Volume : 4 | Issue : 2 | February 2015 • ISSN No 2277 - 8179

Research Paper

Bacteriological Profile and Drug Resistance Pattern of Isolates of the Patients Admitted in Medical Intensive Care Unit of A Tertiary Care Hospital in Ahmadabad

Medical Science

KEYWORDS : ICUs, Antimicrobial agents, multidrug resistant.

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ABSTRACT

Introduction: Microbiological infection plays vital role in determining the outcome as well as cost and duration of the hospital stay for patients admitted in ICU setup. Therefore regular surveillance of important pathogens and its resistance pattern is mandatory.

Objectives: The objective of this study was to find out the common organisms causing infection in patients admitted in medical ICU and to know resistance pattern of these isolates.

Material & Method: During the period from November 2013 to Novemeber 2014, total of 537 samples from patients admitted in medical ICUs were collected and processed for culture, identification and antibiotic susceptibility testing according to CLSI recommendations.

Results: Out of 583, 262 (48.78%) samples were culture positive. Most common organisms isolated were Acinetobacter species (30.92%) and Klebsiella sp. (29.77%) followed by Pseudomonas aeruginosa (22.9%) , E.coli (12.98%). PoymyxinB and colistin appear as most sensitive antibiotics. Carbapenems and Beta lactam-Betalactam inhibitor combination are showing emerging resistance now.

Conclusion: This report reveals the bacteriology profile in patients in medical ICUs. Regular microbiological surveillance help in implementing better therapeutic strategies to reduce the high morbidity and mortality associated among the patients in critical care setting

INTRODUCTION

Multi-drug resistant nosocomial infections are one of the leading causes of mortality and morbidity amongst hospitalized patients, accounting a major burden on the patients and public health system of any country [1-3].

Compared with an average patient, an ICU patient has five to seven folds higher risk of nosocomial infection and ICU infections contributes to 20% to 25% of all nosocomial infections in a hospital 5. Increasing use of invasive devices, immunosuppressive drugs and status as well as irrational use of antibiotic therapy in ICUs are all contributing for the same 1,4-6,8. 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 organisms3,5,7.

The patterns of organisms causing infections and their antibiotic resistance pattern vary widely from one country to another; as well as from one hospital to other and even among ICUs within one hospital4.

The aim of present study was to identify prevalence of predominantly isolated bacterial microorganisms and their drug resistance patterns for the patients admitted in medical ICU of a tertiary care public hospital in Ahmadabad city, India.

MATERIALS AND METHODS

Study setting:

The study was conducted in the Medical Intensive Care Units (MICU) of a tertiary care public hospital in Ahmadabad.

Study period:

Samples of the patients admitted in the MICUs during to November 2013 to Novemeber 2014 were included in the present study.

Study sample:

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[9].

In present study patients admitted in Medical ICUs of the hospital during the study period of three

months, who were clinically suspected of having acquired any infection after 48 hours of admission to the ICUs were included. Patients showing clinical signs of infection on or prior to admission or transfer to the ICUs were not included.

Depending on the clinical suspicion laboratory samples like urine, sputum, pus, swab, body Fluids (E.g. Cerebrospinal fluid, Ascitic fluid, Pleural fluid), blood and stool were collected from the patients.

Study tool:

Only bacterial nosocomial infections were studied in detail in present study. Samples were

subjected to the culture testing and antibiotic sensitivity. The following group of antibiotics were tested for sensitivity: beta lactam , beta lactam-beta lactamase inhibitor combination , Tetracycline , Chloramphenicol , aminoglycoside , fluoroquinolone , polymyxin , colistin ,cotrimoxazole, carbapenem.

Other information regarding the patient including age, gender, date of admission, was also collected from the case records of the patients.

A total 537 samples were analyzed which included swab (20.86%) , Urine (18.99%) , Tracheal aspirate (17.32%) , Blood (16.39%) , CSF (6.89%) , sputum (3.91%). (Table 1)

Total 262 (48.78%) samples were positive for growth of the organisms . In which, 91.99% were gram negative bacteria, 1.52 % were gram positive bacteria and 6.49% were Candida sp. The commonest organism isolated from all samples were Acinetobacter species (30.92%) and Klebsiella sp. (29.77%) followed by Pseudomonas aeruginosa (22.9%) , E.coli (12.98%).Table 2 shows the details of organisms isolated from various types of samples.

