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

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1- Research Guide, 2- Research Scholar

Abstract

Ventilator-associated pneumonia (VAP) is a major cause of hospital morbidity and mortality despite recent advances in diagnosis and accuracy of management. However, as taught in medical science, prevention is better than cure is probably more appropriate as concerned to VAP because of the fact that it is a well preventable disease and a proper approach decreases the hospital stay, cost, morbidity and mortality. The aim of the study is to critically review the incidence and outcome, identify various risk factors and conclude specific measures that should be undertaken to prevent VAP. We studied 100 patients randomly, kept on ventilatory support for more than 48 h. After excluding those who developed pneumonia within 48 h, VAP was diagnosed when a score of ≥6 was obtained in the clinical pulmonary infection scoring system having six variables and a maximum score of 12. After evaluating, the data were subjected to univariate analysis using the chi-square test. The level of significance was set at $P<0.05$. It was found that 37 patients developed VAP. The risk factor significantly associated with VAP in our study was found to be duration of ventilator support, reintubation, supine position, advanced age and altered consciousness. Declining ratio of partial pressure to inspired fraction of oxygen (PaO2/FiO2 ratio) was found to be the earliest indicator of VAP. The most common organism isolated in our institution was Pseudomonas. The incidence of early-onset VAP (within 96 h) was found to be 27% while the late-onset type (>96 h) was 73%. Late-onset VAP had poor prognosis in terms of mortality (66%) as compared to the early-onset type (20%).

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The mortality of patients of the non-VAP group was found to be 41% while that of VAP patients was 54%. Targeted strategies aimed at preventing VAP should be implemented to improve patient outcome and reduce length of intensive care unit stay and costs. Above all, everyone of the critical care unit should understand the factors that place the patients at risk of VAP and utmost importance must be given to prevent VAP.

Introduction

Ventilator-associated pneumonia (VAP) refers to bacterial pneumonia developed in patients who have been mechanically ventilated for duration of more than 48 h. It ranges from 6 to 52% and can reach 76% in some specific settings. Hospital-acquired pneumonia (HAP) is the pneumonia after 48 h or more after admission, which did not appear to be incubating at the time of admission. The presence of HAP increases hospital stay by an average of 7–9 days per patient also imposes an extra financial burden to the hospital. The risk of VAP is highest early in the course of hospital stay, and is estimated to be 3%/day during the first 5 days of ventilation, 2%/day during days 5–10 of ventilation and 1%/day after this.

Method

The study was conducted over a period of 1.5 years, extending from July 2021 to December 2021, 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. A questionnaire was prepared and each patient selected to be included in the study was screened and monitored according to the questionnaire. 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. During the initial stage of ventilation, patients were adequately sedated. All necessary measures were taken for prevention of hospital-acquired infections.

Results

The study cohort comprised of 100 patients of various cases of poisoning, neurological disorders, sepsis and others. The mean age of the patients was 34 years, having a predominance of male population. Of the 100 patients, 37 patients developed VAP during the ICU stay.
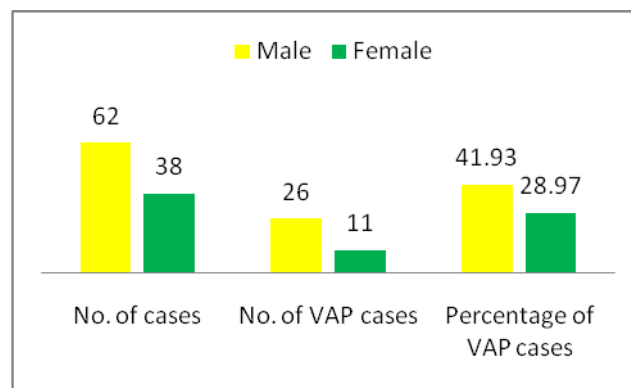
The mean duration of mechanical ventilation was found to be 11 days for the non-VAP group and 19 days for the VAP group.

It was analysed in our study that those requiring prolonged ventilator support (>15 days) had a significantly higher incidence of VAP (P-value, 0.001).
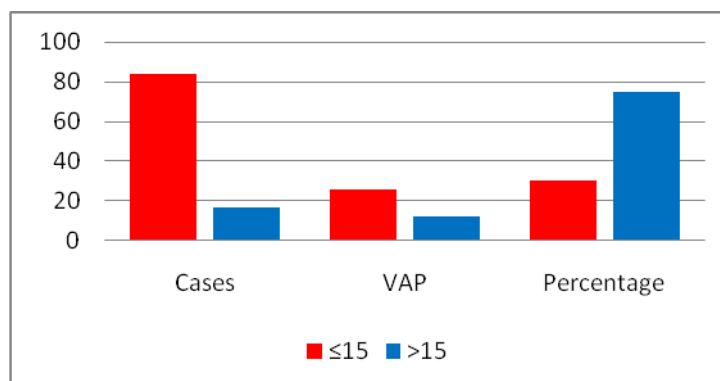
Supine position and stuporous, comatose patients were found to be risk factors, having a high incidence of VAP, and proved to be statistically significant (P-value,

0.003 and 0.0023, respectively). The PaO2/FiO2 ratio was analysed in VAP patients and was found to be <240 mmHg in 86% of the cases. In the remaining 14%, the ratio was higher (>240 mmHg). Of the 37 patients who developed VAP, 10 patients developed early-onset (27.02%) VAP and 27 patients developed the late-onset type (72.97%). The overall mortality was found to be 46%, while mortality in the VAP patients was found to be 54%. The mortality of the early-onset type was found to be 20%. In case of the late-onset type, it was found to be 66.67%. Late-onset VAP had a significantly high association (P=0.0234) as far as mortality was concerned in comparison with early-onset pneumonia.

Conclusion-

We arrive at the following conclusions:

- 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.

- Promoting nasogastric feeding. Although necessary for critically ill patients, it should be given keeping the patients in a semi-recumbent position with the head end elevated to 45° because the supine position promotes aspiration.

- A decrease in the PaO_2/FiO_2 ratio is an early predictor of VAP.

- Pseudomonas is the most common organism in our institution.

- Late-onset VAP is associated with poor prognosis as compared to the early-onset variety.

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