

Frequency of Ventilator Associated Pneumonia in Pediatric ICU of Allied Hospital, Faisalabad

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ABSTRACT

Introduction: Endotracheal intubation and ventilation is often required to manage acute respiratory failure in critically ill patients. Despite being lifesaving therapy, mechanical ventilation can frequently cause problems with significant hazards, including the nosocomial infection recognized as ventilator associated pneumonia. **Objective:** To determine the frequency of ventilator associated pneumonia in children > 1 month – 15 years of age. **Study Design:** Cross sectional study. **Duration of Study:** 06-11-2015 to 05-05-2016. **Setting:** Department of Pediatric Medicine Unit-1, Allied Hospital, Faisalabad. **Sample size:** The total sample size was 96 cases. **Sampling Technique:** Non probability purposive sampling. **Methodology:** Total of 96 patients, having age range from >1 month to 15 years, on mechanical ventilation due to any reason for more than 48 hours were enrolled in study. Patients already having pneumonia were excluded from the study. All patients underwent detailed medical history and physical examination followed by investigations i.e. complete blood count, C reactive protein and X-ray chest. The data was analyzed through SPSS-20, mean and standard deviation was calculated for age of the children. Frequency and percentage was calculated for qualitative variable like gender and presence/absence of VAP. **Results:** In this study, out of 96 children, minimum age was 6 months and maximum age was 156 months and Mean \pm SD was calculated as 38.07 \pm 37.368 months, 51 (53.1%) were male and 45 (46.9%) were females, ventilator associated pneumonia was recorded in 19 (19.8%) while 77(80.2%) had no findings of the ventilator associated pneumonia. **Conclusion:** The frequency of ventilator associated pneumonia was 19.8% in this study, indicating the importance of keeping index of suspicion high for the development of ventilator associated pneumonia in patients being mechanically ventilated.

Keywords: Mechanical Ventilation, Ventilator Associated Pneumonia, Intensive Care Unit.

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INTRODUCTION

Heterogeneous group of pediatric diseases can lead to respiratory distress and failure,¹ making mechanical ventilation a cornerstone in the management of critically sick childrens.² Ventilators are the main stay of mechanical ventilation in intensive care unit settings. Main aim of ventilation is to provide adequate gas exchange.¹ Patients on mechanical ventilation are at a risk of variety of serious complications which are detrimental and increase cost of treatment. One such complication is ventilator associated pneumonia.³

Ventilator associated pneumonia is defined as pneumonia occurring more than 48 hours after patients has been intubated and received mechanical ventilation. It is usually diagnosed by clinical, radiological and microbiological criteria.⁴ It is suspected by the presence of fever, increased WBC count, new x-ray infiltrates and purulent bronchial

secretions.³ Ventilator associated pneumonia can be of two types: (1) early onset ventilator associated pneumonia defined as pneumonia that occurs within the first four days of ventilation and (2) late onset ventilator associated pneumonia defined as pneumonia that occurs more than 4 days after initiation of mechanical ventilation.⁵

Despite major advances in the techniques in caring for the patients whose respiratory tracts are instrumented and routine uses of disinfection procedures for the respiratory equipment, nosocomial bacterial pneumonia continues to complicate the course of 7-41% of patients receiving continuous mechanical ventilation.⁵

Ventilator associated pneumonia extends duration of mechanical ventilation, increases duration of intensive care and hospital stay and ultimately mortality risk.⁶ They are also associated with the increased use of antimicrobials. Various factors contribute to the development of ventilator

associated pneumonia. Two major groups are of host factors like trauma, post-surgical and burn patients, enteral feeding etc. and intervention factors like duration of ventilation, frequent change in ventilation circuit, type of circuit etc. Microbiology and susceptibility patterns are different from center to center.⁷

Different studies in different parts of the world have been conducted to determine the frequency of ventilator associated pneumonia. One such study was conducted in the children hospital and institute of child health, Lahore where the frequency of ventilator associated pneumonia was 17%.² In another study conducted in India it was calculated to be 57.14%.⁵ This difference was attributed to host factors like trauma, post-surgical and burn patients, enteral feeding etc. and intervention factors like duration of ventilation, frequent change in ventilation circuit, type of circuit etc.

Due to controversy in literature current study will be helpful in measuring the exact burden of disease in our population so that morbidity related to ventilator associated pneumonia will be reduced by controlling this disease.

METHODOLOGY

Study Design: Cross sectional study.

Setting: Department of Pediatrics Medicine Unit-1, Allied Hospital, Faisalabad.

Duration of study: 06-11-2015 to 05-05-2016.

Sample size: Sample size was calculated by using WHO sample size calculator; It was 96 by keeping prevalence of VAP 17%², Absolute precision required 10%, Confidence level at 95%.