Table1 : Samples profile and rate of positive culture from different samples

Sample	Number of sample	Sample yielding growth of bacteria
Swab	112 (20.86%)	93 (83.04%)
Urine	102 (18.99%)	26 (25.49%)
Tracheal aspirate	93 (17.32%)	85 (91.40%)
Blood	88 (16.39%)	15 (17.05%)
CSF	37 (6.89%)	6 (16.22%)
Sputum	21 (3.91%)	12 (57.14%)
Fluid	11 (2.05%)	4 (36.36%)
Pus	4 (0.74%)	3 (75%)
Bronchoalveolar lavage	2 (0.37%)	2 (100%)
Tissue	2 (0.37%)	2 (100%)
Pleural fluid	5 (0.93%)	1 (20%)
Stool	2 (0.37%)	1 (50%)
Others	58 (10.80%)	12 (20.69%)
Total	537 (100%)	262 (48.79%)

Table 2 : Pattern of organisms isolated from different samples

Organism	Swab	Urine	Tracheal aspirate	Blood	CSF	Sputum	Fluid	pus	BAL	Tissue	Pleural fluid	stool	others	Total	%
Acinetobacter sp.	26	0	30	5	4	4	0	0	1	0	0	0	11	81	30.92
Klebsiella sp.	26	7	20	1	2	4	3	2	1	0	0	0	12	78	29.77
Pseudomonas aeruginosa	21	8	16	1	0	0	0	1	0	0	1	0	12	60	22.9
Escherichia coli	10	6	8	0	0	1	1	0	0	1	0	1	6	34	12.98
Candida	1	5	4	2	0	3	0	0	0	0	0	0	2	17	6.49
Enterobacter sp.	2	0	2	2	0	0	0	0	0	0	0	0	0	6	2.29
Enterococcus sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0.76
Providencia sp.	1	0	1	0	0	0	0	0	0	0	0	0	1	3	1.15
Proteus sp.	1	0	0	0	0	0	0	0	0	1	0	0	1	3	1.15
Staphylococcus aureus ss. aureus	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0.76
Staphylococcus, coagulase negative	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0.76
Sphingomonas paucimobilis	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.38

Antibiotic sensitivity pattern of most common four isolates is shown in figure 1 to 4. Acinetobacter sp. is most commonly sensitive to Polymyxin B (100%) , Colistin (100%) and Cefoperazone/Sulbactam (49.4%). Klebsiella sp. is most commonly sensitive to Polymyxin B (100%) , Colistin (100%) , chloramphenicol (45%) , Imipenem (45%) and Cefoperazone/Sulbactam (38.3%). Pseudomonas aeruginosa is most commonly sensitive to Polymyxin B (100%) , Colistin (100%) , Imipenem (59.7%) , cefepime tazobactam (52.8%) and Piperacilin tazobactam (50.7%) . E.coli is most commonly sensitve to Polymyxin B (100%) , Colistin

(100%) , Amikacin (77.3%), Imipenem (70.6%) , Chloramphenicol (68.1%) , Cefoperazone sulbactam (64.7%) , Gentamicin (52.1%).

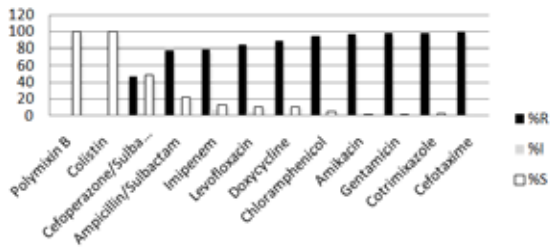

Figure 1 : Antibiotic suceptibility pattern of Acinetobacter sp.

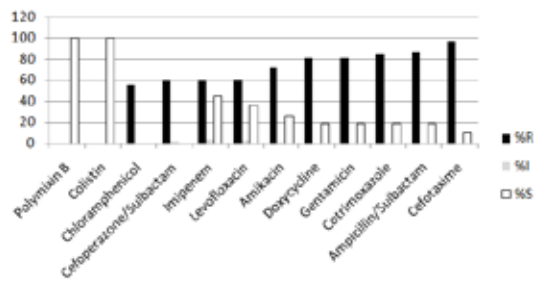

Figure 2 : Antibiotic suceptibility pattern of Klebsiella sp.

