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Bacteriological study on mechanically ventilated patients and incidence of ventilator associated pneumonia

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Abstract

Aim: To determine the bacteriology of mechanically ventilated patients and to know about incidence of ventilator associated pneumonia in a tertiary care hospital. Ventilator associated pneumonia is the commonest hospital acquired infection in ICUs. It is associated with increased morbidity and mortality of ICU patients. Early diagnosis of ventilator associated pneumonia is crucial to save the patient.

Materials and Method: 100 patients who were admitted to medical ICU and were on mechanical ventilation for more than 48 hours were included in the study group.

Under strict aseptic precautions endotracheal aspirates and suction tips were collected from the patients and were subjected to Gram staining, culture, biochemical tests and sensitivity. The patients were divided into early onset VAP and late onset VAP cases. VAP cases were identified by using clinical pulmonary infection scoring system.

Results: Incidence of VAP in the study was 21%. There was no association between gender difference and incidence of VAP. All culture positive cases are not VAP cases. Among the isolates obtained Gram negative bacilli were the commonest, Acinetobacter taking the first place followed by Pseudomonas. Most of them were resistant to commonly used antibiotics.

Keywords: Mechanical ventilation, Ventilator associated Pneumonia, ICU

Introduction

Mechanical ventilation is a common life saving procedure done for many patients admitted to ICUs. Prolonged ventilation leads to development of ventilator associated pneumonia.(1) Ventilator associated pneumonia is a hospital acquired pneumonia occurring after 48hours of mechanical ventilation. VAP is the second most common hospital acquired infection.(2)

VAP which develops during the first 4 days of mechanical ventilation is early onset VAP and VAP which develops after 5 days of mechanical ventilation is considered as late onset VAP.(4,5) Incidence of VAP is around 9-27% in mechanically ventilated patients.(2) VAP is associated with increased morbidity and mortality. It also prolongs the hospital stay of the patient. Development of VAP depends on presence of risk factors like virulence of invading organisms, and host immunity.(2,9,10) VAP with multidrug resistant organisms is becoming more common. Prolonged mechanical ventilation and recent antibiotic use are responsible for this.(3) Colonization of airway is common and mere culture positivity is not considered as VAP. VAP cases are clinically diagnosed by using clinical pulmonary infection score.

Criteria for diagnosis

1. Temperature >38.3 c or < 36 c
2. Leucocyte count > 12000cells/mm^3 or < 4000/mm^3
3. paO_2/FiO_2 ratio
4. New infiltrates / cavitation/ consolidation in chest radiograph
5. Culture positivity
6. Purulent secretions/ abundant secretion.

Gram negative bacilli are commonest isolates from mechanically ventilated patients.(4,5) Most of them are multidrug resistant strains which are difficult to treat. Many studies have shown that early diagnosis of VAP initiation of appropriate antibiotic therapy is very crucial to reduce the mortality associated with VAP.

Materials and Method

The present study was conducted for a period of 1 year in a tertiary care hospital. 100 patients between the age group of 25 – 70years who were on mechanical ventilation for more than 48 hours from medical and surgical ICU were included in the study group. Patients who were suffering with pneumonia at the time of admission were excluded from the study group. After taking informed consent from the patients relatives the study was done.

With aseptic precautions endotracheal aspirates and suction tips were collected from the patients. The samples were processed with in 1 hour of collection. Gram staining, culture, biochemical tests and sensitivity were performed on the samples. Colony counts of > 105 CFU/ml were considered significant. Patients were evaluated for other co-morbidities.

ESBL producers were determined by testing the isolates with antibiotic discs of ceftazidime 30ug and ceftazidime clavulinic acid 10 ug(30/10) combination disc. A > 5mm increase in zone diameter of either antimicrobial agent tested in combination with clavulanate versus the zone diameter of the agent when tested alone confirms the ESBL producer. Metallobeta lactamase production was detected by using the Imipenem – EDTA synergistic test.

