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Ventilator associated pneumonia in a ICU of A tertiary care hospital in India

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***Abstract*---**Introduction:- Ventilator Associated Pneumonia (VAP) refers to a type of pneumonia that occurs more than 48–72 hours after endotracheal intubation. Risk factors include prolonged mechanical ventilation, reintubation after extubation. Our aim of this study to find the incidence of VAP, total days of mechanical ventilation, days of ICU and hospital stay at tertiary care hospital.Methodology:- This study was conducted in Department of Medicine ,Government medical college, Bharatpur, Rajasthan. The population of this study was 200 cases. The duration of study was over a period of two years Result:- The result of this study revealed that most of cases were had infection of Pseudomonas aeruginosa (30%) followed by MRSA (23.4%), Klebseilla pneumonia (20%) , A. baumannii (16.7%), Streptocooccus pneumonia (3.3%) & Candida spp. (3.3%) Conclusion:- This study concludes that Regular fumigation of ICUs and sterilization of ventilators should be done undoubtedly to reduce the incidence of VAP.

***Keywords*---**VAP, Non-VAP, ICU, Organism.

Introduction

In the intensive care units (ICU), the ventilator-associated pneumonia (VAP) is the most common nosocomial infection. VAP is considered as pneumonia that occurs at least 48 hours after tracheostomy or endotracheal intubation and it is found to be caused by infectious agents that are not present at the time of ventilation. VAP

is of two types: (a) early-onset that occurs within 4 days of ventilation, and (b) late-onset that occurs after 4 days of ventilation**.[1]** Even with advancement of techniques of respiratory tract instrumentation and development of better disinfectants, the prevalence of nosocomial bacterial pneumonia is 7-41% in patients receiving continuous mechanical ventilation**.[2]** Quick diagnosis and suitable antibiotic treatment is required in VAP as delayed antibiotic therapy has been linked with increased hospital mortality**.[3]** VAP risk rates are more in developing countries in comparison to United states as evident by respective incidence rates of 10-52.7/1000 and 4-14/1000 ventilator days**.[4]** in various studies, a number of factors have been attributed to increase the risk of VAP **[5]** and causative agents varied in different settings**.[6]** Thus, it becomes mandatory to understand the incidence, associated risk factors and causative pathogens of VAP so that, efficient preventive methods can be developed to reduce the morbidity and mortality.

Material & Methods

Study Area:- This study was conducted in Department of Medicine ,Government medical college, Bharatpur, Rajasthan.

Study Population:- The population of this study were 200 cases.

Study Duration:-The duration of study was over a period of two years.

Data Collection:- We took a consent form then the study was done. Elective tracheostomy was done in some of the patients who were thought to stay for a long period on mechanical ventilation to avoid re intubation. The baseline characteristics like age, any concomitant diseases, the severity of illness based on APACHE II score during first 24 hours of admission were collected. The diagnosis of VAP was established using clinical pulmonary infection score (CPIS), which was evaluated on a daily basis until the patient was on ventilator support. Endotracheal aspirate was preferred over protected specimen brush (PSB) sampling and bronchoalveolar lavage (BAL), as these techniques are more invasive and studies have shown no mortality benefit of using these over endotracheal aspirate. Endotracheal aspirates were obtained under the aseptic precautions by using a 22-inch Romson's 12F suction catheter with a mucus extractor. Gentle aspiration was then performed without instilling saline, and the catheter was withdrawn from the endotracheal tube. After this, 4 ml of 0.9% saline was injected in the endotracheal tube with a sterile syringe to flush the exudates into a sterile container for collection. The samples were sent to laboratory for culture susceptibility. Care was taken during the procedure to avoid injury to the tracheal mucosa and hypoxia development. The patients diagnosed with VAP were started on initial empirical antibiotic therapy, which was guided by the fact whether a multi-drug resistant pathogen was expected. Later on, based on culture sensitivity reports the treatment was modified. The primary outcome measure assessed was mortality. Other measures assessed included the incidence of VAP, frequency of different pathogens isolated, their antibiotic sensitivity pattern, duration of mechanical ventilation and duration of hospital stay. The results were also analysed to find out any association between patient characteristics, severity

of underlying illness as assessed by APACHE II score, factors related to course of care like re-intubation with the incidence and rate of mortality in VAP.
Data Analysis:-Data were analysed by using Microsoft Excel.

Result

In this study we were included 200 cases totally. Among all 122 cases were male rest were female. This study was included from 15 age group to 70 age group of cases. The prevalent age group was 21-30 (54 cases) followed by other age groups shown in Chart no. 3. Out of 200 cases, 60 cases of VAP and rest of non-VAP cases were observed. Most no. of cases were CVA followed by snake bite, sepsis, meningitis, cardiogenic shock etc. Sepsis contributed most to VAP (58%). CVA patients contributed most to the mortality followed by sepsis. But there was no association between clinical disease and development of VAP and also for mortality.Out of 60 VAP cases most of cases were had infection of Pseudomonas aeruginosa (30%) followed by MRSA (23.4%), Klebseilla pneumonia (20%) ,A. baumannii (16.7%),Streptocooccus pneumonia (3.3%) & Candida spp. (3.3%). In this study, the mean APACHE II score, mean duration of mechanical ventilation and mean duration of hospital stay in VAP group was significantly higher than non VAP group (p value <0.05).

