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Original Research Paper

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ROLE OF MULTIDRUG RESISTANT ORGANISMS IN MICU-VENTILATOR ASSOCIATED PNEUMONIA FROM A TERTIARY CARE CENTRE IN INDIA

Deepa R*

Associate professor, Microbiology, SR medical college and research centre,Varkala *Corresponding Author

ABSTRACT

Ventilator associated pneumonia(VAP) is one of the most common nosocomial infections among patients in Intensive care units.The present study aimed at detecting the incidence of VAP in the MICU of our hospital. Gram negative bacilli have been found to be major pathogens of VAP and they are becoming more and more resistant to commonly used antibiotics .The high incidence of VAP and MDR in our study could be attributed to lack of barrier nursing and over use of second line drugs. Appropriate antimicrobial stewardship includes optimal selection, dose, and duration of treatment, as well as control of antimicrobial use, will prevent or slow the emergence of resistance among microorganisms.VAP posses great management challenge to the physician because of multidrug resistant (MDR) nature of the causative agents(2).

KEYWORDS : Ventilator associated pneumonia, endotracheal intubation, multidrug resistant, antimicrobials, extended spectrum β lactamase

INTRODUCTION

Ventilator associated pneumonia(VAP) is defined as pneumonia occurring more than 48hrs after endotracheal intubation and initiation of mechanical ventilation (MV) including pneumonia developing even after extubation. Pneumonia is frequently encountered in patients admitted to intensive care units (ICU) either at the time of admission or later as ventilator associated pneumonia (VAP). It is the most common nosocomial infection which affects patients in the intensive care units.(1) Appropriate antimicrobial stewardship includes optimal selection, dose, and duration of treatment, as well as control of antimicrobial use, will prevent or slow the emergence of resistance among microorganisms.VAP posses great management challenge to the physician because of multidrug resistant (MDR) nature of the causative agents(2).

MATERIAL AND METHODS

The present study was carried out between September2016 – April 2017 to detect the bacterial pathogens and their susceptibility pattern among clinically suspected VAP cases admitted in MICU of Travancore Medical College, Kollam. Approval from the Institutional Research and Ethical committee was obtained prior to the commencement of the study. Samples were collected aseptically from 100 patients. Identification of all causative microorganisms was performed by standard microbiological methods.

Inclusion criteria: All the patients who were under mechanical ventilation for more than 48 hours in MICU with the pulmonary infiltrates and purulent secretions.

Collection:

Endotracheal Aspirate (EA) was collected at the time of admission, 48 hours, 72 hours and depends on duration of ventilation. Endotracheal aspirate (≥1 ml) or tip of endotracheal tube was collected under aseptic precaution after 48 hours of intubation.

Gram stain of the specimen showing >25 polymorphonuclear cells/low power field and bacteria/ oil immersion field was considered as diagnostic. Quantitative cultures of the specimen were done on Mac Conkey agar, Blood agar and the organisms were identified by standard biochemical tests.

Isolates identified were subjected to antibiotic susceptibility testing on Mueller Hinton Agar by Kirby Bauer disc diffusion method using a panel of antibiotics as per CLSI guidelines.(3) Gram negative bacilli resistant to third generation cephalosporins were tested for production of extended spectrum lactamase (ESBL) and AmpC lactamase. Metallo β lactamase (MBL) were detected among isolates resistant to carbapenems. *Staphylococcus aureus* resistant to cefoxitin were tested for MRSA.

For Gram-positive bacteria, vancomycin (30 μg), linezolid (30 μg), ciprofloxacin (1 μg), azithromycin (30 μg), gentamicin (5 μg), cefoxitin (30 μg), and tigecycline (15 μg) were selected. For Gram-negative bacteria, piperacillin + tazobactam (100 μg/10 μg), amikacin (5 μg), ciprofloxacin (1 μg), cefotaxime (30 μg), ceftazidime (30 μg), meropenem (10 μg), polymyxin B (300 μg), and tigecycline (15 μg) were selected. Suspected ESBL confirmed by combination disk test using ceftazidime (30 μgm) and ceftazidime + clavulanic acid (30 μg/10 μg) disks. Isolates that yielded a cefoxitin zone diameter of <18 mm and resistant to third-generation cephalosporins were tested for AmpC enzyme production, by the popular AmpC disk test. Modified Hodge Test was carried out for the detection of carbapenemase.(4)

RESULTS

Specimens were collected from 100 patients who were given antimicrobial treatment, of which 68 (68%) were cultured positive and 32 (32%) were negative. Of these positive cultures 11 (16%) samples had polymicrobial growth (two organisms). Among 68 isolates, 61 were Gram negative bacilli and 7 were *S. aureus*. *Acinetobacter* species were commonest 33 followed by Klebsiella pneumonia 23, *Pseudomonas* species 12.Table 1.

Presence of ESBL was seen in 48(74%) in Gram negative bacilli. The *antibiogram* of the gram negative bacilli showed that 59(91%) isolates were multidrug resistant to ciprofloxacin(84%), amikacin (87%), piperacillin (87%), meropenem (22%), cefoperazone-sulbactum (32%), piperacillin-tazobactum (25%). MRSA were three isolates.

Table 1 showing the organisms isolated

Table 1

Organism	Tracheal aspirate(%)
P. aeruginosa	09(13%)
A.baumannii	29(43%)
K. pneumonia	23(34%)
E.coli	4(6%)
MRSA	3(4%)
TOTAL	68

DISCUSSION

The present study aimed at detecting the incidence of VAP in the MICU of our hospital. The high incidence of VAP and MDR in our study could be attributed to lack of barrier nursing and over use of second line drugs. The pathogens which are

responsible for VAP vary depending on the duration of mechanical ventilation, prior antibiotic exposure and length of hospital stay. Gram negative bacilli have been found to be major pathogens of VAP and they are becoming more and more resistant to commonly used antibiotics which is similar to other studies conducted in Asia(5). Colistin and piperacillin/tazobactam may be used for successful treatment of multidrug resistant *Acinetobacter species* and *Pseudomonas species*. In our study 16% samples had polymicrobials .Colonization of ventilators often occurs with more than one type of organisms, which may lead to polymicrobial infections

Two groups of risk factors for VAP have been identified — namely ventilation-related factors (instrumentation of the airway with an endotracheal tube and subsequent micro aspirations) and, less frequently, patient-related factors (for example, pre-existing pulmonary disease) —and only the former is accessible to prevention. The two guidelines of European and U.S. guidelines agreed that a bacteriological sample should be performed before any antibiotic treatment in order to reduce antibiotic exposure (6).The alarming rate of drug resistance in Acinetobacter and pseudomonas species is a threat to the hospital as well as patient care.

The appropriate infection control practices and prevention of ICU-acquired infections remains a keystone in the management of critically-ill patients. VAP increases the cost of care and utilization of the resources. So the rational use of initial antibiotics prevents the resistant pathogens. This is one important way to prevent the emergence of drug-resistant organisms.

CONCLUSION

Local epidemiological information can help in guiding the initial empirical antibiotic therapy, which would be more rationale and help in decreasing mortality and morbidity. This would also help in preventing development of more resistant strains. Antimicrobial stewardship programs can optimize antibiotic selection, dose, and duration to increase efficacy in targeting causative pathogens and allow the best clinical outcome.

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