



STUDY OF BACTERIAL ISOLATES AND THEIR ANTIMICROBIAL SENSITIVITY PROFILE CAUSING HOSPITAL ACQUIRED INFECTION AMONG PATIENTS IN MEDICAL ICU IN MORADABAD UP

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ABSTRACT

Introduction: An infection occurring in a patient, in a hospital or other Health care facility, in whom the infection was not present or was not incubating at the time of admission. Infections occurring more than 48hrs after admission are usually considered Nosocomial or Hospital Acquired infections. **Aim:** Study of bacterial isolates and their antimicrobial sensitivity profile causing hospital acquired infection among patients in medical ICU in Moradabad (up). **Materials and Methods:** The study was carried out in the 'Department of microbiology' Moradabad hospital. **Result:** From different 200 samples collected from different age group of patients admitted in ICU of TMMC & RC, 138 were positive with the highest prevalence gram negative bacilli of *E. coli* followed by *Klebsiella* and *pseudomonas*. **Conclusion:** ICU- acquired infection is common and often associated with microbiological isolates of resistant organism. The potential effects on outcome emphasize the important of specific measures for infection control in critically ill patients.

KEYWORDS: Nosocomial infection, ICU (Intensive care unit) Patients, AST (Antibiotic sensitivity testing).

INTRODUCTION

Nosocomial infections, also called "hospital-acquired infections (HAI)", are infections acquired during hospital care which is not present or incubating at admission. Infections occurring more than 48 hours after admission are usually considered nosocomial.^[1] Patients in intensive care units (ICUs) have a higher risk of acquiring hospital acquired infections (HAIs) than those in non-critical care areas.^[2] The most common HAIs in ICU patients are respiratory tract infections (RTIs), urinary tract infections (UTIs) and bloodstream infections (BSIs) and are most often associated with the use of invasive devices.^[3] Both Gram-positive and Gram-negative bacteria and *Candida* spp. have been reported as cause of infection in these patients.^[4] The study was aimed to identify the pathogenic organisms causing HAI in medical ICU patients and to determine antimicrobial susceptibility profile of identified isolates.

MATERIALS AND METHODS

200 samples were processed in TMU hospital (Bacteriological section of Microbiology department of TMMC&RC). Clinical specimens including sputum, urine, Bronchoalveolar Lavage (BAL), Endotracheal

aspirates (ETA), Endotracheal tubes (ET), Trans Tracheal Aspirate(TTA), central venous line tips, blood, body fluids, pus and others received from MICU were included. All the clinical samples were inoculated on blood agar and Mac Conkey agar and incubated at 37°C for 18-24 hrs. Organisms isolated in media were further processed and identified by colony morphology, gram stain, biochemical reactions as per standard microbiological techniques. Antimicrobial susceptibility testing of the clinical isolated was done on Mueller Hinton agar according to CLSI guidelines by Kirby Bauer disk diffusion method.

RESULT

A total 200 samples were included in the study. Various samples from the patients admitted in ICU were collected and processed. Urine sample (41%) was the most common sample received followed by sputum (17.50%), blood (16.5%) & pus (16.50%) as shown in table 1. Isolation was more in females compared to males (table 1). Microbial profile of different samples showed that among gram negative organisms, *E. coli* was the most common isolate followed by *Klebsiella* spp., *Pseudomonas* spp., *Enterobacter* spp., *Citrobacter* spp.

and *Proteus* spp. as shown in table 2. Among gram positive organisms most common organism was *S. aureus* followed by *Streptococcus* spp. and CONS (table 2). Antibiotic resistance pattern of gram negative organisms reveal 100% resistance to Ampicillin. Highest

sensitivity was obtained against Polymyxin- B i.e. all the isolates were sensitive to polymyxin B. Among carbapenems, imipenem showed 94-100% sensitivity as shown in table 3.

Table 1: Types of samples receiving in suspected HAI cases.

S.N	Sample	Total no.of samples	Positive samples	Male	Female
1	Urine	82 (41.00%)	67	20	47
2	Blood	33 (16.50%)	22	10	12
3	Pus	33 (16.50%)	25	16	9
4	Sputum	35 (17.50%)	24	11	13
5	Pleural fluid	8 (4.00%)	-	-	-
6	Ascitic fluid	7 (3.50%)	-	-	-
7	Respiratory samples(BAL/ET/TT)	2 (1.00%)	-	-	-
8	Total	200 (100%)	138 (69%)	57(41.30%)	81(58.69%)

Table no 2. Microbial profile of different samples

Organisms	Urine	Blood	Pus	Sputum	Total
<i>E.coli</i>	33(94.28)	02(5.71)	-	-	35(25.36)
<i>Klebsiella</i>	07(33.33)	02(9.52)	05(23.80)	07(33.33)	21(15.21)
<i>Proteus</i>	07(100)	-	-	-	07(5.07)
<i>Citrobacter</i>	07(58.33)	-	05(41.66)	-	12(8.69)
<i>Enterobacter</i>	06(54.54)	-	05(45.45)	-	11(7.97)
<i>Pseudomonas</i>	03(14.28)	07(33.33)	03(14.28)	08(38.09)	21(15.21)
<i>S.aureus</i>	03(12.50)	12(50)	06(25)	03(12.50)	24(17.39)
<i>Streptococcus</i>	-	-	02(50)	02(50)	04(2.89)
CONS	03(100)	-	-	-	03(2.17)
Total	69(50)	23(16.67)	26(18.84)	20(14.49)	138

