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ORIGINAL ARTICLE

A STUDY OF URINARY TRACT INFECTIONS DUE TO MULTIDRUG RESISTANT BACTERIA IN CRITICAL CARE UNIT OF A MEDICAL COLLEGE AND HOSPITAL

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ABSTRACT: The present study was designed to determine antibiotic resistance pattern against commonly used drugs for urinary tract infections in patients of the ICU of the KPC Medical College and Hospital from November 2011 to May 2015. Commonly isolated organisms were, Klebsiella pneumoniae (39.02%), Escherichia coli (8.10%), Pseudomonas aeruginosa (17.07%), A cinetobacterbaumannii (30.08%) and Enterobacter aerogenes (5.60%). Susceptibility testing was determined using the Microscan, (Siemens) and MICs of different antibiotics were determined. Since surveys of antimicrobial resistance form the basis for decisions on empirical therapy this study was designed to provide a guideline for initiation of antibiotic therapy immediately after identification of organism (even before sensitivity report is obtained).

KEYWORDS: UTI, Antibiotic susceptibility testing, Antimicrobial resistance, Rational selection of antimicrobials, Microscan, Carbapenemases, MacConkey agar, CLED agar.

INTRODUCTION: Selection of empiric antibiotics for urinary tract infections (UTIs) has become more challenging because of the increasing rates of multidrug-resistant organisms especially multi drug resistant Enterobacteriaceae (MDRE) mostly ESBLs and Carbapenemases.[1] Enterobacteriaceae are the most common cause of urinary tract infections (UTIs) in both community and healthcare settings. Selection of empiric antibiotics for UTIs is therefore often based on the local or institutions susceptibility profiles of the Enterobacteriaceae.[2] This retrospective study was conducted to determine antibiotic resistance patterns in this institute upon which the choice of antibiotic/s for treatment can be made before the availability of sensitivity report.

MATERIALS AND METHODS: 1248 urine samples received from inpatients of the ICU of the Medical College and Hospital from November 2011 to May 2015 were included in the study.

Sample collection method: Freshly voided midstream urine specimens and catheter urine samples were collected under strict aseptic precautions in sterile wide mouth containers. Samples were transported immediately to the laboratory and processed as soon as possible.

CULTURE AND IDENTIFICATION: Each urine sample was inoculated on Mac Conkey agar and CLED agar. The culture plates were incubated at 37°C for 24 hours and observed for growth. The plates showing significant growth as per Kass count were processed for further identification.[2] Susceptibility testing and identification was done in Microscan (Siemens) and MIC s of different antibiotics were determined.

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RESULTS: This study was done in the period November 2011 to May 2015 in KPC Medical College &hospital ICU. The results of the study are described in the Table 1, Table 2 and Table 3.

ORGANISM	ISOLATED	TOTAL	PERCENTAGE
Klebsiella pneumoniae	105	348	39.02%
Klebaiella pneumoniae (ESBL)	105		
Klebsiella pneumoniae (KPC)	138		
Pseudomonas aeruginosa	103	221	17.07%
Pseudomonas aeruginosa (MBL)	118		
Acinetobacter baumannii (MBL)	137	137	30.08%
E. coli (ESBL)	115	230	8.10%
E. coli (Carbapenemase)	115		
Enterobacter aerogenes (KPC)	117	117	5.60%

Table 1: Commonly isolated organisms from urine samples of UTI cases

Antibiotics	MIC 50	MIC 90	% sensitive	% resistence	Range
Amoxycillin	64	64	0	100	<= 8 - >= 32
Amoxycillin - Clav	32/16	32/16	10	90	<= 8/4 >= 32/16
Pipracillin- Tazo	64	64	15	85	<= 16/4 >= 128/4
Cefo-Sulbactum	64	64	17	83	<= 16 >= 64
Cefuroxime	32	32	4	96	<= 8 >= 32
Cefotaxime	32	32	6	94	<= 1 >= 4
Ceftazidime	16	16	6	94	<= 4 >= 16
Cefipime	32	32	10	90	<= 1 >= 4
Aztreonam	16	16	6	94	<= 8 >= 32
Imipenem	4	4	15	85	<= 4 >= 16
Meropenem	4	4	15	85	<= 1 >= 4
Ertapenem	2	2	15	85	<= 1 >= 4
Gentamicin	16	16	28	72	<= 0.5 >= 2
Tobramicin	16	16	28	72	<= 4 >= 16
Netilmicin	16	16	31	69	<= 4 >= 16
Amikacin	64	64	33	67	<= 16 >= 64
Ciprofloxacin	4	4	9	91	<= 1 >= 4
Oflaxacin	4	4	9	91	<= 1 >= 4
Levofloxacin	8	8	18	82	<= 2 >= 8
Moxifloxacin	8	8	18	82	<= 2 >= 8
Cotrimoxazole	80	80	12	88	< 40 > 80
PolyomyxinB/ colistin	1	1	100	0	< 2 > 4
Tigecycline	1	1	100	0	< 2 > 8

