

## Research Article

# A clinico - microbiological study in patients undergoing mechanical ventilation in a tertiary care hospital

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**Received:** 16 May 2016

**Accepted:** 08 June 2016

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### ABSTRACT

**Background:** Ventilator associated pneumonia (VAP) is an important and common complication of mechanically ventilated patients. It is the leading cause of morbidity and mortality in Intensive Care Units (ICU) worldwide. Objective of the study was to isolate and identify the organisms causing VAP and to know their resistance pattern.

**Methods:** A prospective study was carried out over a period of one year in the ICU of a tertiary care hospital. All patients on mechanical ventilation for more than 48 hours were included in the study. The pathogens were identified based on standard procedures including Gram's stain, colony morphology on Blood agar, Mac Conkey agar and SDA and biochemical reactions.

**Results:** The incidence of VAP in our study was 32% and was more common in males compared to females (65.62%) Gram negative organisms were most commonly isolated. Among them Klebsiella, Pseudomonas, Acinetobacter were the commonest organisms. Gram positive bacteria were *Staphylococcus aureus*, Coagulase negative staphylococci and Pneumococci. In 2% of cases *Candida spp* were isolated.

**Conclusions:** Gram negative bacteria were the major pathogenic organisms of VAP in our ICU. Culture of endotracheal aspirates for early diagnosis and its antibiogram will guide for an approach to targeted treatment.

**Keywords:** Endotracheal aspirates, Intensive care unit, Ventilator associated pneumonia

### INTRODUCTION

Ventilator associated pneumonia (VAP) is defined as pneumonia occurring after 48 hours of endotracheal intubation and initiation of mechanical ventilation.<sup>1</sup> VAP is the most common nosocomial infection diagnosed in the ICUs. It is a leading cause of morbidity and mortality in ICU. Incidence of VAP varies greatly from 7-47% of intubated patients.

Despite major advances in techniques in caring for patients whose respiratory tracts are instrumented and the routine use of efficient disinfection procedures for the respiratory equipment, nosocomial pneumonias continue to complicate the course of 7-41% of patients receiving continuous mechanical ventilation.<sup>2</sup> Detection of

causative organisms and their antibiotic susceptibility is crucial for diagnosis of VAP in order to initiate the appropriate antibiotic treatment thereby reducing the adverse effects of inadequate antibiotic treatment on the patient prognosis.<sup>3</sup>

Hence the present study was undertaken to determine the incidence of VAP, to isolate and identify the organisms causing VAP and to know their resistance pattern.

### METHODS

A prospective observational study was conducted in the Department of Microbiology in association with ICU of our institute from July 2009 to June 2010. The approval of the institutional review board was obtained during the

planning phase of the study and each patient gave informed consent prior to participation in the study.

All patients on mechanical ventilation for more than 48 hours were included in the study. The diagnosis of VAP was established using clinical pulmonary infection score (CPIS), which was evaluated on a daily basis until the patient was on ventilator support. CPIS of greater than six was used as diagnostic criteria for VAP.<sup>4</sup> Clinically diagnosed VAP were observed and clinical parameters were recorded from their medical records and bedside charts.

All patients with clinical and radiological signs suggestive of pneumonia on admission were excluded.

Endo tracheal aspirate was collected under aseptic precautions after 48 hours of intubation whenever patient was suspected to have developed VAP in ICU and was immediately taken to the laboratory for processing.

The pathogens were identified based on the standard bacteriological procedures including -

- Grams's stain
- Colony morphology on Blood agar, Mac Conkey agar and SDA
- Biochemical reactions.<sup>5</sup>

Antimicrobial susceptibility was determined by the Kirby-Bauer disc diffusion method.

## RESULTS

A total of 100 patients, who were on mechanical ventilation for more than 48 hours were included in the study. The incidence of VAP in our study was 32%.

Males accounted for 21 (65.62%) cases and females 11 (34.38%) cases of VAP (Table 1).

