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STUDY OF VENTILATOR ASSOCIATED PNEUMONIA IN NICU AT TERTIARY CARE CENTRE

Paediatrics

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ABSTRACT

This study was undertaken with the aim to know incidence of Ventilator-associated pneumonia (VAP) in ventilated neonates, endotracheal tube culture positivity in VAP and the outcome of babies suffering from VAP. All neonates requiring ventilator support more than 48 hours (according to CDC criteria's for VAP) in NICU at NKPSIMS and Lata mangeshkar Hospital hingna, Nagpur from January 2015 to August 2016, were enrolled in the study, those who already had pneumonia were excluded. The incidence of VAP was calculated. Total of 100 neonates were enrolled. Results: Out of 100 ventilated neonates 18 developed VAP. Mean ventilation days= 9.3. Mean VAP/1000 ventilated days= 19.4.Most common organism is Klebsiella (43%) followed by Staphylococcus aureus (22%) and Pseudomonas(14%).Mortality in babies who had VAP is 44.4%. Conclusion-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 (VAP)

INTRODUCTION:

Ventilator associated pneumonia (VAP) is a common nosocomial infection occurring in 9% to 27% of mechanically ventilated patients. It is associated with significant morbidity including increased ventilator days, increased intensive care unit (ICU) and hospital length of stay, and increased cost. Further, VAP has an attributable mortality rate of 20% to 40%.1By definition, VAP is a pneumonia that occurs > 48 hours after initiation of mechanical ventilation. Depending on the length of mechanical ventilation and other risk factors such as previous antibiotic exposure, the bacterial pathogens responsible for the VAP differ in virulence and antimicrobial resistance.[1-2]

The pathogenesis of VAP is typically micro aspiration leading first to colonization and finally infections of respiratory tract as host defence mechanisms become overwhelmed.1 Non-modifiable risk factors for VAP includes age>60, COPD, ARDS, head trauma, and reintubation among others. Modifiable risk factors are interventions, treatments and behaviours common to the ICU that positively or negatively affect the incidence of VAP. Examples are patient positioning, stress ulcer prophylaxis, and enteral nutrition practices.2 Through careful scrutiny and manipulation of these practices, the incidence of VAP can be reduced.1-2,6 This approach to prevention warrants significant effort.

Once the patient has developed VAP, the efforts should focus on early and accurate diagnosis of the process and identification of the responsible microorganism.1,3 Invasive diagnostic strategies may improve diagnostic efficiency.1,3 Early empiric broad-spectrum antibiotics improve mortality only when they are adequate to cover the pathogen ultimately found to be responsible for infection.1,5 Decisions regarding empiric antimicrobials require consideration of the patient's risk factors for multi-drug resistant bacteria as the cause of VAP.1-2 Important risk factors include mechanical ventilation greater than 5 days and previous antibiotic exposure among others.2 The spectrum of coverage can be limited if possible after identification of the responsible pathogen.1 The duration of treatment is determined by the bacteria identified and the patient's response to treatment.1-2,4

CDC criteria for VAP:

Essential criteria Radiological criteria- ≥2 serial chest X-ray with new or progressive and persistent infiltration or consolidation or cavitation ≥48 hours 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 were sent for culture and sensitivity of those babies who fulfil the criteria of VAP.

Aim and Objective:

The primary objective of the present study is to know incidence of VAP in ventilated neonates. Secondary objectives were to find out endotracheal tube culture positivity in VAP and outcome of babies suffering from VAP.

Material and Methods:

- Study Design: It is an observational prospective study.
- Place and time of study: In the NICU at NKPSIMS and Lata Mangeshkar Hospital, Hingna, Nagpur from January 2015 to August 2016.VAP was considered in neonates according to the CDC criteria's. Incidence of VAP is calculated by mean VAP/1000 ventilated days.

Inclusion Criteria:

- All neonates requiring ventilator support more than 48 hours in NICU at NKPSIMS and Lata Mangeshkar Hospital, Hingna, Nagpur from January 2015 to August 2016 were enrolled in the study.

Exclusion Criteria:

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

RESULTS:

Table 1- Organisms responsible for VAP

Organisms grown in Tracheal Secretion culture(n=14)	No.	Percentage (%)	Mortality

Acinobacter	1	7	-
Staphylococcus	3	22	2
Non Fermenters	1	7	1
Klebsiella	6	43	4
Ecoli	1	7	-
Pseudomonas	2	14	1

% percentage

Of the total 100 neonates who were ventilated more than 48 hours during this period,18(18%) developed ventilator associated pneumonia.

Mean VAP/1000 ventilated days= 19.4

Most common organism is Klebsiella (43%) followed by Staphylococcus aureus(22%) and Pseudomonas(14%). (See table no. 1)

Mortality in babies who had VAP is 44.4%.

Most common organism responsible for mortality is Klebsiella (50%) followed by Staphylococcus (20%).

Figure no.1- Distribution of ventilated neonates

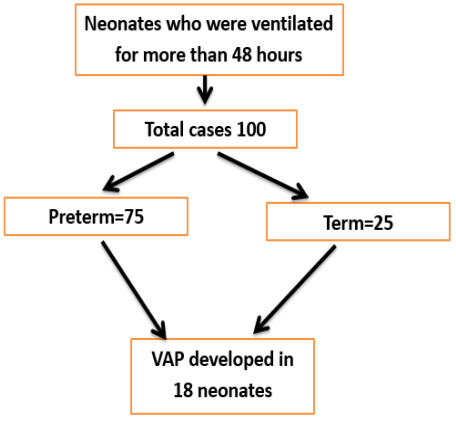
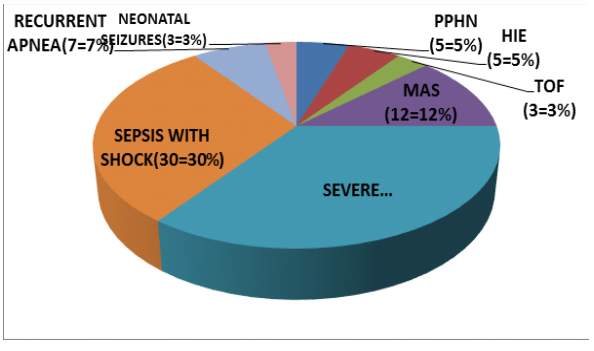


Figure no. 2- Pie Diagram showing indication of ventilation:-



PPHN-Persistent Pulmonary Hypertension of newborn, HIE-Hypoxic Ichaemic Encephalopathy, TOF-Teratology of Fallot, MAS-Meconium Aspiration Syndrome, HMD-Hyaline Membrane Disease

Conclusion-

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. An evidence-based guideline has been developed to implement practices aimed at the prevention, diagnosis, and treatment of ventilator associated pneumonia.

Hence microbiological criteria for neonatal VAP diagnosis has been a prerequisite only in some studies (12–114)] , while in others only clinical and/or microbiological criteria have been required (15-17). Other studies have confirmed that VAP is associated with increased morbidity, a longer duration of MV, and a longer hospital and/or ICU length of stay [18, 19, 20, 21] . Fischer et al. [22] reported an incidence of VAP of 9.6% in a neonatal and pediatric population after cardiac surgery and found a delay in extubation of 3.7 days attributable to VAP. Similarly, Srinivasan et al.[23]

All items involved in our proposed bundle were derived from controlled trials or health institutes recommendations for adults, children or neonatal VAP prevention (12,24).

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