ORIGINAL ARTICLE

An audit on ventilator associated pneumonia in the Intensive Care Unit at Teaching Hospital Karapitiya, Galle, Sri Lanka

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ABSTRACT

Background: Critical care is one of the most expensive services provided by a hospital. The aim of this audit was to ascertain the incidence of ventilator associated pneumonia in the intensive care unit.

Type of study: A descriptive study

Place of study: Teaching Hospital Karapitiya, Galle (Sri Lanka)

Duration of study: 1st June 2010 to 30th August 2010

Methodology: All patients, who were admitted to ICU and who stayed there for more than 48hrs during a period of three months were studied. Infections were identified on clinical parameters such as fever and on laboratory investigations such as full count, CRP and cultures.

Results: Out of 82 patients, 48(58.5%) were subsequently discharged to the ward and 30(36.6%) succumbed to their illness. 68(82.9%) were ventilated and 26 of them had an underlying pathology related to an infection. A total of 20(29.4%) patients of this ventilated group subsequently developed a lower respiratory tract infection. The main nosocomial infection was ventilator associated pneumonia and had an incidence of 21.9%. The most prevalent organisms were mixed gram negative bacilli and Acinetobacter spp.

Conclusion: Nosocomial infections are a cause of increased mortality and morbidity in the intensive care unit. Awareness of the risk factors together with simple preventive measures and surveillance will help to reduce its occurrence.

Key words: Nosocomial infection; ventilator associated pneumonia


INTRODUCTION

Ventilator associated pneumonia (V AP) is a form of nosocomial infection that occurs in patients receiving mechanical ventilation for longer than 48hrs. The incidence of VAP is around 22.8%2, and patients receiving ventilatory support account for 86% of the cases of nosocomial pneumonia3. The mortality rate attributable to VAP is around 27%4, and the costs of treatment of these infections contribute to a significant portion of the expenditure incurred in maintaining an intensive care unit. Teaching Hospital Karapitiya, Galle, Sri Lanka is one of the main tertiary care centers in the country. All the general medical and surgical patients requiring intensive care are admitted to the main intensive care unit where the audit was conducted. The main objective of this study was to ascertain the incidence of ventilator associated pneumonia in the intensive care unit.
METHODOLOGY

Permission to conduct this prospective audit was obtained from the director Teaching Hospital Karapitiya. The audit was conducted for three months from 1st June 2010 to 30th August 2010. We studied all the patients admitted to the main ICU and who stayed there for more than 48hrs, regardless of whether they were ventilated or not during this period. Reports of cultures from tracheal secretions were obtained from the department of microbiology. However, we not able to perform bronchoscopically collected samples for quantitative cultures due to lack of facilities.

RESULTS

Total number of patients admitted to main ICU for more than 48hrs was 82; out of which 48(58.5%) were subsequently discharged to the ward and 30(36.6%) succumbed to their illness. Of the 82 patients studied 68(82.9%) were ventilated and only 26 of them had an underlying pathology related to an infection (Table 2). A total of 20(29.4%) patients of this ventilated group subsequently developed a lower respiratory tract infection (Table 2). The majority of them [14(70%)] were in categories that had no infection in any part of the body at the time of admission to the ICU or at the time of commencing ventilation (Table 2). We used the following criteria to diagnose lower respiratory tract infection (LRTI).

1. New shadow developing in the chest X-ray
2. Temperature > 99°F
3. Course crepitations on chest auscultation
4. White cell count > 11,000

We used the following criteria to diagnose VAP.

1. New shadow developing in the chest X-ray
2. Temperature < 96.8 or > 990°F
3. Ventilated for more than 48 hrs
4. White cell count > 11,000 or < 4,000
5. Cultures positive from endotracheal secretions

All 20 patients, who developed an LRTI, had their tracheal secretions cultured and 2 of them failed to grow any organisms in the endotracheal secretions. However, if we had the facilities to perform bronchoscopic sampling for quantitative cultures, all of them may have been positive for bacterial invasion. The organisms cultured are shown in Table 1.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acinetobacter spp</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Pseudomonas spp</td>
<td>3</td>
<td>66.6</td>
</tr>
<tr>
<td>Coliform spp</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Mixed gram negative bacilli</td>
<td>6</td>
<td>33.3</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>No growth</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

VAP was diagnosed in 18 (21.9%) patients on these criteria.

