Original Article

Prevalence of Ventilator Associated Pneumonia (VAP) in Critical Care Unit at Royal Medical Services, Amman, Jordan

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Objective: To determine the prevalence ventilator associated pneumonia (VAP) and to investigate the most common precipitating factors.

Methodology: This is a retrospective study held at intensive care unit (ICU) of King Hussein Medical Center (KHMC) from January 2011 to January 2012. All patients who were on mechanical ventilation for more than 48 hours were included. All patients should have normal chest x-ray on admission and have no clinical evidence of infection or chest trauma.

Result: A total of 400 patients were enrolled, aged between 15-65 years. Total of 30 patients had VAP. Chest x-ray for pneumonia was positive in all patients, leukocytosis (WBC> 12,000) was seen in 90%. Blood culture was positive in 30%, sputum culture was positive in 90%. Mortality rate was 30%.

Conclusion: VAP is associated with increase in morbidity and mortality, and prolonged hospital stay. Better evaluation to causative factors may help in decreasing the incidence of VAP. (Rawal Med J 2014;39: 243-245).

Key words: VAP, mechanical ventilation, ICU.

INTRODUCTION

Ventilator-associated pneumonia (VAP) is common in the intensive care unit (ICU) affecting 8 to 20% of ICU patients. It is consider a sub-type of hospital-acquired pneumonia (HAP) that occurs in patients mechanically ventilated for greater than 48 hours.[1] It accounts up to 27% of mechanically ventilated patients. Patient with VAP should have at least 3 or 5 following symptoms: fever, leukocytosis, change in sputum (color and/or amount), radiographic evidence of new infiltrates and worsening oxygen requirements. Two Bronchoscopic techniques are used for diagnosing VAP; protected specimen brush (PSB) and bronchoalveoalr lavage (BAL) and both are effective as the standard specific criteria.[2]

VAP pathogenesis is mainly secondary to bacterial invasion of the pulmonary parenchyma in patients on mechanical ventilation. It is secondary to inoculation of the sterile lower respiratory tract, which mainly due to aspiration of gastric secretion, colonization of the aero digestive tract and the use of contaminated equipment or medications. Bacteria usually travel in small droplets both through the endotracheal tube and around the cuff and may colonize the endotracheal or tracheostomy tube and are transmitted into the lungs with each breath. Suctioning and/or bronchoscopy may bring down the bacteria into the lungs.[2] The diagnosis and management of VAP remains one of the most controversial and challenging topics in critically ill patients. In our study, we try to determine the prevalence of VAP and to investigate the most common precipitating factors in ICU of KHMC.

METHODOLOGY

This retrospective study was carried out at ICU of KHMC from January 2011 to January 2012 and included allpatients who were on mechanical ventilation for more than 48 hours. We have 31 beds in our ICU, which includes both medical and surgical patients. A total 380 patients were enrolled. All patients on mechanical entilation were admitted to ICU for different reasons. Exclusion criteria included patients who were intubated for less than 48 hours or had chest infection, chest trauma or sepsis. For diagnosis of VAP in this study, considered chest x-ray, complete blood count (CBC), blood culture and sputum culture. All had baseline chest x-ray, CBC, blood culture, sputum culture. Once the patients were intubated, chest x-ray was taken before and after intubation and then daily. Once suspicion of VAP the patients had CBC, blood and sputum culture. Medical records were reviewed to investigate associated co-morbidities

and drug history.

RESULTS

Total of 30 patients (7%) had VAP, Female /male: 20/10. Aged ranged from 15-65 years. Sixty percent were admitted for medical causes. Leukocytosis (WBC >12.000) was seen in 90% patient, while leucopenia (WBC<4.000) in 17% cases. All patients had pneumonic consolidation in chest x-ray, blood culture was positive in 30% and sputum culture was positive in 70%. Mortality rate was 30%. Gram-negative bacteria were the most common causative agent and commonest was Kliebsella (23.3%), followed by Acinebacter, Pseudomonas, Staph Aureus, E.Coli and Enterobacter (Table 1).

