Changing Trends of Prevalent Microorganisms and Their Drug Resistance Patterns in Intensive Care Unit (ICUS) Infections.

Dr. Pallavi	Junior resident, Department of Microbiology, GMC, Amritsar, House No 50, Block No-13, Dev Nagar, Karol Bagh, New Delhi 110005,
Dr. Loveena Oberoi	Professor, Department of Microbiology, GMC, Amritsar, 76 Avtar Avenue, Near Medical Enclave Amritsar,
Dr. Pushpa Devi	Professor & Head, Department of Microbiology, GMC, Amritsar, 17-F Beauty Avenue, Circular Road Amritsar,

ABSTRACT   *Introduction: Multidrug resistant nosocomial infections are one of the leading cause of morbidity and mortality in intensive care units (ICUs) accounting a major burden on patient and public health system.*
Objectives: Present study was done to identify prevalence of predominantly isolated bacterial organisms and their drug resistance pattern in ICUs.
Material & Method: A total of 183 samples received from various ICUs were processed and antibiotic susceptibility testing was performed as per CLSI recommendations.
Results: A total of 89(48.63%) of 183 samples were culture positive out of which Citrobacter spp.(22.47%) was most frequently isolated bacteria followed by Klebsiella spp.(16.85%), Escherichia coli (16.85%), Pseudomonas aeruginosa (15.73%),and Acinetobacter spp (11.23%). Citrobacter spp was found to be emerging multidrug resistant organism. Most of the isolates are multidrug resistant to the third generation cephalosporins, and quinolones antibiotics.
Conclusion: Regular surveillance of resident microbial flora and antibiotic susceptibility patterns is very important in implementing therapeutic strategies to reduce emergence of drug resistance strains in ICUs.

1. INTRODUCTION

The incidence of nosocomial infections in intensive care unit (ICUs) is showing a rising trend; mainly because of the severity of underlying diseases, the frequency of invasive interventions, and the frequent use of wide-spectrum antibiotics[1]. Critically ill Intensive care unit (ICU) patients are most vulnerable for developing these infections [2]. Compared with an average patient, an ICU patient has five to seven folds higher risk of nosocomial infection and ICU infections contribute to 20% to 25% of all nosocomial infections in a hospital[3].

Antibiotic overuse and misuse partly due to incorrect diagnosis; as well as irrational and counterfeit antibiotic market combinations; and irregular consumption due to either wrong prescription or poor compliance; all contributes to the wide spread drug resistance among the hospital acquired organisms.

The aim of present study was to identify prevalence of predominantly isolated bacterial microorganisms and their drug resistance patterns for the patients admitted in different ICUs of a tertiary care public hospital in Amritsar, Punjab, India.

2. METHODS AND MATERIALS

A retrospective study was conducted in microbiology department of Government medical college, Amritsar .A total of 183 samples e.g. pus, blood, sputum, urine, body fluids of patients received from various ICUs during December 2013 to December 2014 were included in the present study.

The Centre for Disease Control and Prevention (CDC) defines ICU associated infections as those that occur after 48 hours of ICU admission or within 48 hours after transfer from an ICU.

Inclusion Criteria: All patients who were clinically suspected of having acquired any infection after 48 hours of admission to the ICUs were included.

Exclusion Criteria: Patients showing clinical signs of infection on or prior to admission or transfer to the ICUs were not included.

The samples were processed and identified on the basis of the colony morphology, gram staining and the standard microbiological tests[4].Antimicrobial susceptibility testing of isolates was performed by Kirby-Bauer disc diffusion method and results were interpreted according to Clinical Laboratory Standards International (CLSI) guidelines[5].

3. RESULTS

Skin and surgical site infection (33.70%) was most predominant infection followed by blood stream infection (29.21%), respiratory tract infection (25.84%) and urinary tract infection (11.23%).

A total of 89 (48.63%) of 183 samples were culture positive out of which 77(86.51%) were Gram negative bacteria, 8 (8.98%) were gram positive bacteria and 4(4.49%) were candida spp.

Citrobacter spp. (22.47%) was most frequently isolated bacteria followed by *Klebsiella spp* spp.(16.85%), *Escherichia coli* (16.85%), *Pseudomonas aeruginosa* (15.73%), *Acinetobacter spp (11.23%)* and *Proteus spp.*(3.37%).

