ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 02 | February - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

BACTERIOLOGICAL PROFILE AND ITS SUSCEPTIBILITY PATTERN IN PATIENTS OF VENTILATIOR ASSOCIATED PNEUMONIA ADMITTED IN MEDICAL INTENSIVE CARE UNIT(MICU), PMCH, PATNA

Medical Microbiology

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ABSTRACT

INTRODUCTION Ventilator associated pneumonia (VAP) is defined as pneumonia that occurs more than 48hrs following endotracheal intubation and initiation of mechanical ventilation. VAP remains a major cause of mortality and morbidity among ICU's patients. **MATERIAL AND METHOD** A total of 100 samples were collected from patients admitted in medical ICU in PMCH, Patna. Patients should have sign and symptoms suggestive of VAP. Culture, identification, and antibiotic sensitivity of organism was done. **OBSERVATION AND RESULT** The microbiological results revealed that gram negative bacilli were the most common bacterial agents responsible for VAP and accounted for 88% of all the causative agents. The most common isolated organisms were Acinetobacter baumannii (36%) followed by pseudomonas aeruginosa (24%), Klebsiella pneumoniae (18%), klebsiella oxytoca (8%), E. coli (4%). Staph. aureus (10%). 70% of the isolated VAP pathogen were multidrug resistant. **CONCLUSIONS** VAP is increasingly associated with MDR pathogens. Production of ESBL, AmpC beta lactamases and metallo beta lactamases were responsible for the multidrug resistance of these pathogens. Increasing prevalence of MDR pathogens in patients with late onset VAP indicate that appropriate broad-spectrum antibiotics should be used to treat them. It is useful in implementing simple and effective preventive measures including precaution during emergency intubation, minimizing the occurrence of reintubation, and judicious use of antibiotics.

KEYWORDS

Ventilator Associated Pneumonia, Intensive Care Unit, Extended Spectrum Beta Lactamase, Ampc Beta Lactamase, Metallo Beta Lactamase.

INTRODUCTION

Ventilator-associated pneumonia (VAP) is defined as pneumonia that develops more than 48 hours after endotracheal intubation and initiation of mechanical ventilation. It is characterized by the presence of new or progressive radiographic infiltrates, fever, changes in white blood cell counts, changes in sputum disposition, and detection of the causative pathogen.

VAP is usually divided into early-onset and late-onset VAP. Early-onset VAP occurs within his first 4 days on mechanical ventilation (MV), usually has a good prognosis, and may be due to antibiotic-sensitive organisms. Late-onset VAP occurs 5 days (or longer) after initiation of mechanical ventilation. It is caused by the MDR pathogen and is associated with increased patient mortality and morbidity.

VAP risk is highest early in hospital admission, estimated at 3% per day for the first 5 days of ventilation, 2% per day for days 5-10 of ventilation, and 1% per day after 10 days is specified. VAP should be diagnosed early and treated with appropriate antibiotics. This has been shown in several studies that have shown that delayed administration of appropriate antibiotic therapy in patients with VAP is associated with increased mortality.

The most common pathogens of VAP include Acinetobacter, Pseudomonas aeruginosa, Klebsiella species and MRSA (methicillin-resistant Staphylococcus aureus). Among them, Pseudomonas and Acinetobacter species are often multidrug resistant, due to the production of ESBLs (extended-spectrum beta-lactamases), Amp-C beta-lactamases, and metallo-beta-lactamases. VAP therefore poses a serious complication in endotracheally intubated patients in intensive care units worldwide. This leads to negative clinical outcomes and increased healthcare costs. The causes of VAP vary by patient population and intensive care unit type. Therefore, the local microbiota associated with VAP and patterns of its susceptibility should be studied in all clinical settings that may aid in the effective and rational use of antimicrobials. The current study found bacteria commonly associated with VAP in the ICU of our hospital and investigated, their antibiotic susceptibility patterns with a particular focus on multidrug-resistant pathogens.

MATERIALAND METHODS

The study was conducted on 100 patients over a period of one year in the MICU of Patna Medical College and Hospital, Patna. This study included all critically ill adult patients over the age of 18 who were on a ventilator for 48 hours or more. 0.01 ml intratracheal samples were incubated overnight at 37° C. for 24 and 48 hours on blood agar, MacConkey agar and nutrient agar plates. Growth plates were analysed. Bacterial isolates were identified by standard biochemical tests.

Antimicrobial susceptibility testing was performed on Muller-Hinton agar and interpreted according to Clinical and Laboratory Standards Institute (CLSI) guidelines. Meropenem (10µg) piperacillin tazobactum (100/10µg), ceftazidime (30 µg), cefotaxime (30 µg), ceftazidime & clavulanic acid, imipenem (10 µg), gentamicin (10 µg), amikacin (30 µg) Ciprofloxacin (5 µg). For Gram-positive organisms, erythromycin (15 µg), penicillin (10 U), ampicillin (30 µg), co-trimoxazole (25 µg), cefoxitin (30 µg), and vancomycin (30 µg) were tested. Escherichia coli ATCC 25922, Staphylococcus aureus ATCC 25923, and Pseudomonas aeruginosa ATCC 27853 were used as quality controls.

