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Study of Ventilator Associated Pneumonia in NICU at Tertiary Care Centre

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Abstract

Background: Ventilator associated pneumonia (VAP) is a common nosocomial infection which occurs in 9% to 27% of mechanically ventilated patients. It is an important cause of morbidity in ventilated patients increasing their ventilator days, increased length of stay in intensive care unit (ICU) and hospital as well as increased cost burden on patient and or family. **Methods:** This study conducted ina tertiary care centre. It is an observational prospective study. **Results:** Total 50 neonates who were ventilated more than 48 hours during this period were included in this study. From the 50 neonates nine (18%) neonates were associated with pneumonia. Organisms which isolated from the tracheal secretion were 11.1% Acinobacter, 33.4% Staphylococcus, 33.4% Klebsiella, 11.1% E. coli, 11.1% Pseudomonas. Most common organism responsible for mortality is Klebsiella (50%) & Staphylococcus (20%). **Conclusion:** This study conclude that The pathogenesis of VAP involves the micro-aspiration of oropharyngeal and/or gastric secretions that have been contaminated/colonized with pathogenic organisms. Efforts to prevent VAP are focused on early extubating and preventing aspiration. Early diagnosis and treatment help limit VAP related morbidity and mortality.

Keywords: Ventilator Associated Pneumonia, NICU, Organisms, Mortality

INTRODUCTION

Ventilator associated pneumonia (VAP) is a common nosocomial infection which occurs in 9% to 27% of mechanically ventilated patients. It is an important cause of morbidity in ventilated patients increasing their ventilator days, increased length of stay in intensive care unit (ICU) and hospital as well as increased cost burden on patient and or family. It has been reported that VAP attributes to mortality rate of 20% to 40%.1VAP can be defined as a pneumonia that occurs more than 48 hours after initiation of mechanical ventilation. The bacterial pathogens responsible for the VAP vary in virulence and antimicrobial resistance, depending on the length of stay on mechanical ventilation and other risk factors such as previous antibiotic exposure. The pathogenesis of VAP is classically micro aspiration. This aspiration first leads to colonization and finally causes infections of respiratory tract as host defence mechanisms of body have been compromised. There are various non-modifiable risk factors for VAP which include geriatric age group (above 60), COPD, ARDS, head trauma, and reintubation. Along with non-modifiable there are certain modifiable risk factors as well. These include interventions, treatments and behaviors common to the ICU that positively or negatively affect the incidence of VAP. Examples of these conditions are patient positioning, stress ulcer prophylaxis, and enteral nutrition practices.[1-2] The incidence of VAP can be reduced through careful scrutiny and proper implementation of these practices. Once symptoms and signs of VAP appear in patient, the accurate diagnosis and identification of the microorganism should be the urgent need of the treating physician and ICU team. Invasive diagnostic strategies should be used to improve the diagnostic efficiency. Early empiric broad-spectrum antibiotics have been found to improve mortality but only when the responsible pathogen have been identified. Empiric antimicrobials should be chosen after considering the patient's risk factors for multi-drug resistant bacteria as the cause of VAP. Important risk factors include mechanical ventilation longer than 5 days and previous antibiotic exposure. The spectrum of coverage should be limited after identification of causative pathogen. The identified bacteria and patient's response to treatment decide and determine the duration of treatment.[3-6]

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CDC criteria for VAP

Essential criteria Radiological criteria- two or more serial chest X-ray with new or progressive and persistent infiltration or consolidation or cavitation for 48 hours or more after starting mechanical ventilation.

Additional Criteria- Criteria 3 and at least 3 of the other criteria

1. Temperature instability
2. Total Leukocyte Count (TLC) count < 4000/mm3
3. Worsening of gas exchange or increased oxygen requirement
4. Increased respiratory efforts (Retractions, nasal flaring)
5. Rales, rhonchi / wheezing
6. Cough present
7. Heart rate <100 beats/min or >170 beats/ min
8. Apnea, tachypnea, nasal flaring with retraction of wall or grunting

Endotracheal secretions should be sent for culture and sensitivity of those babies who fulfill the criteria of VAP.

MATERIAL AND METHODS

Study population

Nine neonates were considered for this study which had ventilator associated pneumonia.

Study Area
This study conducted in a tertiary care centre.

Study duration
The duration of the study was six month.

Sampling technique & Data collection
It is an observational prospective study.

Inclusion Criteria
All neonates requiring ventilator support more than 48 hours in NICU at a tertiary care.

Exclusion Criteria
Those neonates already suffering from pneumonia before putting on ventilator support.

Data Analysis
Data were analyzed with Microsoft excel.

