Journal of Cardiovascular Disease Research

ISSN:0975-3583,0976-2833 VOL13, ISSUE04,2022

Original research article

A study on outcome of ventilator associated pneumonia at a tertiary care hospital

[1]Dr.Darshan M, [2]Dr.Akshatha Kattimani , [3]Dr.Nishchit KN

[1]Consultant Physician, Department of General Medicine, Suyog Hospital,Mysore, Karnataka,India

[2]Assistant Professor , Department of General Medicine, JJMMC, Davangere, Karnataka,India

[3]Senior Resident, Department of General Medicine, KRIMS, Karwar , Karnataka,India

Corresponding Author:

Dr.Nishchit K N

Abstract

According to National Nosocomial Infections Surveillance(NNIS),the rate of VAP is documented 7.6 for each 1000 ventilator days, the recurrence of VAP reported to be 22.8 for each 1000 patient days, 29.6 for each 1000 days at risk,35.7 for every 1000 ventilator days. The general pervasiveness is 9.3%.The rates differ according to population and the diagnostic criteria. Using protected brush specimen (PSB)during fibrotic bronchoscopy to diagnose pneumonia in ventilated patient's fagon reported a nosocomial pneumonia incidence rate of 9%. All the patients who are on mechanical ventilation for more than 48 hours irrespective of the cause, total of 101 patients of both sexes, who were on mechanical ventilation for more than 48 hours were selected. In Early VAP group, 47.2% died, 41.7% improved and 11.1% had DAMA and in Later VAP group, 50.8% died, 41.5% improved and 7.7% had DAMA. In the study among those with mortality, in Early VAP group, majority of subjects had HTN/DM as Comorbidity and in Later VAP group, Majority of subjects had DM as Comorbidity (21.2%).

Keywords: Ventilator associated pneumonia, DAMA, DM

Introduction

VAP is defined as pneumonia occurs in after 48 hours of endotracheal intubation and initiation of mechanical ventilation[1].

The accuracy of epidemiologic data of NP and VAP has been in question because of the difficulties in defining a gold standard for diagnosis. The incidence of VAP varies among different studies, depending on the definition, the type of hospital or ICU, the population studied, and the level of antibiotic exposure.Knowledge of the incidence of VAP and their associated risk factors are imperative for development and use of more effective preventive measures. This nosocomial infection increases morbidity and likely mortality as well as the cost of health care[2].

According to National Nosocomial Infections Surveillance(NNIS),the rate of VAP is documented 7.6 for each 1000 ventilator days, the recurrence of VAP reported to be 22.8 for each 1000 patient days, 29.6 for each 1000 days at risk,35.7 for every 1000 ventilator days. The general pervasiveness is 9.3%.

The rates differ according to population and the diagnostic criteria. Using protected brush specimen (PSB)during fibrotic bronchoscopy to diagnose pneumonia in ventilated patients fagon reported a nosocomial pneumonia incidence rate of 9%[3].

The incidence of 16.6% was reported at later period using bronchoscopic alveolar lavage(BAL) with quantitative culture techniques.

The risk of acquiring pneumonia appears to increase with the duration of mechanical ventilation in one study it was found to be 7% at 10 days and 19% at 20 days. In that study the incremental risk of pneumonia was virtually constant with mean rate of around 1% per day of ventilation. According to hinagadani*et al*. the mortality in VAP was found to be 54%[4].

The major clinical features suggestive of hospital acquired pneumonia are fever, purulent sputum and new or changing pulmonary infiltrates on chest radiograph(CXR).Although sensitivity of a clinical diagnosis VAP is high. The specificity is low. Specificity is a problem in patients with preexisting pulmonary infiltrates such as patients with ARDS. The diagnosis of VAP is not based on C- xray alone. No single radiographic sign or combination of signs increase the likelihood of a diagnosis of hospital acquired pneumonia[5]. The combination of any one clinical feature with an abnormal chest x-ray is associated with high likelihood of hospital acquired pneumonia. Basing the diagnosis of VAP on a new or changing pulmonary infiltrate on C-Xray and one clinical feature of hospital acquired pneumonia has a good sensitivity but poor specificity. Increasing the number of criteria required increases the ability to distinguish hospital acquired pneumonia from other entities that mimic pneumonia clinically. If all 4 features are required for positive diagnosis. However sensitivity drops to unacceptable levels[6].

ISSN:0975-3583,0976-2833 VOL13, ISSUE04,2022

Methodology

All the patients who are on mechanical ventilation for more than 48 hours irrespective of the cause., total of 101 patients of both sexes, who were on mechanical ventilation for more than 48 hours were selected.
Clinical and diagnostic criteria were based on the Clinical Pulmonary Infection Score (CPIS). The CPIS originally proposed by Pugin and others helps in diagnosing VAP with a sensitivity of 72% and specificity of 80%.
It includes

1. New or progressive infiltrates in chest radiography.
2. At least two of the following four.

a) Hypothermia or hyperthermia.
b) Presence of purulent secretions.
c) Leucocytosis or leukopenia.
d) Decreasing oxygen saturation.