**Table 1: Sex wise distribution of ventilator associated pneumonia.**

Sex	No. of Cases	Percentage
Male	21	65.62%
Females	11	34.38%

The highest percentage of VAP was seen in the age group of more than 45 years (56.25%). In 1-10 years age group (3.12%), 11-20 years (6.25%), 21-30 years (12.5%) and 31-45 years (21.87%) (Table 2).

In VAP group total 30 bacteria (93.75%) and 2 yeasts (6.25%) were isolated. *Klebsiella* species 8 isolates, *Acinetobacter* and *Pseudomonas* species 6 isolates each were the most common Gram-negative organisms followed by *Staphylococcus aureus* 5 isolates, Coagulase negative staphylococci species 3 isolates and

Pneumococci 2 isolates. The two yeasts were identified as *Candida albicans* (Table 3).

**Table 2: Age wise incidence of ventilator associated pneumonia.**

Age	No. of Cases	Percentage
1-10 years	1	3.12%
11-20 years	2	6.25%
21-30 years	4	12.5%
31-45 years	7	21.87%
>45 years	18	56.25%

**Table 3: Percentage positivity of organisms isolated.**

Bacterial isolates	No. of cases	Percentage
<i>Klebsiella</i>	8	25%
<i>Acinetobacter</i>	6	18.75%
<i>Pseudomonas</i>	6	18.75%
<i>Staph. aureus</i>	5	15.62%
<i>Coagulase Negative Staphylococcus</i>	3	9.375%
Pneumococci	2	6.25%
<b>Fungal isolate</b> <i>candida</i>	2	6.25%

In this study, most of the Gram-negative organisms showed sensitivity to Piperacillin+Tazobactam, Tobramycin, Levofloxacin and Imipenem.

Most of the gram positive organisms were susceptible to Erythromycin and Vancomycin.

## DISCUSSION

VAP is an important nosocomial infection in patients on mechanical ventilation in ICU's.

A total of 100 patients, who were on mechanical ventilation for more than 48 hours were included in the study. The incidence of VAP in our study was 32% which was similar to a study conducted by Shalini et al and Rakshit et al.<sup>6,7</sup>

In relation to gender the incidence of VAP was more among males (65.62%) than females (34.38%) similar to the study of Gandani et al.<sup>8</sup> In different age groups the incidence of VAP was highest in patients more than 45 years of age (56.25%).

A total of 30 bacterial isolates were obtained from the endotracheal aspirate of VAP patients in which the commonest bacterial isolates were gram negative bacilli (66.66%). *Klebsiella* species accounted for 25% followed by *Acinetobacter* species (18.75%) and *Pseudomonas* (18.75%) similar to a study by Reena set et al.<sup>9</sup> *Staphylococcus aureus* (15.62%) was the commonest among the gram positive isolates followed by Coagulase

negative staphylococci (9.37%) and Pneumococci (6.25%). Two isolates were yeast species (6.25%).

Klebsiella was found to be most sensitive to Levofloxacin (87.5%) and Imipenem (75.7%), Acinetobacter was most sensitive to piperacillin+tozobactam (100%) and Imipenem (60%) and Amikacin (60%), Pseudomonas was most sensitive to Tobramycin (75%) and Amikacin (66.4%). Staphylococcus aureus was found to be most sensitive to Ciprofloxacin (80%) & Amikacin (60%).

## CONCLUSION

VAP is a serious problem in the ICU leading to longer hospital stay, higher treatment costs and increased mortality and morbidity. The endotracheal aspirate of patients on mechanical ventilation should be sent for routine culture and sensitivity. The overall outcome of VAPs could improve with the anti-microbial policies of individual centers. Better knowledge of local patterns of pathogens causing VAP can help facilitate treatment choices. Therefore, in addition to aseptic precautions while handling ventilated patients and adequate preventive measures, the choice of antibiotics should be guided by the sensitivity patterns of the involved pathogens. This can significantly improve the outcome for mechanically ventilated patients

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Jampala BL, Toleti S, Kolipaka SR, Myneni RB. A clinico - microbiological study in patients undergoing mechanical ventilation in a tertiary care hospital. Int J Res Med Sci 2016;4: 2856-8.