RESULTS

Table 1: Number of positive cases with ventilator associated pneumonia

Total patients	No. of patients	Percentage
Positive cases	9	18%
Negative cases	41	82%
Total	50	100%

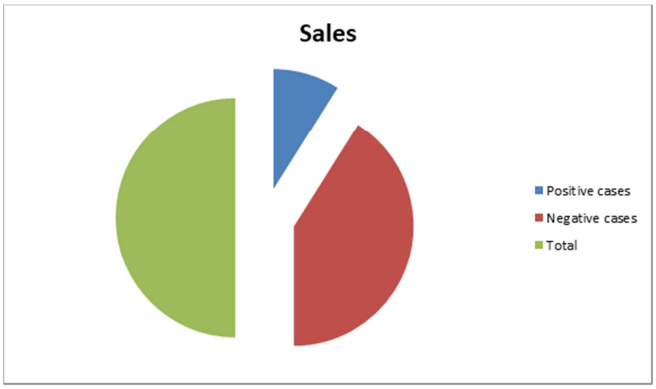

Figure 1: Number of positive cases with ventilator associated pneumonia

Table 2: Isolated organism from the tracheal secretion

Isolated organisms	Number	Percentage
Acinetobacter	1	11.1%
Staphylococcus	3	33.4%
Klebsiella	3	33.4%
E. coli	1	11.1%
Pseudomonas	1	11.1%
Total	9	100%

Total 50 neonates who were ventilated more than 48 hours during this period were included in this study. From the 50 neonates nine (18%) neonates were associated with pneumonia. Organisms which isolated from the tracheal secretion were 11.1% Acinetobacter, 33.4% Staphylococcus, 33.4% Klebsiella, 11.1% E. coli, 11.1% Pseudomonas. Most common organism responsible for mortality is Klebsiella (50%) & Staphylococcus (20%).

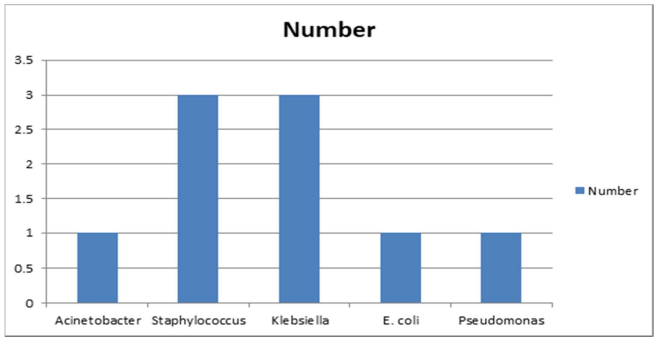

Figure 2: Isolated organism from the tracheal secretion

Table 3: This table showing indication of ventilation

Indication of ventilation	Percentage
Persistent Pulmonary Hypertension of newborn	5%
Hypoxic Ichaemic Encephalopathy	5%
Teratology of Fallot	3%
Seizures	3%
Apnea	7%
Meconium Aspiration Syndrome	12%
Sepsis with shock	30%
Severe	35%

DISCUSSION`

The primary objective of the present study was to find out the incidence of VAP in ventilated neonates. Secondary objectives were to find out endotracheal tube culture positivity and outcome of babies. The pathogenesis of VAP includes the micro-aspiration of oropharyngeal and/or gastric secretions that have been contaminated /colonized with pathogenic organisms. Efforts to prevent VAP are focused on early extubating and preventing aspiration. Early diagnosis and treatment help limit VAP related morbidity and mortality. An evidence-based guideline has been developed to implement practices aimed at the prevention, diagnosis, and treatment of ventilator associated pneumonia.
In the present study, total 50 neonates were included in this study. From the 50 neonates nine (18%) neonates were associated with pneumonia. Isolated Organisms from the tracheal secretion were 11.1% Acinetobacter, 33.4% Staphylococcus, 33.4% Klebsiella, 11.1% E. coli, 11.1% Pseudomonas. Most common organism responsible for mortality is Klebsiella (50%) & Staphylococcus (20%).
Some studies of neonatal VAP have microbiological criteria as their diagnostic prerequisite,[7-9] while others have considered clinical criteria along with microbiological.[10-12]
Some researchers have revealed association of VAP with increased morbidity, a longer duration of MV, and a longer hospital and/or ICU stay.[13-16] Fischer et al., in their study,[17] reported an incidence of VAP of 9.6% in a neonatal and pediatric population after cardiac surgery and observed that a delay in extubation of 3.7 days might lead to VAP. Similar results were obtained by Srinivasan et al.[18]
All items involved in our proposed bundle were derived from controlled trials or health institutes recommendations for adults, children or neonatal VAP prevention.[12,19]

CONCLUSION

This study conclude that The pathogenesis of VAP involves the micro-aspiration of oropharyngeal and/or gastric secretions that have been contaminated/colonized with pathogenic organisms. Efforts to prevent VAP are focused on early extubating and preventing aspiration. Early diagnosis and treatment help limit VAP related morbidity and mortality.

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