RESULT

A total of 100 patients with suspected ventilator-associated pneumonia who met the inclusion criteria were enrolled in this study. Of the 66 males and 34 females, the majority of patients were younger than 30 years (25%), followed by aged 51–60 years. (22%)

The clinical spectrum of the study population indicates that poisoning (30%) was the largest number of cases enrolled in the study, followed by intra-abdominal disease (17%).

Diagnosis	Percentage
OPC Poisoning	30%
Intra-Abdominal Disease	17%

Acinetobacter baumannii (36%) was the most commonly isolated organism in VAP patients, followed by Pseudomonas aeruginosa (24%), Klebsiella pneumoniae (18%), Klebsiella oxytoca (8%), Escherichia coli (4%), and Staphylococcus aureus (10%)

Organisms	Percentage
Acinetobacter Baumannii	36
Pseudomonas Aeruginosa	24
Klebsiella Pneumoniae	18
Klebsiella Oxytoca	8
Escherichia Coli	4
Staphylococcus Aureus	10

Acinetobacter baumannii showed reduced susceptibility to first-line drugs such as ceftazidime (11%), quinolones (ciprofloxacin) (33%) and amikacin (44%). They were 67% sensitive to carbapenems and 44% sensitive to piperacillin tazobactam.In P. aeruginosa, 67% of isolates were susceptible to amikacin, 61% to carbapenems, and 50% to piperacillin-tazobactam. Among Enterobacteriaceae isolates, 67% were susceptible to amikacin, 33% to quinolones, and 83% to piperacillin-tazobactam. All Enterobacteriaceae isolates were sensitive to carbapenems.

Staphylococcus aureus isolated in our study showed 50% susceptibility to quinolones and amikacin. All isolates were sensitive

to vancomycin. All isolates were methicillin-resistant Staphylococcus aureus and were associated with late-onset VAP.

Antibiotic Isolates	Acinetobacter Baumannii	Pseudomonas Aeruginosa	Klebsiella Pneumoniae	Klebsiella Oxytoca	Escherichera Coli
Amikacin	44%	67%	67%	50%	100%
Cotrimoxazole	22%	0%	0%	0%	0%
Ciprofloxacin	33%	17%	33%	50%	0%
Cefotaxime	0%	0%	0%	0%	0%
Ceftazidime	11%	33%	0%	0%	0%
Ceftazidime & Clavulanic Acid	0%	0%	67%	100%	100%
Cefoxitin	44%	50%	67%	100%	100%
Gentamicin	22%	50%	33%	50%	100%
Imipenem	67%	61%	100%	100%	100%
Meropenem	67%	61%	100%	100%	100%
Piperacillin Tazobactum	44%	50%	67%	100%	100%

DISCUSSION

A total of 100 patients with suspected ventilator-associated pneumonia who met the inclusion criteria were enrolled in this study. Of these, 66 were male and 34 females. The clinical spectrum of the study population indicates that poisoning (33%) was the largest number of cases enrolled in the study, followed by cardiovascular disease (17%).

In the current study, VAP was common (30%) in patients with organophosphate poisoning. A similar study by Panwar et al. showed that VAP was primarily associated with poisoning cases.

In this study 34.8% were classified as early-onset and 65.2% as late-onset. Similar results were reported by Mukhopadhyay et al. 38% early-onset VAP and 62% late-onset VAP. Classification of VAP is important for initiating early empiric antibiotic therapy. Late-onset VAP is often associated with MDR pathogens and should be treated with broad-spectrum antibiotics.

In the current study, Gram-negative bacilli were the predominant pathogens (88%), followed by Gram-positive cocci (9%) of VAP patients. Among Gram-negative bacilli, non-fermentative bacteria were the predominant pathogen causing VAP at MICU.

In the present study, Acinetobacter baumannii (36%), followed by Pseudomonas aeruginosa (24%), were the most frequently isolated pathogens in VAP patients and were also associated with late-onset VAP, similar to the study by Craven et al. Common organisms causing early onset of VAP belonged to the Enterobacteriaceae group, including Klebsiella pneumoniae (25%), Klebsiella oxytoca (25%) and Escherichia coli (12.5%). In a study by Dey et al. Manipal, the most common organism causing both early-onset and late-onset his VAP was Acinetobacter spp. (48.94%) followed by P. aeruginosa (25.53%).

Acinetobacter baumannii, the primary pathogen isolated in this study, exhibited decreased susceptibility to first-line drugs such as ceftazidime (11%), quinolones (ciprofloxacin) (33%), and amikacin (44%). showed. They were 67% sensitive to carbapenems and 44% Sensitive to piperacillin and tazobactam.

In Pseudomonas aeruginosa, 67% of isolates were susceptible to amikacin, 67% to carbapenems, and 50% to piperacillin-tazobactam. Similar results were obtained in a study by Joseph et al. and Dey et al. In this study, mortality was significantly higher in patients with late-onset VAP (46.5%) due to multidrug-resistant infections caused by Acinetobacter baumannii and Pseudomonas aeruginosa compared to early-onset VAP (12.5%). was found to be high.

CONCLUSION

The success of VAP depends on the rapid identification of the causative organism. Empirical treatment based on knowledge of the most common microbes and their resistance patterns could reduce morbidity and mortality, shorten hospital stays, reduce treatment costs, and ultimately reduce the incidence of her MDR bacteria in a VAP patient.

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