Original Research Paper

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# Bacteriological Profile and Antibiotic Sensitivity Pattern of Ventilator Associated Pneumonia in a Tertiary Care Hospital

Medical Science

KEYWORDS : Ventilator associated pneumonia, Bacteria, Antibiotic.

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## ABSTRACT

*Introduction: Approximately, 86 % of nosocomial pneumonias are associated with mechanical ventilation and are known as ventilator associated pneumonia. The patients who are admitted in ICUs are always at threat of dying. This threat is not because of their critical illness but also from nosocomial infections. One fourth of critically ill patients get affected by nosocomial pneumonia. This is a real matter of concern for microbiologists and physicians. Material and method: This study is done for a period of six month, during this time a total of 50 patients were found to be associated with VAP after diagnosing clinically. Endotracheal aspirates and endotracheal tube tips after extubation were collected and processed. Results: The analysis of 50 patients showed the incidence of VAP to be 78% among the mechanically ventilated patients, out of which 46.15% had early-onset VAP and 53.85% had late-onset VAP. Klebsiella spp. (26.66%) followed by Escherichia coli (24.44%), were the most commonly isolated pathogens in both types of VAP. Conclusion: Prompt and early diagnosis of pneumonias would however be the mainstay in bringing down mortality. Endotracheal aspirate and Endo tracheal tube samples have been found to be very useful in isolation of etiological agents and should be sent to the clinical microbiology lab as early as possible in a patient on mechanical ventilation more than 48 hours.*

**Introduction**

Ventilator associated pneumonia is defined as pneumonia occurring in patients admitted to critical care units for more than 48 hours after endo-tracheal intubation and initiation of mechanical ventilation, including pneumonia developing even after extubation[1]. It is usually designated as either early onset (occurring within 96 hours of start of mechanical ventilation) or late onset (>96 hours after start of mechanical ventilation) [1]. The problem with this condition is that it is very difficult to diagnose accurately and expensive to treat. Its development makes patient helpless to stay for long in the Intensive care unit (ICU), and leads to significant morbidity and mortality.

9-27% of all intubated patients suffer from VAP [2]. The risk of VAP is highest early during the hospital stay, 3% per day during the first 5 days of ventilation, 2% per day of 5 to 10 days of ventilation and 1% per day after 10 days [3]. A wide spectrum of bacterial pathogens are responsible for VAP, it is seen that VAP may be polymicrobial and very rare found that a viral or fungal pathogens causing VAP in immune compromised hosts [2, 4].

Hence, this study was aimed to detect the bacterial pathogens causing VAP among patients who were mechanically ventilated in the Medical Intensive Care Unit of our tertiary care hospital and to prepare antibiogram of pathogens mainly associated with.VAP.

**Material and Methods**

**Sample size and study period:** The study was conducted at a tertiary care teaching hospital for a period of six months from Jan 2014 to June 2014. The study was done by taking samples from 50 clinically diagnosed cases of VAP in ICU during this period.

**Study design:** Cross sectional study

**Data collection:** Clinically diagnosed ventilator associated pneumonia cases were observed and data such as age, gender, date of admission, risk factors involved, underlying diseases, duration of mechanical ventilation, antibiotic therapy etc. were obtained. Endotracheal aspirates were collected from the patients and subjected to microbiological processing.

**Specimens collected:**

1. Endotracheal aspirates
2. Endotracheal tube tips after extubation

**Inclusion Criteria:**

1. ICU patients who are intubated and on mechanical ven tilation for more than 48 hours.
2. Patients in whom VAP is clinically suspected.

**Exclusion Criteria:**

1. Patients who have developed pneumonia within 48 hours of mechanical ventilation were excluded.

**Results** The clinical spectrums of patients is shown in Table 1, Prevalence of early and late onset of VAP is depicted in Table 2 & Graph 1, Correlation between organism and onset of VAP is illustrated in Table 3 and Antibiotic sensitivity pattern of bacterial isolates is shown in Table 4.

**Table 1 Clinical spectrum of patients**
**(about here )**
**Table (2) and Graph (1) Prevalence of early and late onset of VAP**
**(about here )**
**Table 3 Correlations between organism and onset of VAP**
**(about here )**
**Table (4) Antibiotic sensitivity pattern of bacterial isolates**
**(about here )**