Chart:1 Gender distribution

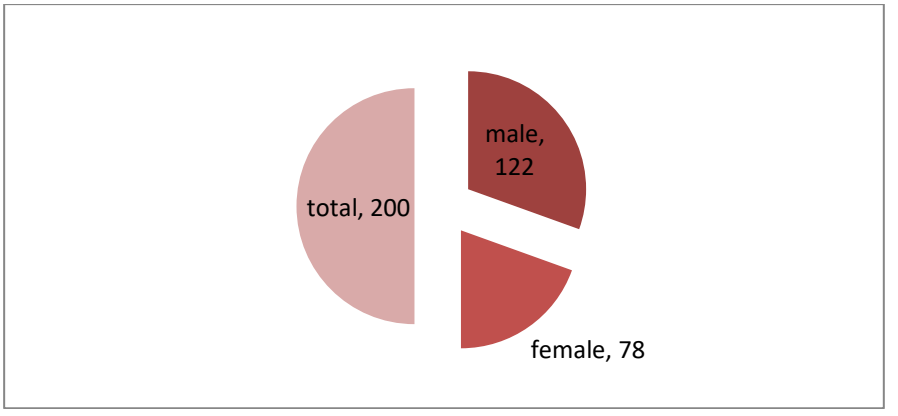

Chart:2 Age Distribution

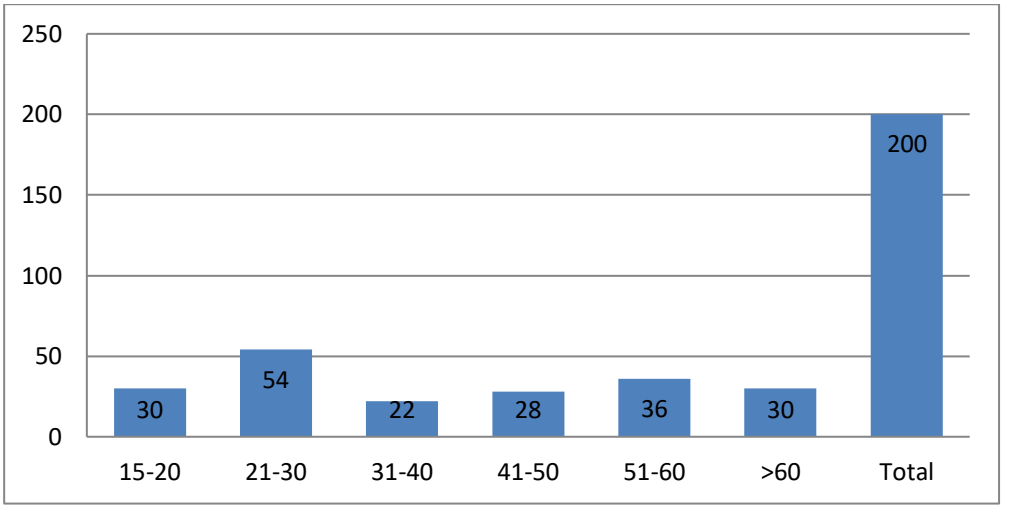

Chart:3 Distribution of cases according to VAP & Non-VAP

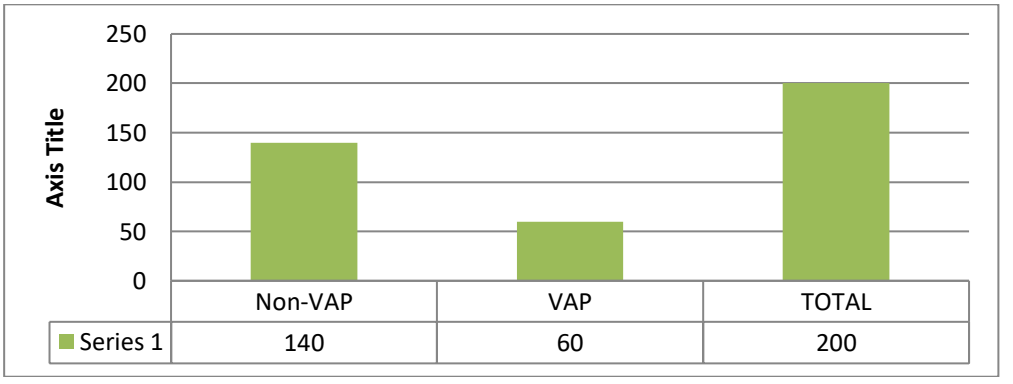

Table :1 Comparison of disease with VAP ,Non VAP according to disorder

Disorder	VAP	NON-VAP	Total
Meningitis	6	14	20
GBS	6	6	12
Snake bite	6	28	34
Cerebral vascular accident	8	32	40
Cardiogenic shock	2	18	20
Sepsis	14	10	24
Metabolic (ARF/DKP)	4	8	12
Malaria	4	4	8
Dengue shock syndrome	0	6	6
Poisoning	4	8	12

