloxacin (90.67%), ciprofloxacin (83.42%), cefotaxime (82.5%), gatifloxacin (82%), ceftriaxone (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] Chakraborty et 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.[8,9]

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 polymixin B, gatifloxacin, ceftriaxone.[10] In this study, *E. coli* was mostly resistant to cephalosporins which is consistent with the findings of other studies.[11]

Klebsiella was also resistant to most of the antibiotics including cephalosporins 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 *cocci* 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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