**Discussion**

The aim of the study was to find out the bacterial pathogens causing VAP in our setup along with the susceptibility pattern for antibiotics. This study was done enrolling patients admitted and put on mechanical ventilation

for ≥48 hours in ICU of NIMS medical college and hospital. Endotracheal aspirates and Endo-tracheal tube were collected from patients with suspected VAP and routine cultures were performed on all samples. A total of 50 Patients were admitted to MICU and put on mechanical ventilation during the 6 month period from January 2014 to June 2014. The analysis of 50 patients showed the incidence of VAP to be 78% among the mechanically ventilated patients, out of which 46.15% had early-onset (< 96 hours of mechanical ventilation) VAP and 53.85% had late-onset (>96 hours of mechanical ventilation) VAP (Table/ fig 2). Similar results were obtained by Dey A, Bairy Indira [5] with 47.7% being early-onset VAP and 52.3% late-onset VAP. Ventilator associated pneumonia was more preponderant in males, the common age group being 41- 60 years in both sexes also in accordance with Dey A, Bairy Indira [5]. In this study, by routine culture test we observed that Gram negative bacilli were predominant over gram positive cocci causing VAP. 86.36% Gram negative bacilli accounts for VAP and only 13.64% Gram positive cocci were associated with VAP (Table/ fig 3). Similar results were reported by Chawla R [6] in their study also i.e. 87% of patients with VAP were infected with Gram negative bacilli. Our observation also correlates with Apostolopoulou E, Bakakos P, Katostaras T et al.[7] who depicted 84% GNB prevalence and 16% GPC prevalence in their study. Among the 39 VAP patients, 33 (84.61%) patients had infection with only one type of microorganism and rest 6 (15.38%) patients had polymicrobial infection. Our study does not correlate with various authors [2, 5, 7], as in their study pseudomonas Spp. were predominant over other GNB isolates associated with VAP. The most frequently isolated organisms in VAP patients was Klebsiella spp. (26.66%) followed by Escherichia coli (24.44%). The predominant organism in the early-onset as well as late-onset VAP group was also Klebsiella spp.The isolates were then subjected to antibiotic sensitivity test by Kirby- Bauer disk diffusion method. The drugs were used accordingly based on the microscopic examination (GNB or GPC). We observed that most of the GNB isolates were sensitive to Piperacillin/Tazobactam, Cefoperazone/Salbactam, and Imipenem (Table/ fig 4). Similar sensitivity towards Piperacillin/Tazobactam, Cefoperazone/Salbactam, and Imipenem was reported by Jakribettu RP and Boloor R [8]. Carles MVP, Easow JM, Joseph NM et al. [9] also reported high sensitivity of Gram negative bacilli isolates against Imipenem, Piperacillin/Tazobactam followed by amino glycosides. Our observations are also in accordance with Rajasekhar T, Anuradha K, Suhasini T et al [10], Trouillet JL, Chastre J, Vuagnat A[11] and Payal MP, Tanuja JB, Nanda S[12] show the same sensitivity pattern.

**Conclusion**

In the light of observations we suggest necessity for active surveillance for VAP in all ICU setups. Our results show discordance with many studies. Keeping track of incidence of VAP and microorganism associated with VAP along with information on the susceptibility patterns will surely help in selection of the appropriate antibiotic for better treatment. Simultaneously, also diminish the emergence of drug resistant strains by judicial and appropriate use of antibiotics. This study provides a baseline data of current scenario of VAP in our set up which can be utilized to formulate infection control strategies. An on-going study would be beneficial to maintain a track of the VAP rates. There is also a need for many more hospital based prospective studies in our country to prevent these infections in intensive care setting.

**Table 1 Clinical spectrum of patients**

| DISEASE | No. of Patients | VAP | % age |
|---|---|---|---|
| Head injury | 3 | 3 | 100 |
| Sepsis | 1 | 1 | 100 |
| OP Poisoning | 4 | 4 | 100 |
| Acute renal failure | 5 | 4 | 80 |
| Viral Meningitis | 1 | 0 | 0 |
| Hernia | 1 | 0 | 0 |
| Head injury/RTA | 9 | 8 | 88.88 |
| Stroke | 1 | 0 | 0 |
| Acute on CKD | 1 | 1 | 100 |
| Perforation | 1 | 1 | 100 |
| Burns | 3 | 1 | 33.33 |
| Fracture Femur | 2 | 1 | 50 |
| Enteric fever | 1 | 1 | 100 |
| Pancreatitis | 3 | 2 | 66.66 |
| Fractures | 4 | 4 | 100 |
| Spleenomegaly pyrexia | 2 | 2 | 100 |
| Breathlessness | 1 | 1 | 100 |
| Liver disease | 3 | 1 | 33.33 |
| Kidney disease | 1 | 1 | 100 |
| Aspiration | 1 | 1 | 100 |
| Cancers | 1 | 1 | 100 |
| Puerperal sepsis | 1 | 1 | 100 |

