

INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA IN POST-OPERATIVE CARDIAC SURGERY PATIENTS

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ABSTRACT:

BACKGROUND: Major cardiac surgery patients are at high risk for nosocomial infections. Our objective was to identify risk factors for ventilator-associated pneumonia (VAP) in post-operative cardiac surgery patients. One of the leading cause of morbidity and mortality in cardiac intensive care is VAP. So this serious nosocomial infection is a real threat to post-operative cardiac surgery patients.

AIMS & OBJECTIVE: The objective of the study was to find the incidence of ventilator associated pneumonia in post-cardiac surgery patients.

MATERIAL & METHODS: This was a prospective, clinical study conducted at Punjab institute of cardiology between 01-06-2021 to 31-12-2021 for six months. A total of 120 post-cardiac surgery patients of both genders in ICU were enrolled in the study. Informed consent and demographic details were taken. Baseline investigations were taken. With properly designed Questionnaire data regarding the observations were entered by working personnel in ICU. VAP was confirmed by history of patients and by microbiology aspect. The data was collected and was analyzed by the help of SPSS v20 software.

RESULTS: All of 120 patients underwent controlled ventilation. In 5 patients microbiological results confirmed VAP. Among patients who were diagnosed as case of VAP average patient age was a 59.40±5.12 years. 2 (40%) males and 3(60%) females suffered VAP. Predominant organism isolated was pseudomonas aeruginosa4 (80%). CABG with and without valve surgery 4 (80%) was the commonest type of surgery. Majority of patients 4(80%) remained on mechanical ventilation for more than 48 hours.

CONCLUSION: VAP is relatively most common nosocomial infection in post-cardiac surgery patients. Post CABG patients especially with multiple risk factors, compromised left ventricular systolic function and longer duration on mechanical ventilation are at high risk of developing VAP. Such population should be given special attention.

KEY WORDS: VAP, Post-cardiac surgery patients, Mechanical Ventilation.

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INTRODUCTION:

Ventilator-induced pneumonia (VAP) is a type of nosocomial infection occurring in intubated patients and requiring mechanical ventilation (MV). The incidence of this complication in such patients predisposes to elevated mortality (25-75%), economical burden and longer hospital stay. So that it results in increased cost and treatment duration. It can be prevented by both care and pharmacological means.¹ Early diagnosis is a key, and treatment outcome depends on selection of appropriate antibiotic. Prolonged MV is performed in post-operative cardiac surgery patients in whom failure of spontaneous breathing results in inability to extubation. This leads to increased exposure of such patients on MV to adverse nosocomial infection as VAP.² In recent era, the common micro-organism causing VAP can be drug resistant. Mostly isolated bacteria *Acinetobacter baumannii*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*.³ Target should be maximal efforts to earlier extubation from MV. Provision of normal maintenance of respiratory function will minimize the risk of developing VAP.⁴

Risk factors for VAP following cardiac surgery are diversified. There may be variable relationship to the medical status of the patient. Data on risk factors in our population is lacking and require much more research.

The rationale of this study is to identify the incidence and risk factors of VAP in post-cardiac surgery patients. Also in our population as very small data is available. After exploring the factors and by correcting them we can reduce the nosocomial infections by improving nursing care.

OBJECTIVE:

The objective of this study to identify the association between risk factors and incidence of VAP in post-cardiac surgery patients.

MATERIAL & METHODS:

Operational Definition:

Ventilator Associated Pneumonia:

Diagnosis of VAP requires presence of new or progressive lung infiltrate on chest x-ray with mechanical ventilation duration > 48 hours with two or more of the following:

- 1) Temperature $\geq 38.5^{\circ}\text{C}$ or $< 36^{\circ}\text{C}$
- 2) TLC count $\geq 12 \times 10^9/\text{l}$
- 3) Purulent secretions from trachea and bronchi
- 4) $\geq 15\%$ drop in PaO₂/ FiO₂ in last 48 hours.⁵

Research design

This was prospective cohort study. This study conducted between 01-06-2021 to 31-12-2021 for six months. A total of 120 post-cardiac surgery patients of both sex in ICU were enrolled in the study. All patients were compared for risk factors. Data was collected daily from cardiac surgery ICU to observe incidence of VAP. Because of observational study there was no intervention in treatment by investigators. Patients were followed for any evidence of pneumonia during intubation period and for 48 hours after extubation.

Demographic and clinical characteristics and the data concerning intraoperative and postoperative course were prospectively recorded for all patients.

Data was entered and analyzed in SPSS version 20.0. Mean and standard deviation was calculated for quantitative variables like age, duration on mechanical ventilation. Frequency and percentage were calculated for qualitative variables like gender and VAP.