Table 1: Micro-organism detected in blood culture.

Micro-organism	Number	Percentage
Kliebsella	**7**	**23.3**
Acinebacter	**6**	**20**
Pseudomonas	**4**	**13.3**
Staph aureus	**4**	**13.3**
Mixed growth	**2**	**6.7**
E.Coli	**2**	**6.7**
Enterobacter	**2**	**6.7**

VAP was detected in first 48 hours in only 4 patients, after 96 hours in 18 patients and after one week 8 patients. The duration of mechanical ventilation hospitalization was longer in VAP patient in comparison with patient without VAP (10-30 days vs 5 days to two week). Twelve (40%) VAP patients failed to be extubated at first attempt, and three (10%) at second attempt; five (15%) patients required tracheotomy. Comparing to patients without VAP, 4% failed to be extubated at first attempt, 1% at second attempt and only 1% without VAP had to have tracheotomy.

The mortality rate in VAP patient and patient without VAP was 30%, 12%, respectively. The causes of deaths were 40% secondary to septic shock and disseminated intravascular coagulation, and 15% secondary to severe respiratory failure. The main risk factors for VAP were presence of co-morbid diseases (40%), prolonged duration of intubation and sedation (20%), history of smoking (15%), major surgery (15%) and immuno suppressive medications (10%).

DISCUSSION

Pneumonia has accounted for approximately 15% of all hospital-associated infections and 27% and 24% of all infections acquired in the medical ICU and coronary care unit, respectively. It is the second most common hospital-acquired infection after urinary tract infection. The primary risk factor for the development of hospital-associated bacterial pneumonia is mechanical ventilation.[3]

Risk factors for VAP can be divided into modifiable and non-modifiable; the modifiable are the duration of ventilation, enteral feeding prior antibiotic usage and paralytic agents, while the non-modifiable factors are extreme age and presence of co-morbidities as pulmonary diseases and head trauma.[4] In our patients, risk factors for were: presence of co-morbid diseases, prolonged duration of intubation and sedation, history of smoking, major surgery and immunosuppressive medications mainly steroids and steroid sparing agents. All our patients had nasogastric tube either
for feeding and or medications. It predisposes to gastric reflux and increases the probability of aspiration.[4]

An endotracheal tube provides a direct route for colonized bacteria to enter the lower respiratory tract that secretions from upper airway and oral cavity can pool forming a biofilm, and cause an abnormal interruption between the upper airway and the trachea so provide the bacteria a direct route into the lower airway.[4,5] In addition, the cough reflex is often eliminated and/or decreased by the presence of an endotracheal tube,[2] impairing the mucociliary clearance,[6] increasing production and secretion of mucus.[7] In our study, we relied on clinical suspicion, radiographic changes and culture results for diagnosis and did not use any invasive testing as bronchoscopy.[8]

In our study, Kliebsella was most common organism followed by acinobacter and pseudomonas 23,3%, 20% and 13.3%, respectively. In some reports, the

most common organism was pseudomonas followed kliebsella and acinobacter.[9] VAP rate in our study was in the range 1-7. We calculated rate by dividing number of VAP cases on ventilated days multiplied by 1000 days. Our rate is lower than the Egyptian study[9] and higher than US national health work safety net work.[10]

Reducing the rate of VAP needs recommendations and establishing guide lines in our unit as minimizing the duration of mechanical ventilation, hand hygiene guidelines and educating healthcare personnel who care for patients undergoing ventilation about VAP.[11,12] In this study, it seem pneumonia incidences increased by higher hospitalization days, and prolonged ventilation in ICU.

CONCLUSION

VAP is associated with increases in morbidity and mortality, hospital length of stay, and costs. To help prevent ventilator-associated pneumonia, clinicians caring for patients who are receiving mechanical ventilation should participate in programs aimed at its prevention.

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