**Table (2) and Graph (1) Prevalence of early and late onset of VAP**

Table No (2) Onset of VAP

| ONSET | Number (n=39) | %age |
|---|---|---|
| EARLY | 18 | 46.15% |
| LATE | 21 | 53.85% |

Graph No (1) Onset of VAP

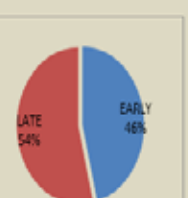


**Table 3 Correlations between organism and onset of VAP**

| ORGANISM | EARLY ONSET | LATE ONSET | TOTAL(n=45) |
|---|---|---|---|
| *Klebsiella spp.* | 8 | 4 | 12 (26.66%) |
| *Escherichia coli* | 7 | 4 | 11 (24.44%) |
| *Citrobacter spp.* | 1 | 6 | 7 (15.55%) |
| *Staphylococcus aureus* | 2 | 2 | 4 (8.88%) |
| *Pseudomonas spp.* | 2 | 1 | 3 (6.66%) |
| *Enterobacter spp.* | 1 | 1 | 2 (4.44%) |
| *Acinetobacter spp.* | 1 | 2 | 3 (6.66%) |
| *Enterococcus* | - | 1 | 1 (2.22%) |
| *A Haemolytic streptococci* | - | 1 | 1 (2.22%) |
| *Candida spp.* | - | 1 | 1 (2.22%) |

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**Table (4) Antibiotic sensitivity pattern of bacterial isolates**

| Antibiotics | Susceptibility | Acinetobacter (n-3) | Pseudomonas (n-3) | Klebsiella (n-12) | Cloxacin (n-7) | Intermediate (n-2) | Escherichia coli (n-11) | Staphylococcus (n-1) | Candida species (n-1) | Enterococcus (n-1) | Staph. aureus (n-4) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Imipenem | S | 1 | 1 | 9 | 4 | 1 | 7 | - | - | - | - |
| Cefoperazone/Sulbactum | S | 1 | - | 5 | 3 | 2 | 2 | - | - | 0 | - |
| Piperacillin/Tazobactum | S | 1 | 2 | 6 | 3 | 1 | 4 | 1 | - | 0 | 1 |
| Tetracycline | S | 0 | 0 | 4 | - | 0 | 0 | 1 | - | 0 | 0 |
| Amikacin | S | 1 | 1 | 5 | 2 | 1 | 5 | - | - | - | 2 |
| Chloramphenicol | S | 1 | - | 3 | 1 | 0 | 3 | 0 | - | 0 | - |
| Ampicillin | S | 1 | 1 | 4 | 2 | 1 | 4 | 1 | - | - | 2 |
| Linezolid | S | - | 2 | - | - | - | - | 1 | - | 0 | 3 |
| Vancomycin | S | - | - | - | - | - | - | 1 | - | 0 | 3 |
| Cefepime | S | - | 3 | - | - | - | - | - | - | - | - |
| Co-Trimoxazole | S | - | 1 | - | - | - | - | - | - | - | - |
| Norfloxacin | S | - | 1 | - | 2 | 1 | - | - | - | - | - |
| Gentamycin | S | - | - | - | - | - | - | 1 | - | 0 | - |
| Cephoxitin | S | - | - | - | - | - | - | - | - | - | 2 |
| Imipenem | R | 2 | 2 | 3 | 3 | 1 | 4 | - | - | - | - |
| Cefoperazone/Sulbactum | R | 2 | - | 7 | 4 | 0 | 9 | - | - | 1 | - |
| Piperacillin/Tazobactum | R | 2 | 1 | 6 | 4 | 1 | 7 | 0 | - | 1 | 1 |
| Tetracycline | R | 3 | 3 | 8 | - | 2 | 11 | 0 | - | 1 | 4 |
| Amikacin | R | 2 | 2 | 7 | 3 | 1 | 6 | - | - | - | 2 |
| Chloramphenicol | R | 2 | - | 9 | 6 | 2 | 8 | 1 | - | 1 | - |
| Ampicillin | R | 2 | 2 | 8 | 5 | 1 | 7 | 0 | - | - | 2 |
| Linezolid | R | - | 1 | - | - | - | - | 0 | - | 1 | 1 |
| Vancomycin | R | - | - | - | - | - | - | 0 | - | 1 | 1 |
| Cefepime | R | - | 0 | - | - | - | - | - | - | - | - |
| Co-Trimoxazole | R | - | 2 | - | - | - | - | - | - | - | - |
| Norfloxacin | R | - | 2 | - | 5 | 1 | - | - | - | - | - |
| Gentamycin | R | - | - | - | - | - | - | 0 | - | 1 | - |
| Cephoxitin | R | - | - | - | - | - | - | - | - | - | 2 |

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