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Ventilator-Associated Pneumonia in a Tertiary Care Hospital

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Abstract

Background: Ventilator-associated pneumonia (VAP) is the most frequent intensive care unit (ICU)-related infection in patients requiring mechanical ventilation. In contrast to other ICU-related infections, which have a low mortality rate, the mortality rate for ventilator-associated pneumonia ranges from 20% to 50%. Lack of a gold standard diagnosis is the main factor of poor outcome of VAP Knowledge of the incidence of VAP and their associated risk factors are important for development and use of more effective preventive measures. **Aims &Objectives**: To find out the incidence of VAP in adult patients undergoing mechanical ventilation and to identify the main risk factors for development of Ventilator-associated pneumonia. **Subjects and Methods**: A prospective study was carried out in the Intensive care unit of a tertiary care CentreAll adult patients of both sexes on mechanical ventilation for more than 48 hours were included. Patients who died or developed pneumonia at the time of admission and patients of acute respiratory distress syndrome were excluded. **Results**: 100 ventilated patients over a period of 1 year were included in the study.Of the 100 patients 20 patients developed ventilator associated pneumonia.Our study found that 60%of the cases were late-onset VAP, while 40% were early-onset VAP. Supine head position and impaired consciousness, were found to be risk factors, of VAP. **Conclusion**: settings. Knowledge of the important risk factors predisposing to VAP may prove to be useful in implementing simple and effective preventive measures.

Keywords: Ventilator associated pneumonia, Intensive care unit, Mechanical ventilation

Introduction

Ventilator-associated pneumonia (VAP) is the most frequent intensive care unit (ICU)-related infection in patients requiring mechanical ventilation. In contrast to other ICU-related infections, which have a low mortality rate, the mortality rate for ventilator-associated pneumonia ranges from 20% to 50%[1].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.[2]The incidence of VAP varies among studies, depending on the factors like definition, the type of hospital , the patients studied, and the level of antibiotic exposure among the patients[3,4]. Lack of a gold standard diagnosis is the main factor of poor outcome of VAP. The clinical diagnosis of ventilator associated pneumonia is based on purulent sputum may follow intubation or oropharyngeal secretion leakage around airway, chest X-ray changes may also be a feature of pulmonary oedema, pulmonary infarction, atelectasis or acute respiratory distress syndrome. Although microbiology helps in diagnosis, it is not devoid of pitfalls. In fact, it was proven that colonization of airway is common and presence of pathogens intracheal secretions in the absence of clinical findings does not suggest VAP[3,5]. The Clinical Pulmonary Infection Scoring (CPIS) system originally proposed by Pugin and others helps in diagnosing VAP with better sensitivity (72%) and specificity (80%). Knowledge of the incidence of VAP and their associated risk factors are important for development and use of more effective preventive measures.

Aims& objectives

1. To find out the incidence of VAP in adult patients undergoing mechanical ventilation

2. To identify the main risk factors for development of Ventilator-associated pneumonia

Materials and Methods

a) **Study design:** Prospective study

b) **Study setting:** Intensive Care Unit of Sree Mookambika Institute of Medical Sciences, Tamilnadu

c) **Approximate total duration of the study:** 1year (April 2015-May 2016)

d) **Detailed description of the groups:**. All the adult patients on Mechanical ventilation(MV) for more than 48 hours in the Intensive care unit.

e) **Total sample size of the study:** 100

f) **Scientific basis of sample size used in the study**: All the patients fulfilling the eligibility criteria over the period of one year was included

g) **Sampling technique**: convenient sampling

h) **Inclusion criteria/ Exclusion criteria**: All adult patients of both sexes on mechanical ventilation for more than 48 hours were included. Patients who died or developed pneumonia at the time of admission and patients of acute respiratory distress syndrome were excluded.