All adult Patients who develop VAP in critical care units as per definition in inclusion criteria are investigated clinically, radiologically and bacteriologically to determine presence of pneumonia. Clinical and diagnostic criteria were based on the Clinical Pulmonary Infection Score (CPIS).
Patients who developed pneumonia within 48 hours or those who were admitted with pneumonia Age, sex, date of admission to ICU, date of initiating mechanical ventilation and mode of access to the patient airway were recorded. Indication of mechanical ventilation was noted.

Results

Table 1: CPIS and Duration of hospitalization distribution comparison between two groups

	Type of VAP						P value
	Early VAP		Late VAP		Total		
	Mean	SD	Mean	SD	Mean	SD	
CPIS	8.67	0.93	8.78	1.08	8.74	1.03	0.583
Duration of Hospitalization	8.72	5.59	18.38	10.78	14.94	10.34	<0.001*

In the study there was no significant difference in CPIS between two groups.
In Early VAP group, mean duration of Hospitalization was 8.72 ± 5.59 days and in Later VAP group, mean duration of Hospitalization was 18.38 ± 10.78 days. There was significant difference in duration of hospitalization between two groups.

Table 2: Outcome distribution comparison between two groups

		Type of VAP					
		Early VAP		Late VAP		Total	
		Count	%	Count	%	Count	%
Outcome	DAMA	4	11.1%	5	7.7%	9	8.9%
	Death	17	47.2%	33	50.8%	50	49.5%
	Improved	15	41.7%	27	41.5%	42	41.6%

χ 2 =0.363, df =2, p =0.834

In Early VAP group, 47.2% died, 41.7% improved and 11.1% had DAMA and in Later VAP group, 50.8% died, 41.5% improved and 7.7% had DAMA.

Table 3: Association between Comorbidities and Mortality between two groups

		Type of VAP					
		Early VAP		Late VAP		Total	
		Count	%	Count	%	Count	Column N %
Co-Morbidities	DM	2	11.8%	7	21.2%	9	18.0%
	DM/HTN/CKD	1	5.9%	1	3.0%	2	4.0%
	HIV	0	0.0%	1	3.0%	1	2.0%
	HTN	3	17.6%	3	9.1%	6	12.0%
	HTN/DM	4	23.5%	2	6.1%	6	12.0%
	N	7	41.2%	19	57.6%	26	52.0%
A. Outcome = Death							

χ 2 =5.418, df =5, p =0.367

In the study among those with mortality, in Early VAP group, majority of subjects had HTN/DM as

ISSN:0975-3583,0976-2833 VOL13, ISSUE04,2022

Comorbidity and in Later VAP group, Majority of subjects had DM as Comorbidity (21.2%).

Discussion

The clinical diagnosis is based on the presence of fever, leucocytosis, purulent secretions and persistent radiological infiltrates. These systemic features of infection may be due to extrapulmonary infections or due to noninfectious causes that stimulate inflammatory response such as trauma, surgery and pancreatitis. In study conducted in 84 patients fagon*et al.*[26] compared prospectively the diagnostic predictions based on clinical radio graphical and laboratorycriteria by a team of physicians with those resulting from a full work up with invasive methods. They found that only 27 out of 84 clinicaly suspected patients were actually found to have pneumonia. Among those found to have pneumonia only 62% had positive predictions on clinical grounds. The main values of temperature,leucocytes,PaO_2/FiO_2 and radiologic scores in the 3 days preceding the onset of pneumonia did not differ among those who were found to have pneumonia and those who did not. It is estimatedthat the rate of false positive clinical judgment is 10-25% and that of false negative 20-40%[7].

The existence of purulent secretions signifies the presence of tracheobronchitis but not for pneumonia. Tracheobronchitis alone does appear to carry additional mortality risk and antibiotic therapy does not alter the outcome in absence of pneumonia[8].

The appearance of a new infiltrate on chest x-ray cannot be relieved upon as evidence of pneumonia in ICU setting. Infiltrates may represent. Atelectasis, pulmonary embolism, heart failure or alveolar haemmorhagewundernk*et al.* [9]studied 69 patients of VAP who subsequently died ad 24 of whom had autopsy proven pneumonia. They found that no radiological sign either alone or in combination with clinical features had diagnostic accuracy of more that 68%.

