

Original Article

Incidence of ventilator associated pneumonia (VAP) in neuro ICU, in a Tertiary Hospital

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Abstract

Background: Ventilator-associated pneumonia (VAP) is the most common nosocomial infection diagnosed in the intensive care unit (ICU), in spite of advances in diagnostic techniques and management it remains a common cause of hospital morbidity and mortality. Early and rapid diagnosis and initiation of the appropriate antibiotic treatment reduce mortality and decrease the development of MDR organisms.

Objective: To determine the incidence of ventilator-associated pneumonia (VAP) and its effect on patients' outcome.

Materials and Methods: A retrospective study was conducted in Enam Medical College Savar, Dhaka. The study group consisted of patients who received mechanical ventilation in the Neuro-surgery ICU from January 2021 to December 2021. The study group consisted of patients who received mechanical ventilation in the Neuro-surgery ICU from January 2021 to December 2021 and developed pneumonia before 48 hours of intubation. Patients records were taken from the ICU and their detailed reports. Data were collected using a structured questionnaire containing all the variables of interest. Data was processed and analyzed with the help of computer program SPSS for windows version 25.

Results: This study shows the mean age of the participants was 32.88±18.47 years with a range of 4 to 75 years. Majority (76%) were male and 24% were female (24%). Common co-morbidity was hypertension (14%) followed by diabetes mellitus (12%) and 8% were DM with HTN. It observed that severe traumatic brain injury case was the most common underlying condition (58%). Staph aureus (42%) accounted for the highest number of cases followed by Klebsiella (26%) and E. coli (26%). Clindamycin was the most common sensitivity pattern of antibiotic in ventilator associated pneumonia (VAP). Majority (90%) were good prognosis, 6% were bad prognosis and 4% were lung fibrosis.

Conclusions: This study shows most common pathogens causing VAP were Staph aureus then Klebsiella and E. coli. Clindamycin was the most common sensitivity pattern of antibiotic in ventilator associated pneumonia (VAP). Therefore, it is important to frame local antibiotic policies and precautions to prevent VAE in the future.

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Introduction

Ventilator-associated pneumonia (VAP) is defined as pneumonia acquired more than 48 hours after being intubated, due to a colonization of the upper airway followed by subsequent replication of bacteria in the lower respiratory tract.^{1,2} It is a well-recognized complication in patients who are admitted to the Intensive Care Unit (ICU), caused by infectious agents not present or incubating at the time mechanical ventilation (MV) is started. Generally, it occurs in 9 - 24% of patients intubated for longer than 48 hours.

This infection can be classified into early onset (within the first 96 hours of MV) and late onset (more than 96 hours after the initiation of MV). The latter is more commonly attributable to multidrug-resistant (MDR) pathogens. These deadly pathogens, also known as “superbugs” can cause significant morbidity and mortality. With infection caused by such bacteria, the death rate may be as high as 20 - 30% in critically-ill ICU patients who have undergone invasive MV via an endotracheal tube (ETT) or tracheostomy.³

Despite advances in preventive strategies, diagnostic techniques, and treatment modalities, ventilator-associated pneumonia (VAP) remains the most common infectious complication among patients admitted in intensive care units (ICUs). It results in high morbidity and mortality, prolonged lengths, and increased cost of hospitalization.² The incidence of VAP varies widely in different studies depending on the diagnostic criteria used, type of ICU, and patient population. Moreover, the causative organisms vary according to the patients' demographics in the ICU, the duration of hospital/ICU stay, and the antibiotic policy of the institution. ICU is often called “the hub of infections” and the organism causing these infections are highly evolved and resistant to most anti-biotics. Thus, treating these infections are difficult and are often associated with high mortality rates. Micro-organisms causing VAP vary from hospitals to hospitals thus necessitating the need for local surveillance.⁸ In view of rising importance of VAE in ICUs, this study was done to assess the incidence of VAE, different microorganisms causing PVAP and to analyse different anti-biotic resistance in the isolates taken from Intubated patients in neurosurgery ICU of hospital. Therefore, knowledge of the incidence of VAP, associated risk factors and common pathogens causing VAP can help in

development of effective preventive measures and bundle protocols, which in turn will decrease the mortality and morbidity, duration of treatment and hospital stay. This study to determine the incidence of ventilator associated pneumonia (VAP) in neuro ICU, in a Tertiary Hospital.