Pancreatitis	4	2	6
Hepatic encephalopathy	2	4	6
Total	60	140	200

Table:2 Distribution of cases according to organism

Organism	Numbers	Percentage
P. aeruginosa	18	30%
MRSA	14	23.4%
K. pneumoniae	12	20%
A. Baumannii	10	16.7%
Enterococci	2	3.3%
S. pneumoniae	2	3.3%
Candida	2	3.3%

Table:3 Comparison of Apache II Score and Outcome from Ventilator

Category	VAP	Non-VAP	P value
Apache II score	21 ±7.02	15.88 ±5.57	<0.0002
Duration of mechanical ventilation	12.66 ± 3.69	5.72 ± 2.58	<0.0001
Duration of Hospital Stay	16.1± 3.81	8.7± 3.73	<0.0001

Discussion

In the present study, the incidence of VAP was 30% that was almost similar to 28% of Gupta et al but the associations between genders (p value-0.372) and age (p value-0.929) were non- significant. **[7]** It has been observed that the patients who required increased number of days of mechanical ventilation had more chances of developing VAP. The patients of septicemic shock, Guillain Barre Syndrome, meningitis and complicated malaria who required prolonged ventilation developed VAP more often. On the contrary, the cases of snake bite, cardiogenic shock that do not need ventilation for long duration developed VAP less commonly. In the present study, a significant correlation was not found between the primary disease and development of VAP (p value =0.24). These findings have been supported by the findings of Gupta et al **[7]** and Awasthi S et al **[8]** . In the present study, the most common cause of mortality were CVA patients and second most common was sepsis but the relation between diseases and mortality was non-significant (p value= 0.2). CPIS scoring system was found to be a highly sensitive tool to diagnose VAP in the studies of Luytet al **[9]** and Croce et al **[10]**. Patients with a CPIS score of more than 6 were found to be suffering from VAP. In the present study, out of the 10 patients reintubated, 8 was found to develop VAP (p value = 0.0009) indicating reintubation a high level risk factor for VAP development. Similar findings were observed in the studies of Gupta et al **[7]** , Panwar et al **[11]** and Rit et al **[12]** . Increased duration of ventilation and repeated procedure of intubation can be attributed for this. It can also be said the patients who required reintubation may be exposed to aspiration

in between extubation and re-intubation. Patients who underwent early tracheostomy showed a lower but a non-significant (P - 0.4816) trend of developing VEP. The commonest organisms isolated were P. aeruginosa (18 isolates, all from patients with late onset VAP) followed by, K. Pneumoniae (12 isolates) and A. baumannii (10 isolates). There was no correlation found between infecting organism and type of VAP. Similar findings were reported by Rit et al **[12]**. It was observed that most strains of P. Aeruginosa were resistant to the commonly used beta-lactamase inhibitors but were highly sensitive to polymyxin B, colistin, meropenem and imipenem. Strains of S. aureus were MRSA and resistant to methicillin, oxacillin, amoxicillin+ clavulanic acid, erythromycin etc but sensitive to linezolid and vancomycin. Isolates of K. Pneumonia were ESBL producing and resistant to commonly used cephalosporins and one starin was resistant to both carbapenems but sensitive to polymyxin and colistin. Isolates of A. baumannii presented the similar results. Studies of Ijaj et al **[13]**, Krishnamurthy et al **[14]** and Gupta et al **[7]** presented the similar antibiotic profiles. In the present study, the rising drug-resistance of strains of various organisms can be held responsible to be an important cause of VAP. Although VAP was not independently associated with mortality, mortality rate was higher in patients with VAP. The overall mortality in the present study was 32%. Mortality in VAP and non-VAP groups was 43.33% and 27.14% respectively but without any significant difference (P value-0.15). Almost similar results were found in the studies of Gupta et al **[7]** and Panwar et al **[11]**. Patients suffering from A. baumannii and K. pneumonia showed high mortality of 80% and 66.6% respectively. It was found that the mean duration of mechanical ventilation was much more in VAP patients then in non-VAP patients (p value < 0 .0001) increasing the cost of treatment. Dubey et al **[15]** and Gupta et al **[7]** presented almost similar results but no significant difference was noted in duration of hospital stay between survivors and non survivors (p value = 0.414). It was reported by Naved et al **[16]** and Gupta et al **[7]** that the patients with high APACHE II score at admission had higher mortality, increased duration of mechanical ventilation, ICU and hospital stay. This finding supported the finding of the present study.

Conclusion

Therefore, it can be finally suggested that the early diagnosis of VAP and start of proper antibiotic treatment is extremely important to prevent the adverse outcomes. Proper hand hygiene and other sterile techniques are also needed to halt spread of infection. Regular fumigation of ICUs and sterilization of ventilators should be done undoubtedly to reduce the incidence of VAP.

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