Results

Table 1: Isolates detected in early VAP and late VAP cases

Isolates	No. of VAP cases	Early VAP cases	Late VAP cases
Acinetobacter[22]	8	6	2
Pseudomonas[14]	5	4	1
Klebsiella[14]	4	4	-
E.coli[6]	2	2	-
CONS[4]	0	0	0
MRSA[2]	2	2	0

Table 2: Gender distribution among VAP cases

Gender	Total No. of cases	No. of VAP cases	Percentage of VAP
Male	76	18	23.6%
Female	24	03	12.5%
Total	100	21	

Table 3

Gender	No. of culture positive cases	No. of VAP positive cases
Male	46	18
Female	18	3

Table 4: Bacteria isolated from total samples

Bacteria	Number isolated
Acinetobacter	22
Pseudomonas	14
Klebsiella	14
E.coli	6
CONS	4
MRSA	2

Out of 100 patients, 76 were male patients and 24 were female patients.

Table 1 shows out of 21 patients who developed VAP 18 patients developed early onset VAP (85.7%) and 3 patients developed late onset VAP (14.2%). Late onset VAP was due to multidrug resistant non fermenters.

Table 2 shows Incidence of VAP was 23.6% in male patients and 12.5% in female patients.

Out of 100 samples, 62 were culture positive.

Among the 62 culture positive mechanically ventilated patients 21 of them developed VAP.

Table 4 shows Gram negative bacteria were the commonest isolates from the samples, Acinetobacter taking the first place[22] followed by Pseudomonas,[14] Klebsiella,[14] Escherichia coli[6] and MRSA.[2]

Among the total number of culture positive samples, 8 isolates were metallobetalactamase producers, 2 isolates were Methicillin resistant Staphylococcus aureus.

Discussion

In our study 64% of mechanically ventilated cases were culture positive, all culture positive cases were not meeting CPIS score so they were not considered as VAP cases.

Incidence of VAP in this study was 21% and VAP rate was 17.5/1000 ventilator days.

In the studies of Gupta et al and Deba Prasad et al it was found to be 28% and 30% respectively.

According to Rodrigues et al VAP rates are around 10- 52% in developing countries.

Different types of clinical cases were included in our study like road traffic accidents, poisoning cases, meningitis, CVA, Dengue shock syndrome etc.

Gram negative bacilli were the predominant bacteria isolated from ventilated patients in our study. The most common organism isolated was Acinetobacter baumanii which is responsible for 38% of VAP cases followed by Pseudomonas 23.8%, Klebsiella pneumoniae (19.0%) and E.coli 9.5%.

Among the Gram positive isolates MRSA was responsible for 9.5% of VAP cases.

In studies of Rajan et al and Veena et al Acinetobacter was the commonest organism associated with VAP followed by Pseudomonas aeruginosa, Klebsiella pneumoniae and E.coli.

Other studies of Babasaheb et al and Deba Prasad et al Pseudomonas aeruginosa was the commonest isolate followed by Acinetobacter.

6 isolates of Acinetobacter baumanii and 2 isolates of Pseudomonas aeruginosa were metallobetalactamase producers. They were resistant to carbapenems and sensitive to polymyxin B and colistin.

5 isolates of Klebsiella and 4 isolates of E.coli were ESBL producers. They were resistant to all beta lactam group of drugs. They were susceptible to carbapenems.

2 isolates of MRSA were associated with early VAP, they were resistant to all beta lactam group of drugs but were susceptible to linezolid and vancomycin.

Conclusion

Do not treat colonizers, clinically correlate culture positive samples with CPIS score before confirming as VAP.

Acinetobacter is the commonest isolate in our hospital.

By following safe infection control practices and by providing proper bundle care can help in reducing the incidence of VAP.

Emergence of multidrug resistant pathogens can be prevented by judicious use of antibiotics and by adopting Institutional antibiotic policy.

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