Even if the diagnosis is correct, bacteriological diagnosis can be misleading because of heavy colonization of upper respiratory tract. Thus recovery of bacteria does not mean infection of lung tissues. Hill *et al.* found that culture from lung biopsies correlated with only 40% of cultures from endotracheal specimen obtained simultaneously[10].For the patients with histologically proven pneumonia, endotracheal aspirate sensitivity was 82% but specificity was only 27%.Fagon and chastre[11] found that only 1/3rd of antibiotics proposed on the basis of ETA sampling was found to be appropriate. However, ETA qualitative culture has a high negative predictive value and in absence of prior antibiotic exposure, a negative culture results virtually excludes VAP[12].ETA culture is also an easy to apply surveillance tool to detect potential pathogens to detect potential pathogens to direct empirical therapy in the event of the occurrence of VAP.

NP can be diagnosed more reliably if there is cavitation of a pulmonary infiltrate or the same organism is found from respiratory secretions and blood or by lung biopsy or percutaneous needle aspiration. However these conditions are seen only in a small minority and lung biopsy or needle aspiration are usually contraindicated in patients on mechanical ventilation.

In our study the average length of hospitalization in late VAP (18.38 ± 10.78 days) was prolonged compared to early VAP (8.72± 5.59 days) similar to study done by ravi*et al.*

In our study 49.5% died, 41.6% improved. Death was more common in late VAP (50.8%) In study done by ravi*et al.* [2] out of 60 patients (13.3%) died out of which 7patients had late VAP and 1 patient had early VAP.

Conclusion

- The mean duration of hospitalization. In Early VAP group, mean duration of Hospitalization was 8.72 ± 5.59 days and in Later VAP group, mean duration of Hospitalization was 18.38 ± 10.78 days.
- In Early VAP group, 47.2% died, 41.7% improved and 11.1% had DAMA and in Later VAP group, 50.8% died, 41.5% improved and 7.7% had DAMA.

References

1. Chastre J, Fagon JY. Ventilator-associated pneumonia. Am J RespirCrit Care Med. 2002;165:867-903.
2. Jakbrittu RP, Boloor R. Characterisation of aerobic bacteria isolated from endotracheal aspirate in adult patients suspected ventilator associated pneumonia in a tertiary care center in Mangalore. *Saudi* J Anaesth. 2012 Apr-Jun;6(2):115-19.
3. Jordi R, Daniel AO, Gerry O, Montserrat VL,Lisa B, Rebecca R, *et al*. Epidemiology and Outcomes of Ventilator-Associated Pneumonia in a Large US Database Chest. 2002;122:2115-2121.
4. David R. Park MDthe Microbiology of Ventilator-Associated Pneumonia.Respircare. 2005;50(6):742-763.
5. Feldman C, Kassel M, Cantrell J, Kaka S, Morar R, GoolamMahomed A,*et al*. The presence and sequence of endotracheal tube colonization in patients undergoing mechanical ventilation.EurRespir J. 1999;13:546-551.
6. Weber DJ,Rutala W, Mayhall CG. Nosocomial Respiratory tract infection and Gram negative pneumonia. Chap-143 in Fishman's Text Book of Pulmonary diseases and disorders. 3rd

ISSN:0975-3583,0976-2833 VOL13, ISSUE04,2022

edition,New York, McGraw-Hill publication. 1998;2:2213-2229.
7. Fabregas N,Ewig S, Torres A, El-Ebiary M, Ramirez J,Puig de la Bellacasa,*et al*. Clinical diagnosis of ventilatorassociated pneumonia revisited comparative validation using immediate post- mortem lung biopsies. Thorax. 1999;54(10):867-873.
8. Fagon JY,Chastre J,Hance AJ,Montravers P,Novara A, Gilbert C. Nosocomial pneumonia in ventilated patients; A cohort study evaluating attributable mortality and hospital stay. Am JMed.1993;94(3):281-288.
9. Wunderink RG, Woldenberg LS, Zeiss,*et al*. The radiologic diagnosis of autopsy -proven ventilator-associated pneumonia. Chest. 1992;101:458-63.
10. Hill JD, Ratloff JL, Parrot JC,*et al*. Pulmonary pathology in acute respiratory insufficiency: lung biopsy as a diagnostic tool. J Thorax Cardiovasc Surg. 1976:71:64-71.
11. Fagon JY, Chastre J, Hance AJ,*et al*. Evaluation of clinical judgement in the identification and treatment of nosocomial pneumonia in ventilated patients. Chest. 1993;103:547-553.
12. Campbell GD, Niederman MS, Broughton MA, Craven DE, Fein AM, Fink MP,*et al*. American Thoracic Society. Hospital-acquired pneumonia inadults:diagnosis,assessmentofseverity,initialantimicrobial therapy and preventive strategies.A consensus statement. Am J RespirCrit Care Med. 1995;153:1711-1725.