Materials and Methods

A retrospective study was conducted in Enam Medical College Savar, Dhaka. The study group consisted of patients who received mechanical ventilation in the Neuro-surgery ICU from January 2021 to December 2021. Consecutive sampling was used. Patients who developed pneumonia before 48 hours of intubation. Patients records were taken from the ICU and their detailed reports. Demographic details, days of mechanical ventilation, Temperature, WBC counts, Polymorphs counts were taken. Details regarding organisms isolated from the sputum samples and their anti-biotic sensitivity pattern were taken from the microbiology department. The details were recorded in individual case study forms. Data were collected using a structured questionnaire containing all the variables of interest. Data was processed and analyzed with the help of computer program SPSS for windows version 25.

Results

Table I: Demographic characteristics of the study subject (n=50)

Characteristics	Frequency	Percentage (%)
Age in years		
≤15	6	12.0
16-30	24	48.0
31-45	7	14.0
46-60	10	20.0
>60	3	6.0
Mean±SD	32.88±18.47	
Sex		
Male	38	76.0
Female	12	24.0

Table II: Diagnosis of the study subject (n=50)

Characteristics	Frequency	Percentage (%)
Severe traumatic brain injury	29	58.0
Haemorrhagic stroke	13	26.0
Aspiration pneumonia	2	4.0
H/O TURBT	2	4.0
Vertigo	2	4.0
Ischaemic stroke	2	4.0
Severe TBI with Poly trauma	2	4.0
Massive ischemic stroke	1	2.0
Meningo-encephalitis	1	2.0

Table III: Co-morbidity of the study subject (n=50)

GCS	Frequency	Percentage (%)
3-8	40	80.0
9-12	8	16.0
13-15	2	4.0

Table V: Intubation of the study subject (n=50)

Intubation	Frequency	Percentage (%)
Not done	2	4
1 st day	42	84.0
2 nd day	4	8.0
3 th day	2	4.0

Table VI: Ventilator of the study subject (n=50)

Ventilator	Frequency	Percentage (%)
1 st day	44	88.0
2 nd day	4	8.0
3 th day	2	4.4

Table VII: Pneumonia developed of the study subject (n=50)

Pneumonia developed	Frequency	Percentage (%)
2 nd day	6	12.0
3 rd day	16	32.0
4 th day	16	32.0
5 th day	11	22.0
6 th day	1	2.0

Fig. 1: Culture result of the study subject (n=50)

Antibiotic Sensitive	Frequency	Percentage (%)
Clindamycin	45	90.0
Ceftriaxone	20	40.0
Meropenem	13	26.0
Linezolid	11	22.0
Amikacin	6	12.0
Piperacillin	4	8.0
Tazobactam	4	8.0
Cefuroxime	4	8.0
Colistin	3	6.0
Tigecycline	3	6.0
Moxifloxacin	1	2.0
Vancomycin	1	2.0

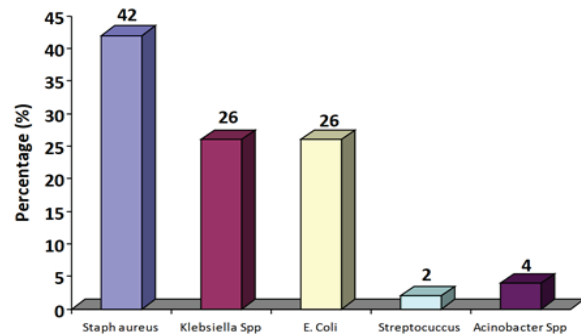


Fig. 1: Culture result of the study subject (n=50)

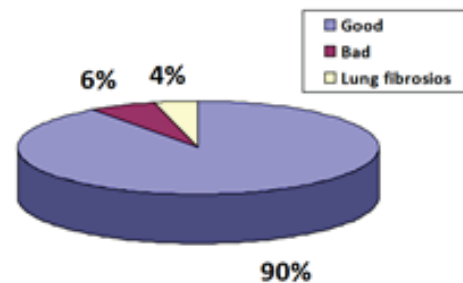


Fig. 2: Prognosis of the study subject (n=50)