RESULTS:

In this study we included 120 patients. Mean age of cases was 49.99 ± 14.45 yrs. There were 65 (54.2%) males and 55 (45.8%) were females. Among patients were diabetics 32 (26.7%), hypertensive 64 (53.3%), smokers 14 (11.7%) and chronic kidney disease 10 (8.3%). Left ventricular ejection fraction < 30% 4 (3.3%), 30-50% 31 (25.8%), > 50%

Table-1: Baseline Demographic Variables		
Gender	Male	65 (54.2%)
	Female	55 (45.8%)
Age		49.99±14.45 yrs.
Risk Factors	DM	32 (26.7 %)
	HTN	64 (53.3%)
	SMK	14 (11.7%)
	CKD	10 (8.3%)
LVEF	< 30 %	4 (3.3 %)
	30-50 %	31(25.8 %)
	> 50%	85(70.8%)
Type of Surgery	CABG	62(51.7%)
	MVR	20(16.7%)
	AVR	12(10 %)
	DVR	9 (7.5%)
	CABG + Valve surgery	7(5.8%)
	Acyanotic Congenital HD	8 (6.7%)
	Cyanotic Congenital HD	2(1.7%)

Table-2: Frequency of VAP & Organism Isolated		
VAP	5 (4.2%)	
Organism Isolated	MRSA	1 (20%)
	Pseudomonas Aeroginosa	4 (80%)

Table-3: Characteristics of Patients with VAP		
Gender	Male	2 (40%)
	Female	3 (60%)
Age		59.40±5.12 yrs.
LVEF	< 30 %	0 (0%)
	30-50 %	5 (100 %)
	> 50%	0(0%)
No. of Risk Factors	0-1 Risk factors	0 (0%)
	2 or more Risk factors	5 (100%)
Type of Surgery	CABG	1(20%)
	AVR	1(20%)
	CABG + Valve surgery	3(60%)
Duration of Mechanical Ventilation	<48 hours	1(20%)
	>48 hours	4(80%)

85(70.8%). Majority patients underwent CABG 62(51.7%), followed by MVR 20(16.7%), AVR12 (10 %), DVR 9 (7.5%), CABG+ Valve surgery 7(5.8%), Acyanotic heart disease 8 (6.7%) and cyanotic heart disease2(1.7%). Frequency of VAP was 5

(4.2%) of patients. Predominant organism isolated was pseudomonas Aeroginosa 4 (80.0%). Other organisms isolated were MRSA 1 (20%). 2 (40%) males and 3(60%) females suffered VAP. All of the VAP patients had 2 or more risk factors. CABG

with valve surgery 3(60%), isolated CABG 1(20%), AVR 1(20 %). 80 % patients who developed VAP remained on MV for more than 48 hours.

DISCUSSION:

Pneumonia in postoperative cardiac surgery patients is important cause in terms of postoperative sequel especially mortality and adds to increased economic burden to both patients and hospital.^{6,7} Different factors predispose to development of pneumonia. In our study incidence of VAP was 4.2 %. In a study Hortal J et al. VAP developed in 2.1% patients with similar preoperative characteristics and type of surgery.⁸ Another study by Kim DJ showed incidence of ventilator-associated pneumonia (1.4% in < 48 hours duration vs. 4.9% in > 48 hours.⁹

In our study different micro-organisms were isolated but most common were pseudomonas aeruginosa and MRSA. In a meta-analysis in Asian population by Bonell A et. al common causative organisms were Gram-negative bacteria like *A. baumannii*, *K. pneumonia* and *P. aeruginosa*. While gram-positive organisms such as *S. aureus* and fungi such as *C. albicans* were not so common.¹⁰ A study group by Wang M also concluded three most common organisms as *Pseudomonas aeruginosa*, *Acinetobacter baumannii* (*A. baumannii*), and *Enterobacteriaceae*.¹¹ Ren J et. al studied organisms in multi-drug resistant cases incidence was 8.6% and major organisms isolated were *Acinetobacter*

baumannii, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*.¹²

In current study, CABG was a major type of surgery involving in 45.5 % of VAP patients. Majority of patients (72.7%) had multiple risk factors and remained ventilated for more than 48 hours. In a study Ailawadi G et.al highlighted the importance of earlier extubation from MV. Those requiring intubation for more than 48 hours had 2.83 and 4.67-fold increased risk of VAP than those extubated within 24 hours.¹³ Luckraz H et al. VAP patients remained on longer duration on MV leading to more respiratory dependence and extubation issues.¹⁴

In our study longer stay led to increased cost of treatment. Lower ejection fraction and compromised lung function as in COPD were significant contributors to VAP. Raymond J et. al group studied characteristics of VAP patients also confirmed that patients with compromised pulmonary function and reduced ejection fraction contributed to overall VAP burden.¹⁵ Luckraz H et al. also revealed higher overall cost of care in VAP patients.¹⁴

CONCLUSION:

In a nutshell our study concluded that VAP is common nosocomial infection in VAP patients. Multiple risk factors, surgery involving CABG, longer post-operative mechanical ventilation, compromised pulmonary functions and reduced ejection fraction were predominant factors for developing VAP.

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