Table 2: Patient categories developing LRTI following ventilation

<table>
<thead>
<tr>
<th>Patient category</th>
<th>No.</th>
<th>Ventilated</th>
<th>LRTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Injury</td>
<td>14</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Trauma other than head injury</td>
<td>6</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Poisoning</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Post-op elective Ventilation</td>
<td>9</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Medical reasons without infection</td>
<td>11</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Infections from Medical wards</td>
<td>7</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Infections from other wards</td>
<td>30</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>68</td>
<td>20</td>
</tr>
</tbody>
</table>

DISCUSSION

The patients needing intensive care usually have low host defense immunity. Immunosupression primarily due to the release of interleukins and other anti inflammatory agents creates a state sometimes termed as immunoparalysis. Endotracheal intubation compromises local defense mechanisms such as coughing, sneezing and mucociliary clearance. Upper airway and oral secretions can pool above the cuff of an endotracheal tube and line the tube, forming a biofilm, starting as early as 12 hrs after intubation. The biofilm contains large amounts of bacteria that can be disseminated into the lungs by the ventilator induced inspiration. The presence of the endotracheal tube also provides a direct route for colonized bacteria to enter the lower respiratory tract. Exogenous colonization arises from cross transmission from the hands of health care workers or visitors.
Cook and colleagues noted that the administration of paralytic agents was an independent predictor of nosocomial pneumonia in their study of 1,014 mechanically ventilated patients\(^\text{10}\). Sedative drugs and stress ulcer prophylaxis have all been implicated as risk factors.

In a report from the National Nosocomial Infection Surveillance (NNIS) system involving data from 498,998 patients, 83% of episodes of nosocomial pneumonia was associated with mechanical ventilation\(^\text{11}\). Langer and colleagues showed an increased incidence from 5% in patients who received 1 day of mechanical ventilation to 69% in those who received 30 days of ventilation\(^\text{12}\). One of the largest databases related to nosocomial infection in intensive care is the EPIC study \(^\text{13}\). In this 1-day point prevalence study, information was obtained on all patients who occupied a bed in an intensive care unit over 24hrs. 10,038 patients were recruited from 1,407 western European intensive care units. 2,064 of them (21%) had an intensive care unit acquired infection. The incidence of nosocomial pneumonia in the EPIC study was 47% and 31% in the NNIS study.

For many years VAP has been diagnosed by the clinical criteria published by Johanson et al in 1972, which include the appearance of a new pulmonary infiltrate, fever, leukocytosis and purulent tracheobronchial secretions\(^\text{14}\). However these criteria are non specific. VAP is most accurately diagnosed by quantitative cultures and microscopic examination of lower respiratory tract secretions which are best obtained by bronchoscopically directed techniques, such as the protected specimen brush and bronchoalveolar lavage. These techniques have acceptable repeatability and interpretation of results is unaffected by antibiotics administered concur rently for infections in extra pulmonary sites as long as the antimicrobial therapy has not been changed for <72 hrs before bronchoscopy\(^\text{15,16}\). The accuracy of quantitative cultures and microscopic examination of lower respiratory tract secretions for the diagnosis of VAP was validated by Chastre et al\(^\text{17,18}\). However, other published studies have concluded that bronchoscopically directed techniques were not more accurate for diagnosis of VAP than clinical X-ray criteria combined with cultures of tracheal aspirates\(^\text{19-22}\).

Prevention has a key part to play in limiting VAP. Several studies have reported high rates of contamination with potentially pathogenic organisms by the hands of healthcare workers\(^\text{23,24}\). Hand disinfection with the use of alcohol based antiseptic hand rub solutions have been shown to be effective in reducing hand contamination\(^\text{25}\). Chlorhexidine oral rinse twice daily has been used by some workers to reduce oral colonization\(^\text{26}\). However, no evidence based protocols for oral care have been tested to decrease the incidence of VAP in patients receiving mechanical ventilation. According to the studies done so far, stress ulcer prophylaxis does not play a significant role in the development of VAP. Saline lavage of endotracheal tubes before suctioning can dislodge bacteria from the endotracheal tubes in to the lower airways increasing the risk of VAP\(^\text{27}\). Positioning the patient in a semi recumbent position prevents reflux and aspiration. Maintaining an adequate cuff pressure decreases the likelihood of secretions leaking around the cuff. Use of tubes with port s for continuous subglottic suctioning can decrease the incidence of VAP by 50%\(^\text{28,29}\) and therefore the oropharynx should be thoroughly suctioned. Daily interruption of continuous sedation and paralysis can shorten the duration of mechanical ventilation. Infection surveillance can reduce nosocomial infection rates when incorporated with infection prevention programmes\(^\text{30}\).

**CONCLUSION**

VAP, although often preventable, is a cause of increased mortality and morbidity; it is also responsible for excessive resource expenditure in the intensive care unit. Awareness of the risk factors and attention to simple preventive measures such as hand hygiene can reduce the incidence of these infections. Surveillance together with a multidisciplinary approach of prevention is the other important aspect of its limitation.

**REFERENCES**