Table 2: Antibiotic susceptibility profile of bacterial isolates against commonly used antibiotics

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	% sensitive to meropenem	% sensitive to amikacin	% sensitive to colistin	% Sensitive to ciprofloxacin	% sensitive to Cefo/sulbactum
Klebisiella pneumoniae	15	33	100	9	17
Acinetobacter baumannii	15	30	100	8	16
Pseudomonas aeruginosa	10	33	100	9	17
E. Coli	25	33	100	9	17
Enterobacter aerogenes	35	31	100	9	17

Table 3: Percentage sensitivity of common isolates against major antibiotics

DISCUSSION: Antimicrobial agents are commonly available drugs, over the counter, in India and also in most of the third world countries leading to their rampant misuse. The inevitable consequence of the widespread use of antimicrobial agents has been the emergence of antibiotic resistant pathogens. Resistance to antimicrobial agents is an emerging problem that has prompted physicians around the globe to rethink strategies of empirical therapy and has prompted laboratory researchers to rethink testing strategies. The rate at which resistant organisms develop is directly related to their exposure to antimicrobial agents. Control strategies must include guidelines for prudent use of antimicrobial agents. The high level of resistance seen among the isolates indicates that there is an absolute need for antimicrobial stewardship and adhering to specific antibiotic protocol to combat this situation. Some antibiotics should be put under restricted category and their use should only be allowed on logical and scientifically based justifications (e.g. efficacy, safety, cost, pharmacokinetic, convenience of administration etc). The hospital infection control committee should review the pattern of resistance every six months and suggest changes as and when necessary so as to formulate guidelines for empirical as well as sensitivity test based therapy.

CORRELATION WITH OTHER RELEVANT STUDIES: In the study Urinary Tract Infections due to Multidrug-Resistant Enterobacteriaceae: Prevalence and Risk Factors in a Chicago Emergency Department carried out at Section of Infectious Diseases, Rush University Medical Center, Chicago, IL 60612, USA[3] in the year 2013 and reviewed independently by Shawn Vasoo, and Kamaljit Singh of Division of Infectious Diseases, Faculty of Medicine, Thammasat University, Pathum Thani 12120, Thailand and Thana Khawcharoenporn of Section of Infectious Diseases, Rush University Medical Center, Chicago, IL 60612, USA,[3] Enterobacteriaceae were the major causes of UTIs (88%) and prevalence of MDRE UTIs among patients were, 19% overall..

In another study carried out in the Department of Microbiology, Indira Gandhi Medical College & Research Institute, Puducherry, India.[4] A total of 2941 urine samples were received for culture and sensitivity during the study period. Among these, 547 samples (18.5%) yielded significant bacteriuria; 2323 samples (79.1%) showed no growth and 74 samples (2.4%) showed mixed growth. The isolates were sensitive to amikacin (82.6%), piperacillin-tazobactum (78.2%),

nitrofurantoin (82.1%) and imipenem (98.9%);. The sensitivity to ampicillin, cefuroxime, ceftriaxone, norfloxacin, ciprofloxacin varied from 11-25 per cent.

In the present study out of 1248 samples 695 were multidrug-resistant enterobacteriaceae i.e. approximately 55.68% this difference in percentage in the number of cases is attributable to selection of cases, the present study is based only on samples drawn from cases admitted in ICCU and ICU compared to all UTI cases of emergency department in Rush University Medical Center, Chicago, IL 60612, USA and isolates obtained from urine samples among all hospital inpatients suspected to have, admitted during the period of August 2011 to July 2012 at Indira Gandhi Medical College & Research Institute, Puducherry, India. But in both the studies the pattern of drug resistance has shown considerable similarity with the present study in terms of multi drug resistance.

In the ECO·SENS study[5] carried out in the Department of Clinical Microbiology, Central Hospital, SE-351 85 Växjö, Sweden to investigate the prevalence and susceptibility of pathogens causing community-acquired acute uncomplicated urinary tract infections (UTIs), between January 1999 and December 2000, 4734 women with acute uncomplicated UTI were enrolled. Recognized uropathogens were cultured from 3278(69.2%) patients E. coli was the most common pathogen, exceeding 70% of proven infections P. mirabilis was the second most common pathogen and along with Klebsiella spp.

Resistance was most common to ampicillin (29.8%) and sulfamethoxazole (29.1%), followed by trimethoprim (14.8%), trimethoprim/sulfamethoxazole (14.1%) and nalidixic acid (5.4%). Here the percentage of isolation appears similar but the resistance pattern varies.

CONCLUSION: The resistance pattern that has emerged out of this retrospective study allows us to choose the best antibiotics against the commonly isolated organisms. Identification of the isolated organisms will allow us to initiate antibiotic empirical therapy (even before sensitivity reports are available) depending upon the sensitivity pattern data available with the hospital. But regular monitoring has to be carried out to observe any drop in sensitivity amongst the selected best antibiotics and any such observation has to be reported immediately to the Hospital Infection Control committees, for revision of the antibiotic list.

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