Among Gram positive organisms major pathogens were *Coagulase negative staphylococci* (*CONS) (5.61%)*, followed by *Enterococcus spp.* (2.24%) and *Staphylococcus aureus* (1.12%).

Candida ablicans was isolated from 4 samples contributing to 4.49% of nosocomial infections.

Table -1 Showing distribution of gram negative organisms isolated from ICUs.

| Gram negative Organism	No of isolates	Percentage
Citrobacter spp.	20	22.47 %
Klebsiella spp	15	16.85 %
Escherichia coli	15	16.85 %
Pseudomonas aeruginous	14	15.73 %
Acintobacter spp	10	11.23 %
Proteus	3	3.37 %

Table -2 Showing distributions of gram positive organisms isolated from ICUs

Gram positive organism	No of isolates	Percentage
Coagulase negative staphylococci	5	5.61 %
Enterococcus	2	2.24 %
Staphylococcus aureus	1	1.12 %

In our study majority of gram negative organisms were highly resistant to ciprofloxacin (98.1%), ceftazidime (90.1%) and ceftriaxone (89.2%), moderately resistant to gentamicin (76.4%), Sulbactam+Ceftazidime(61.82%), Sulbactam+Ceftriaxone(58.25%) and Piperacillin Tazabactam (67.3%). 50% of *Citrobacter spp.* showed resistant to all the antibotics.

Gram negative organism showed maxmium senistivity to amikacin (55.6%), imipenam(92%), polymixin B(100%)

In gram postive organism maximum sensitivity was observed to Linezolid(95%) and vacomycin(97%).Methicillin resistance was observed in 20% of coagulase negative staphylococci.
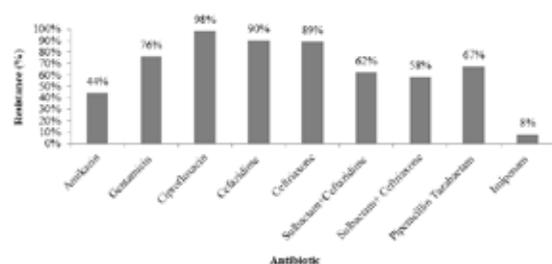
Fig 1: showing antibiotic resistance pattern (in percentages) in gram negative organisms .

4. DISCUSSION

Nosocomial infections are becoming increasing problem for ICU patients causing high morbidity and mortality in developing countries. In our study, infection rate in ICU patients was 48.63%. Most predominant organisms were *Citrobacter spp.* (22.47%), *Klebsiella spp. (*16.85%), *Escherichia coli* (16.85%), *and Pseudomonas aeruginosa* (15.73%).

Similar findings were observed in a study done by Khadka SB et al. which showed prevalence rate of *Citrobacter spp* 37.9% among the pathogens infecting neonates in ICUs[6].A study done by Radii et.al. reported *Pseudomonas aeruginosa*(26.5%).and *Klebsiella spp.(*15.3%) as predominant organisms isolated from ICUs[7.] The reason can be explained by the fact that pattern of organism causing infections and their antibiotic resistance pattern vary according to the geographical distribution.

In our study most of the isolates were multidrug resistant to the third generation cephalosporins, and quinolones antibiotics. Alarmingly high resistance to beta lactam-beta lactam inhibitor combinations was observed in present study. Citrobacter spp was found to be the multidrug resistance bacteria to the commonly used antibiotics. Another study done by B Thapa, et.al. showed Citrobacter *spp.*as most common isolates from surgical wound and about 50% of isolated were multidrug resistant[8].

5. CONCLUSION

Nosocomial infections and antimicrobial resistance in the ICUs is a major deterrent to patient's outcome, increasing duration of patient stay as well as expense. This study highlights the emergence of multidrug resistant *Citrobacter spp.* as a leading cause of ICU infections followed *by Klebsiella spp, E.coli, Pseudomonas aeruginous and Acintobacter spp.* Regular surveillance of antibiotic susceptibility patterns is very important for setting orders to guide the clinician in choosing empirical or directed therapy of infected patients.

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