Sampling technique: Non probability purposive sampling technique

Inclusion Criteria: Children of >1 month – 15 years of age and either sex on mechanical ventilation due to any reason for > 48 hours.

Exclusion Criteria: Patients already having pneumonia.

Data Collection Procedure: After getting permission from ethical review committee and taking informed written consent from the parents/guardian of 96 children meeting the inclusion criteria were selected. All the children on mechanical ventilation were closely monitored for any feature suggestive of ventilator associated pneumonia, especially new and persistent chest examination of crepitation's, rhonchi and bronchial breathing on auscultation and unexplained fever > 101°F. All such children underwent septic screening including complete blood count and differential serum CRP (CRP level) from pathology department and X-ray chest from radiology department. The criteria for diagnosing

ventilator associated pneumonia was taken from CDC guidelines as defined in operational definition. Patient included in study group were thoroughly evaluated by taking detailed history and detailed clinical examination of the patient.

After explaining the purpose and taking informed consent, data was collected by trainee researcher through specially designed Performa.

Finally, the results were entered and analyzed in SPSS version 20. Quantitative variable like age of child were presented by mean and standard deviation. Qualitative variable like sex and presence of ventilator associated pneumonia were presented as frequency and percentage. All the results for qualitative variables were presented in the form of tables. Effect modifiers like age and gender were controller by stratification. Post stratification chi-square test was applied. p-value less than 0.05 was taken as significant.

RESULTS

In this study, the minimum age of the participation was 6 months and maximum age was 156 months and Mean \pm SD was calculated as 38.07 \pm 37.368 months (Table No I),

Table 1: Clinical variable of patients (n=96)

Age	n	Minimum	Maximum	Mean	Std. Deviation
	96	3	156	38.07	37.368

Out of 96 patients, 70 (72.9%) were between 1 – 60 months, 20 (20.8%) were between 61 – 120 months while 6 were 121-156 months old (Table 2)

Table 2: Age distribution (n=96)

Age (Months)	Frequency	Percentage
1-60 Months	70	72.9%
61-120 Months	20	20.8%
121-156 Months	06	6.3%

Among them 51 (53.1%) were male and 45 (46.9%) were females (Table No 3),

Table 3: Gender distribution of patients (n=96)

Gender	Frequency	Percent
Female	45	46.9%
Male	51	53.1%

Ventilator associated pneumonia was recorded in 19 (19.8%) while 77(80.2%) had no findings of the ventilator associated pneumonia (Table No – IV).

Table 4: Distribution of VAP according to study subjects (n=96)

Ventilator associated pneumonia	Frequency	Percent
Absent	77	80.2
Present	19	19.8

Amongst 19 patients who developed VAP 11 were male and 8 were female (Table No – V)

Table 5: Distribution of VAP according gender (n=96)

Gender	VAP		Total
	NO	Yes	
Male	40	11	51
Female	37	8	45
Total	77	19	96

Out of 96 patients, 9 were between 1 – 60 months, 10 were between 61 – 120 months, while no patient between 121 – 156 months developed ventilator associated pneumonia (Table 4).

Table 6: Distribution of ventilator associated pneumonia according to age group (n=96)

Age Group	Ventilator associated pneumonia		Total
	No	Yes	
1 – 60 Months	61	9	70
61 – 120 Months	10	10	20
121 – 156 Months	6	0	6

DISCUSSION

Health care associated infections are one of the most difficult challenges faced in the modern intensive care units especially in developing countries due to lack of surveillance programs.⁸ Ventilator Associated Pneumonia (VAP) is of great concern in modern ICUs and certain risk factors i.e. emergency intubations, prolonged ventilation, microbes etc are considered vital in causing VAP. It is also observed that VAP is associated prolonged duration of hospital stay.⁹ It is also associated with longer period ventilation and increased length of intensive care stay and increased mortality.¹⁰ This study was planned as no such research has been conducted in recent years locally and the results of this study may be helpful for reducing morbidity and mortality among infants by formulating guidelines and advising preventive measures.

In our study, out of 96 children, minimum age was 6 months and maximum age was 156 months and Mean±SD was calculated as 38.07±37.368 months, 70 (72.9%) were between 1 – 60 months, 20 (20.8%) were between 61 – 120 months and 121 – 156

months was recorded in 6 (6.3%), 51 (53.1%) were male and 45 (46.9%) were females, Ventilator associated pneumonia was recorded in 19 (19.8%) while 77(80.2%) had no findings of the ventilator associated pneumonia. Similar results were seen in one of the study done at medical ICU of children hospital and institute of child health where frequency of VAP was 17%. Majority of the patients were male in this study which is similar to some local study in Pakistan.² Amongst 19 patients who developed VAP 11 were male and 8 were female; 9 were between 1 – 60 months, 10 were between 61 – 120 months, while no patient between 121 – 156 months developed ventilator associated pneumonia. Higher mean age was associated with lower infection rate which is similar to St Louis Children’s Hospital.¹¹