Table no 3: Antibiotic sensitivity pattern of gram negative organisms

Antibiotic	<i>E. coli</i> (n=35)	<i>Klebsiella</i> (n=21)	<i>Proteus</i> (n=21)	<i>Citrobacter</i> (n=12)	<i>Enterobacter</i> (n=11)
Ampicillin	35(100)	10(47.61)	4(57.14)	10(83.33)	3(27.27)
Ampicillin/ sulbactam	14(40)	6(28.57)	4(57.14)	3(25)	1(9.09)
Imepenem	2(5.71)	0	2(28.57)	1(8.33)	0
Meropenem	4(11.42)	3(14.28)	1(14.28)	1(8.33)	3(27.27)
Ertrapanem	3(8.57)	1(4.76)	1(14.28)	1(8.33)	1(9.09)
chloramphenicol	3(8.57)	4(19.04)	1(14.28)	3(25)	1(9.09)
Tetracycline	16(45.71)	10(47.61)	3(42.85)	4(33.33)	5(45.45)
Nitrofurontoin	9(25.71)	3(14.28)	0	3(25)	4(36.36)
Ciprofloxacin	14(40)	10(47.61)	3(42.85)	1(8.33)	3(27.27)
Levofloxacin	8(22.85)	8(38.08)	3(42.85)	4(33.33)	4(36.36)
Ceftriaxone	9(25.71)	4(19.04)	3(42.85)	4(33.33)	3(27.27)
Cefoparazone	14(40)	7(33.33)	3(42.85)	4(33.33)	4(36.36)
Tobramycin	10(28.57)	7(33.33)	3(42.57)	3(25)	4(36.36)
Gentamycin	14(40)	10(47.61)	3(42.85)	5(41.66)	5(45.45)
Amikacin	8(22.85)	4(19.04)	2(28.57)	2(16.66)	1(9.09)
Polymyxin- B	0	0	0	0	0
Co- trimoxazole	21(60)	10(47.61)	4(57.14)	7(58.33)	7(63.63)

DISCUSSION

In a study conducted in 1417 ICUs in 17 countries showed that the gram negative and gram positive bacteria are almost equal in frequency and the most common gram negative bacteria are gram negative enteric bacteria and *Pseudomonas aeruginosa*.

Lockhart et al. isolated 74394 gram negative bacteria from which common isolates were *Pseudomonas aeruginosa* (22.2%), *E.coli* (18.8%), and *Klebsiella pneumoniae* (14.2%) respectively.^[5]

In another study conducted by MYSTIC study 6243 gram negative bacteria were evaluated and the most common bacteria were found as *Pseudomonas aeruginosa* (22.5%), *E.coli* (19.8%) and *Klebsiella pneumoniae* (10.4%) respectively.^[6] Esen et al. showed that the most common microorganism isolated from the intensive care unit are *Pseudomonas aeruginosa* (20.8%), *S. aureus* (18.2%), *Acinetobacter spp.* (18.2%) and *Klebsiella spp.* (16.1%).^[7]

All these findings show that the most common bacteria in the intensive care unit is *Pseudomonas aeruginosa* but in our study *E. coli* is the most common isolate. Although *E.coli* is usually the 2nd common bacteria, we found it first (25%). The second rank is followed by *Klebsiella* and *Pseudomonas* but usually in other studies *Pseudomonas* is the first common isolate.

In study conducted by Dr Yasmin T. in Mymen singh Medical college, Mymen singh January 2012 observed that 300 gram negative strains were isolated from various clinical specimens of which majority of the organisms were isolated from urine 72% followed by wound swab 15%, pus 13%. Among the isolated *Escherichia coli* was the most prevalent 52%, followed by *Proteus spp.* 18.3%, *Klebsiella spp.* and *Pseudomonas spp.* 3% but in our study organism isolated from urine were 41%, followed by sputum 17.50%, blood 16.50%, pus 16.50% and pleural fluid 4%.^[8]

Microorganism isolated from the ICU is usually resistant to antibiotics. These bacteria lead to infections that extend hospitalization and increase the cost for the treatment and mortality. For the treatment of infection in the ICU culture antibiogram tests should be done to choose the right antibiotics. In different studies from India show that the most effective antibiotic against gram negative bacteria are Carbapenems. The most effective antibiotics against gram negative bacteria were found as Imipenem and Polymixin-B in our study. Leblebicioglu et al.^[9] showed in a multi-centre study that the susceptibilities against antibiotics are Imipenem (68%), Cefoparazone/ sulbactam (61%), Ciprofloxacin (59%) and Cefepime (57%).

The study conducted in university of Tromso in department of pharmacy by faculty of medicine, the susceptibility pattern of the tested Aminoglycosides indicated the presence of multiple Aminoglycoside resistance mechanisms in the *Enterobacteriaceae* isolates from western Norway. The susceptibility pattern of the tested Aminoglycosides in the *Enterobacteriaceae* isolates from Western Norway also showed a low prevalence of Amikacin.

CONCLUSION

Knowledge of microorganisms and the profile of antibiotic resistance in hospitals, especially in the ICU are important in rational antibiotic usage and infections control precautions. A multidisciplinary approach is

required to succeed in combating the problem. According to European commission the following action should be taken to control the antimicrobial resistance. National surveillance systems should be developed on antibiotic use and resistance. Method of prevention and control of infection should be implemented like, education and training of health professional the appropriate use of antimicrobials and hygiene standards.

In addition to above strategy the most important step to control antibiotic resistance to be taken is to prescribe antibiotic only after performing proper antibiotic sensitivity test.

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