Discussion

Incidence of ventilator associated pneumonia (VAP) is a common iatrogenic pulmonary infection in critically ill mechanically ventilated patients. Literature provides no large prospective study exploring the incidence, risk factors of VAP development in patients with TBI. Moreover, the impact of VAP on long term outcome is still debated. We tried to incidence of

ventilator associated pneumonia (VAP) in neuro ICU, in a Tertiary Hospital In this study shows the mean age of the participants was 32.88 ± 18.47 years with a range of 4 to 75 years. Commonest age range were 16-30 years (48%) and 46-60 years (20%). Majority (76%) were male and 24% were female ((24%). This findings consistent with other studies.^{3,5,6} This study shows common co-morbidity was hypertension (14%) followed by diabetes mellitus (12%) and 8% were DM with HTN. In a study done by Karatas in Turkey, they found that Diabetes mellitus significantly increased risk of VAP.⁷ Agarwal et al.⁸ reported association of Chronic kidney disease with development of VAP. But in this study co-morbidities were not related to VAP which may be due to the fact that the study was performed in a tertiary care hospital specialized in treating diabetic patients where most of the patients were diabetic and had pre-existing multiple co-morbidities.

In this study, it observed that severe traumatic brain injury case was the most common underlying condition (58%) followed by haemorrhagic stroke (26%) and the Aspiration pneumonia (4%). Previous studies reported head injury patients are at increased risk for VAP compared to medical patients.⁹ Similarly study observed that head injury case was the most common underlying condition (45.7%) followed by pathologies of the craniovertebral junction and the cervical spine trauma.³ In this study Staph aureus (42%) accounted for the highest number of cases followed by Klebsella (26%) and E. coli (26%). This findings consisted with other studies.³ Similar Study of VAP done in a French ICU they noted that prior antimicrobial therapy markedly increased the rate of VAP caused by P. Aeruginosa and Acinetobacter spp. These two pathogens in their study accounted for 65% of VAP cases among patients who have previously received antibiotics, compared with only 19% of VAP¹⁰ cases among antibiotic-naïve patients.¹⁰ Similarly, Joseph et al. also reported Staph aureus and Klebsella as the predominant organisms causing VAP.¹² Similar study done by Giantsou et al. also observed that potentially multiresistant P. Aeruginosa has been seen to be the most commonly isolated pathogen in both early onset and late onset VAP.¹³

This study shows clindamycin was the most common sensitivity pattern of antibiotic in ventilator associated pneumonia (VAP). Regarding the antibiotic sensitivity pattern, our

results were in accordance with the study conducted.^{3,8,9,14}

This study shows majority (96%) were need intubation. This findings consistent with others studies Thomas et al.¹⁵ Majority (84%) were need intubation 1st day. Similar Ahsan et al.⁶ study reported among the 35 VAP patients, 18 (51.4%) developed early VAP and 17 (48.6%) developed late VAP. The mean time interval between intubation and development of VAP was 5.65 ± 3.99 days. In early VAP mean interval was 2.83 ± 0.85 and in late VAP mean interval was 8.64 ± 3.82 days.

This study shows majority (90%) were good prognosis, 6% were bad prognosis and 4% were lung fibrosis. This results are in agreement with a recent meta-analysis.¹⁶ The literature reports VAP as a frequent ICU complication in incidence ranging from 10-40%, and with large variations among studies and countries.¹⁷ Several authors also suggest that VAP adversely impacts mortality.¹⁸⁻²¹ A study attempting to control for confounding biases demonstrated a VAP-attributable bad prognosis in 10%.²¹

Conclusion

This study shows commonest age range were 16-30 years. Majority were male. Common co-morbidity was hypertension followed by diabetes mellitus. Severe traumatic brain injury case was the most common underlying condition. Staph aureus accounted for the highest number of cases followed by Klebsella and E. coli. Clindamycin was the most common sensitivity pattern of antibiotic in ventilator associated pneumonia (VAP). We recommend conducting prospective multicenter studies to know local risk factors and patterns of pathogens causing VAP to assist in making appropriate preventive, diagnostic, and therapeutic plans to reduce their incidence and improve outcomes.

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