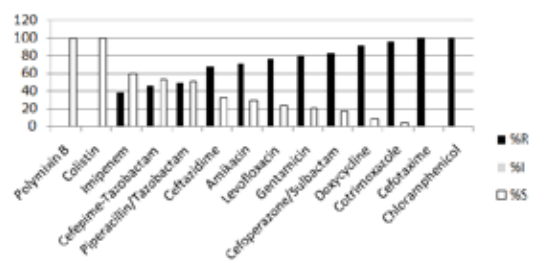

Figure 3 : Antibiotic suceptibility pattern of Psuedomonas aeruginosa

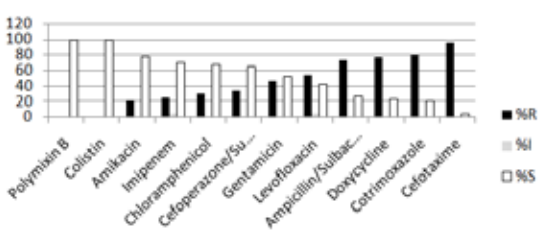

Figure 4 : Antibiotic suceptibility testing of E.coli

DISCUSSION

Our study included types and antibiotic susceptibility pattern of bacterial organism isolated from different samples from critically ill patients after 48 hours of admission to identify hospital acquired infections.

In present study, the infection rate among ICU patients was 48.78%. Most common organisms isolated were Acinetobacter species (30.92%) and Klebsiella sp. (29.77%) followed by Pseudomonas aeruginosa (22.9%) , E.coli (12.98%).

In study by Barai L et al the most predominant isolates were Pseudomonas aeruginosa (26.5) followed by Klebsiella pneumoniae (15.3) and Staphylococcus epidermidis (14.9)[10] . Another study in ICU at Birdem also showed growth obtained from 34% of the samples yielding 632 organisms with major organism isolates as Pseudomonas spp. (29.1), Acinetobacter spp. (27.5), Candida spp. (12.8), Escherichia coli (10.3) and Klebsiella spp. (9.7), and Staphylococcus aureus, Enterobacter spp., Citrobacter spp., Enterococcus spp.,Providentia spp. and Serratia spp. (10.6) of isolates4. But in a European ICU, Staphylococcus aureus was as the most frequently isolated organisms (30.1) followed by Pseudomonas aeruginosa (28.7), Coagulase negative staphylococcus (19) and yeast (17.1) [4]. While in the Jordan University hospital isolated pathogens, in descending order were Staphylococcus aureus (40), Acinetobacter spp. (28), Pseudomonas spp. (23), Enterobacter spp. (20), Coagulase negative staphylococcus (19), Candida spp. (19), Klebsiella spp. (17), Escherichia coli (15) and Enterococcus[11] Study by Shehabi et al showed E.coli isolates 14%[1].

All 4 common isolates are 100% sensitive to PoymyxinB and colistin. Carbapenems and Beta lactam-Betalactam inhibitor combination are showing emerging resistance now.

CONCLUSION

Most socmmon organism were Acinetobacter sp., Klebsiella sp., Pseudomonas aeruginosa and E.coli. All 4 common isolates are 100% sensitive to PoymyxinB and colistin. Carbapenems and Beta lactam-Betalactam inhibitor combination are showing emerging resistance now.

Nosocomial infections and antimicrobial resistance in the ICUs is a major deterrent to patient outcome, increasing duration of patient stay as well as expense. The high frequency of multidrug resistant bacteria in ICUs suggests that we need to prescribe broad-spectrum antibiotics more wisely in order to reduce pressure on sensitive strains. Emphasis was laid on various infection control measures such as universal precautions and stringent adherence to hand washing practices; formulation and antibiotic policy; Survillence activities and appointment of infection control practitioners.

LIMITATIONS

Patients who were in the incubation period of nosocomial infections on discharge, who manifests it after discharge, were not covered in current study. Contribution of their load to current study prevalence is unknown.

Volume : 4 | Issue : 2 | February 2015 • ISSN No 2277 - 8179

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