Another surveillance study from pediatric intensive care unit shown that VAP occur in 3-32% of the ventilated patients.^{11,12} The prevalence quoted from neonatal intensive care unit and adult intensive care unit reports is much higher 15-32%.¹³

Another study from Uttar Pradesh, India, reported incidence of VAP 28.04%. They also observed that mortality in VAP group was higher as compared to non-VAP group.⁹

This study confirms the high frequency of VAP in a critical care patient, and also provided other interesting results like VAP rate was higher than seen in similar studies conducted locally; The case definition did not require invasive diagnostic technique; The surveillance system is prospective on site and consequently sensitive.

Our study suffers certain limitations also. Firstly, it was conducted in a single pediatric ICU therefore limiting the generalizability of the result. Second as for any study on this topic the challenge of accurately diagnostic VAP remains. In our study we relied on standard definitions being used worldwide for diagnosing ventilator associated pneumonia but it was not supported by invasive diagnosis procedures. Therefore, certainly there is some level of misclassification of the outcome with some conditions mistakenly considered as VAP and some true VAP episodes that we failed recognized. However further research is still needed for concrete evidence based recommendations for prevention of VAP.

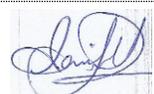
CONCLUSION

The frequency of ventilator associated pneumonia was 19.8% in this study, indicating the importance of keeping index of suspicion high for the development of ventilator associated pneumonia in patients being mechanically ventilated.

REFERENCES

1. Freedman MH, Hord JD. The acutely ill child. In: Sarnaik AP, Clark JA, Mastropietro C, Gelmini MJ. Nelson textbook of pediatrics 19th ed. Philadelphia Elsevier; 2011: 314-33.
2. Hamid MH, Malik MA, Masood J, Zia A, Ahmad TM. Ventilator-associated pneumonia in children. J Coll Physicians Surg Pak 2012;22:155-8.
3. Klompas M, Branson R, Eichenwald EC. et al. strategies to prevent ventilator-associated pneumonia in acute care hospital: 2014 update. Infect Control Hosp Epidemiol 2014;35:915-36.
4. Cernada M, Brugada M, Golombek S, Vento M. Ventilator-associated pneumonia in neonatal patients: an update. Neonatology 2014;105:98-107.
5. Ranjan N, Chaudhary U, Chaudhry D, Ranjan KP. Ventilator-associated pneumonia in a tertiary care intensive care unit: Analysis of incidence, risk factors and mortality. Indian J Crit Care Med 2014;18:200-4.
6. Keyt H, Faverio P, Restrepo MI. Prevention of ventilator-associated pneumonia in the intensive care unit: a review of the clinically relevant recent advancements. Indian J Med Res 2014;139:814-21.
7. Charles MP, Kali A, Easow JM, Joseph NM, Ravishankar M, Srinivasan Set al. S. Ventilator-associated pneumonia. Australas Med J 2014;7:334-44.
8. Bammigatti C, Doradla S, Belgode HN, Kumar H, Swaminathan RP. Healthcare associated infections in a resource limited setting. J Clin Diagn Res 2017;11(1):1-4.
9. Gupta A, Agrawal A, Mehrotra S, Singh A, Malik S, Khanna A. Incidence, risk stratification, antibiogram of pathogens isolated and clinical outcome of ventilator associated pneumonia. Indian J Crit Care Med 2011;15(2):96-101.
10. Ranjan N, Chaudhary U, et al. Ventilator-associated pneumonia in a tertiary care intensive care unit: analysis of incidence, risk factors and mortality. Indian J Crit Care Med 2014;18(4):200-4.
11. Elward AM, Warren DK, Fraser VJ. Ventilator-associated pneumonia in pediatric intensive care unit patients: risk factors and outcomes. Pediatrics 2002;109(5):758-64.
12. Srinivasan R, Asselin J, Gildengorin G, Wiener-Kronish J, Flori HR. A prospective study of ventilator-associated pneumonia in children. Pediatrics 2009; 123:1108-15.
13. Foglia E, Meier MD, Elward A. Ventilator-associated pneumonia in neonatal and pediatric intensive care unit patients. Clin Microbiol Rev 2007; 20:409-25.

AUTHORSHIP AND CONTRIBUTION DECLARATION

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Dr. Maryam Masood Medical Officer, Pediatrics Children Hospital, Faisalabad.	Contributed in conception and interpretation of data and give his expert view of manuscript designing	
Dr. Sayed Ghulam Shabbir Medical Officer, Pediatrics Children Hospital, Faisalabad.	Drafting the article and shares its expert research opinion and	
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