i) **Procedure:** The study protocol was approved by the Institutional Human Ethics Committee. A Questionnaire was prepared. From each patient the following data were collected at ICU admission: name , age , gender , date of admission to Intensive care unit , date of initiating mechanical ventilation and mode of assess to the patients airway (orotracheal and tracheostomy) were recorded. Ventilator mode and settings were recorded daily. Participant's vitals and general physical examination were monitored regularly. The patients fulfilling both the clinical and

microbiological criteria were diagnosed to be suffering from ventilator associated pneumonia. Clinical criteria was diagnosed using modified clinical pulmonary infection score (CPIS)>6[6] .Microbiological criteria included positive Gram stain (> 10 polymorphonuclear cells/low power field and ≥ 1 bacteria/oil immersion field with or without the presence of intracellular bacteria) and quantitative endotracheal aspirate culture showing ≥ 105 CFU/ ml[7,8]. Ventillator associated pneumonia pathogens was identified by quantitative culture of endotracheal aspirate (EA). EA was serially diluted in sterile normal saline as 1/10, 1/100, 1/1.000, and 0.01 ml of 1/1.000 dilution was inoculated on 5% sheep blood agar for incubation at 37^{o}C in a 5% CO_2 incubator for 24 hours, a colony count was done and expressed as number of colony forming units per ml (CFU/ml). The microorganisms isolated at a concentration of more than 105 CFU/ ml were considered as VAP pathogens and were identified based on standard bacteriological procedures including Gram's stain, colony morphology on blood agar and MacConkey agar, and biochemical reactions[9]. .Data collected was entered in Microsoft Excel spread sheet and analysis was done using SPSS version 20. The Study cohort was classified in to two groups early onset ventilator associated pneumonia (onset after 48 h but within 96 h) and late onset ventilator associated pneumonia (onset after 96 h). Results were expressed as mean ± SD. Descriptive statistics, Chi-square test or Fisher's exact test was usedfor analysis

Results

The study comprised of 100 patients of various cases of neurological disorders, accidents, poisoning and sepsis. The mean age of the patients was 40 ± 15.1 years. Out of the 100 patients majority are females (55%). Of the 100 patients 20 patients developed ventilator associated pneumonia during the intensive care unit stay.

The Mean duration of mechanical ventilation was found to be 10 days among the non-ventilator associated pneumonia group and 20 days for the ventilator associated group. The onset of VAP was more likely to occur during the first two weeks of MV as 75%(15 out of 20) cases occurred during this period .Our study found that 60% of the cases were late-onset VAP, while 40% were early-onset VAP. In this study the mortality rate of patients with ventilator associated pneumonia was 23%. There was no statistical association in mortality between ventilator associated pneumonia groups and non-ventilator associated pneumonia groups (p=0.8321). Supine head position and impaired consciousness, were found to be risk factors, of VAP, and it was statistically significant (*P*-value, 0.005 and 0.0013, respectively). The prevalence of organism for ventilator associated pneumonia were caused by Gram-negative bacteria, which accounted for 90% of causative organisms. *Pseudomonas aeruginosa* (40%) and *Acinetobacter baumannii* (21.3%) were the most common Gram-negative bacteria associated with ventilator associated pneumonia. Staphylococcus aureus (14.9%) was the most common Gram-positive bacteria among patients with ventilator associated pneumonia.

Discussion

Ventilator associated pneumonia is an important nosocomial infection among ICU patients receiving Mechanical ventilation .Our current study shows the incidence of VAP was 20% which was similar to Kollef et al and fagon et al showed a incidence ranging from 15%-30%[10,11] . Hina Gadani[12] et al showed a high prevalence of ventilator associated pneumonia (37%) in Gujarat. In the current study, 40% of cases were early-onset VAP, which is similar to other studies reporting early-onset VAP in almost half of all VAP episodes[4,13].Our study found that majority of the VAP episodes occurred within the first two weeks of MV. In the current study Patients with neurological disorders and CNS infections were significantly predisposed for the development of VAP which was similar to Noyalmariya Joseph et al[14] in Pondicherry. Our study found that Supine head position & impaired consciousness documented as independent risk factors for the

development of VAP which was similar to other studies done by Noyalmaria et al[14] and Hinagadani et al [12]. In the current study *Pseudomonas aeruginosa* (40%) and *Acinetobacter baumannii* (21.3%) were the most common Gram-negative bacteria associated with ventilator associated pneumonia which was similar to Hinagadani et al[12]

Conclusion

VAP is a common nosocomial infection among patients on ventilator support. It is a major challenge for physicians in tertiary care settings. Knowledge of the important risk factors predisposing to VAP may prove to be useful in implementing simple and effective preventive measures.

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