

## A STUDY OF VENTILATOR-ASSOCIATED PNEUMONIA: INCIDENCE, OUTCOME, RISK FACTORS AND MEASURES TO BE TAKEN FOR PREVENTION

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### Abstract

**Background:** Pneumonia is the second most common nosocomial infection among critically ill patients, affecting 27% of all critically ill patients.

**Methods:** The study was conducted in an intensive care unit (ICU) of a tertiary care centre. A total of 100 patients who were kept on mechanical ventilator were randomly selected. Cases included were patients of both sexes who were kept on mechanical ventilator for more than 48 h, having the age of >15 years. Patients who died or developed pneumonia within 48 h or those who were admitted with pneumonia at the time of admission and patients of ARDS (Acute Respiratory Distress Syndrome) were excluded from the study.

**Results:** The mean duration of mechanical ventilation was found to be 12.3±3.1 days for the non-VAP group and 19.1 ±4.2 days for the VAP group that those requiring prolonged ventilator support (>15 days) had a significantly higher incidence of VAP (*P*-value, 0.001). Supine position and stuporous, comatose patients were found to be risk factors, having a high incidence of VAP, and proved to be statistically significant.

**Conclusion:** Incidence is directly proportional to duration of mechanical ventilation and re-intubation is a strong risk factor for development of VAP. Therefore, duration of ventilation has to be reduced to get rid of morbidity and mortality associated with mechanical ventilation, which can be achieved by administering a proper weaning protocol and titrating sedation regimens as per the need of the patients.

**Keywords:** Incidence, Infection, ICU

### Introduction:

Pneumonia is the second most common nosocomial infection among critically ill patients, affecting 27% of all critically ill patients.<sup>1</sup>

It is one among the leading cause of morbidity and mortality among the hospital acquired infections.<sup>2</sup>

Ventilator associated pneumonia (VAP) refers to hospital acquired pneumonia that occurs within 48 hours or longer after mechanical ventilation (MV). It is characterized by the presence of new or progressive infiltrate, sign of systemic infection (fever, altered white cell count), changes in sputum characteristics.<sup>3</sup> Ventilator-associated pneumonia (VAP) is the most commonly seen nosocomial infection among mechanically ventilated patients and is the biggest concern for critical care specialists. Eighty-six percent of nosocomial pneumonias are associated with mechanical ventilation. Though the incidence of VAP has declined in the developed countries, it continues to be unacceptably high in the developing world.<sup>4,5</sup> VAP that occurs within 48 to 72

hours of MV is termed as early onset VAP. VAP that occurs after this period is considered late onset VAP. VAP is the second most common nosocomial infection in the intensive care unit (ICU) and the most common in mechanically ventilated patients. The incidence of VAP increases with the duration of MV. Approximately 10-28% of critical care patients develop VAP during their stay in the critical care unit. The incidence of VAP increases with the duration of MV. VAP may account for up to 60% of all HealthcareAssociated Infections out of the total. The VAP increases the length of ICU stay of a patient by around 28% and doubles the risk of mortality as compared with patients without VAP. The crude mortality rate for VAP is 27 to 76 %. The Studies in the past have consistently shown that a delay in initiation of appropriate antibiotic therapy is found to increase the mortality among the patients developing VAP.<sup>6</sup>

## Material and methods

The study was conducted in an intensive care unit (ICU) of a tertiary care centre. A total of 100 patients who were kept on mechanical ventilator were randomly selected. Cases included were patients of both sexes who were kept on mechanical ventilator for more than 48 h, having the age of >15 years. Patients who died or developed pneumonia within 48 h or those who were admitted with pneumonia at the time of admission and patients of ARDS (Acute Respiratory Distress Syndrome) were excluded from the study. Most of the patients put of ventilator support were primarily treated elsewhere with antibiotics either in the indoor ward or in other health care centres that was not traceable.

Age, sex, date of admission to ICU, date of initiating mechanical ventilation and mode of assess to the patients' airway, i.e. orotracheal or tracheostomy, were recorded. Indication of mechanical ventilation was noted. In each patient, ventilator mode and settings were recorded and any change in setting was recorded daily.

Patients' vitals, general and physical examination, oxygen saturation and position of the patients were monitored regularly.

### Statistical analysis

After evaluating, the data were subjected to univariate analysis using the chisquare test. The level of significance was set at <0.05.

## Results

The study comprised of 100 patients of various cases of poisoning, neurological disorders, sepsis and others. The mean age of the patients was 31.2±6.3 years, having a predominance of male population. Of the 100 patients, 41 patients developed VAP during the ICU stay. The mean duration of mechanical ventilation was found to be 12.3±3.1 days for the non-VAP group and 19.1 ±4.2 days for the VAP group.

**Table 1:** Age and gender wise distribution

Variable	VAP present	VAP absent	p-value
Age	32.10±5.12	31.23±6.1	>0.05
Sex	27:14	42:17	>0.5

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the 100 patients, 41 patients developed VAP during the ICU stay.

**Table 2:** Hospital stay

Variable	VAP present	VAP absent	p-value
Hospital stay	19.1 ±4.2	12.3±3.1	<0.05
Sex	27:14	42:17	>0.5

The mean duration of mechanical ventilation was found to be 12.3±3.1 days for the non-VAP group and 19.1 ±4.2 days for the VAP group that those requiring prolonged ventilator support (>15 days) had a significantly higher incidence of VAP (*P*-value, 0.001). Supine position and stuporous, comatose patients were found to be risk factors, having a high incidence of VAP, and proved to be statistically significant.

Of the 41 patients who developed VAP, 12 patients developed early-onset VAP and 29 patients developed the late-onset type. The overall mortality was found to be 24%, while mortality in the VAP patients was found to be 53.66%.

## DISCUSSION

In the study of our set up, males predominated. Although the incidence of VAP was also high in males, it was statistically not significant.

The mean age group in our study was 31.2±6.3 years. The young population group in our set up is due to the number of cases of poisoning that predominated our study. The incidence of VAP in our setting was 41%. In the era of advanced diagnosis and early management of possible complications, the incidence tends to be lower. In recent studies,<sup>7,8</sup> the reported incidence is very low, ranging from 15 to 30%. The high incidence in our study may be due to a lower number of cases (i.e.,100) and lack of adequate nursing staff which may have adversely affected the quality of care given to the patients. Another factor in our study was a higher number of cases of patients of Organophosphorous poisoning that required prolonged ventilation, which is proved to be a risk factor having a statistically significant relation with incidence of VAP, and may have influenced the incidence.

## Conclusion

Incidence is directly proportional to duration of mechanical ventilation and re-intubation is a strong risk factor for development of VAP. Therefore, duration of ventilation has to be reduced to get rid of morbidity and mortality associated with mechanical

ventilation, which can be achieved by administering a proper weaning protocol and titrating sedation regimens as per the need of the patients.

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