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COMPARATIVE EVALUATION THE INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA AMONG TRACHEOSTOMIZED AND NON-TRACHEOSTOMIZED PATIENTS

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ABSTRACT

Background: Hospitalizations in intensive care units has a high risk of acquiring nosocomial infections or hospital-acquired infections. In the majority of patients, the underlying conditions and invasive diagnostic and therapeutic procedure unavoidably contributes to the risk of hospital-acquired infections. **Material & Methods:** The present cross-sectional prospective study was conducted at department of respiratory and critical care medicine of our tertiary care hospital. 150 Patients who were requiring mechanical ventilation for 7 days or more for various etiology were enrolled for the study. **Results**: In the present study, out of 150 patients, 51 (34%) patients reported to had ventilator-associated pneumonia. Out of these 150 patients, 87 were in a non-tracheostomized group, and among them, 33 (38%) had developed VAP. Out of 63 patients who had undergone tracheostomy 18 (28.6%) patients had developed VAP. Among them, 5 (27.7%) developed VAP in the period 7 to 10 days, between 11-14 days 6 (33.3%) patients developed VAP and after 14 days, 7 (38.8%) patients developed VAP. **Conclusion:** The incidence of VAP was higher among non-tracheostomized patients compared to patients who underwent tracheostomy. Tracheostomy was done early as 7-10 days after mechanical ventilation results in a lesser incidence of VAP.

Keywords: Ventilator-associated pneumonia, Tracheostomy, Mechanical ventilator.

INTRODUCTION

Hospitalizations in intensive care units (ICU) has a high risk of acquiring nosocomial infections, or hospital-acquired infections (HAIs). Among them, the most common is hospital-acquired pneumonia (HAP) **(1)**. In the majority of patients, the underlying conditions and invasive diagnostic and therapeutic procedure unavoidably contributes to the risk of hospital-acquired infections **(2)**. Invasive mechanical ventilation (IMV) is commonly used in the treatment of critically ill patients in an intensive care unit (ICU) settings **(3)**. In ICU during IMV patients has the risk for iatrogenic lung injury or ventilator-associated pneumonia (VAP) depending on associated risk factors like patient's immunity, the severity of illness physiological reserve and duration of invasive ventilation **(4)**. These complications directly related to high mortality, longer ICU stay and high treatment costs **(5)**.

Ventilator-associated pneumonia is defined as bacterial pneumonia which developed among patients who have been mechanically ventilated for more than 48 hours of duration. The incidence rates of VAP

ranges from 6 to 50%, but in some cases, it can reach as high as 76% in some specific cases **(6)**. Hospital-acquired pneumonia is specifically developing after 48 hours, or more duration after admission and no signs of pneumonia was present or incubating at the time of admission **(7)**. The incidence rates of HAP increases with prolonged hospital stay like an average of 7–10 days per patient had high rates of HAP with high treatment costs **(8)**. The incidence rates and risk of VAP are highest early days of hospital stay, and it is reported to be 3% per day during the initial five days of mechanically ventilation, 2% per day during next five to10 days of mechanically ventilation and then 1% per day after 15 days **(9)**.

Tracheostomy is demonstrated to reduce the risk of acquiring ventilator-associated pneumonia as it prevents chances of aspiration, helps in better clearance of secretions and decreases the respiratory dead space **(10)**. It is done generally after 14 days of endotracheal intubation to prevent tracheal complications. However, longer duration of endotracheal intubation is also reported with a high incidence of VAP **(11)**. The present study was conducted on the relative incidence of VAP in tracheostomized and non-tracheostomized patients.

MATERIALS & METHODS

The present cross-sectional prospective study was conducted at the department of respiratory medicine and critical care of our tertiary care hospital. The study duration was of one year from August 2017 to July 2018. A sample size of 150 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.2. Patients who were requiring mechanical ventilation for seven days or more for various etiology, i.e. respiratory failure, sepsis, lung carcinomas, cerebrovascular accidents, post-operative neurosurgical cases and patients with head injury were enrolled for the study. **(12)**.

Enrolled subjects then further divided into two groups, tracheostomized and non-tracheostomized patients. VAP assessment was done by Clinical pulmonary infection score (CPIS) **(13)**.

Clearance from Institutional Ethics Committee was taken before the start of the study. Written informed consent was taken from each study participant. Patients who had pneumonia before mechanical ventilation, patients who had pulmonary edema and patients who had ARDS were excluded from the study. Data analysis was carried out using SPSS v22. All tests were done at alpha (level significance) of 5%; means a significant association present if the p-value was less than 0.05.

Table .1: Simplified version of the CPIS used in this study (14)

PARAMETERS	VALUE	SCORE
Temperature ≥ ≤	≥36.5 and ≤ 38.4	0
	≥38.5 and ≤ 38.9	1
	≥39.0 and ≤ 36.0	2
Blood leukocytes per mm3	≥4000 and ≤ 11000	0
	<4000 or > 11000	1
Tracheal secretions	Few	0
	Moderate	1
	Abundant Purulent	2
Oxygenation Pao2/ Fio2 mmHg	>240 or presence of ARDS	0
	≤240 or absence of ARDS	2
Chest radiograph	No, infiltrate	0
	Patchy or diffuse infiltrate	1
	Localized infiltrate	2

RESULTS

In the present study, out of 150 patients that were enrolled 100 (66.6%) were males and 50 (34.4%) were females. Out of these 150 patients, 63 patients underwent tracheostomy. Out of these 63 patients, 44 (69.8%) were males, and 19 (30.2%) were females. Out of 150 patients, 87 patients did not undergo tracheostomy. Out of these 87 non-tracheostomized patients, 56 (64.4%) were males, and 31 (35.6%) were females. Among tracheostomized group majority of patients were in the age group 66-75 years, i.e. 17, followed by 11 in 46-55 years. Among non-tracheostomized group majority of patients were in the age group 46-55 years, i.e. 25, followed by 16 in 36-45 years. (Table 2)

Table 2: Distribution of study participants according to age and gender

Group		Tracheostomized patients	Non-tracheostomized patients
Gender	Male	44	56
	Female	19	31
Age group	18-25	9	12
	26-35	10	13
	36-45	8	16
	46-55	11	25
	66-75	17	13
	76-85	8	6

Table 3: Distribution according to days of mechanical ventilation prior to tracheostomy

	Days of mechanical ventilation prior to tracheostomy			Total
	7-10	**11-14**	**>14**	
No. of tracheosto-mised patients	35 (55.5%)	16 (25.4%)	12 (19.1%)	63 (42%)
Number of ventilator associated pneumonias	5 (27.7%)	6 (33.3%)	7 (38.8%)	18 (28.6%)

Out of 63 patients that underwent tracheostomy 35 (55.5%) patients underwent tracheostomy between 7-10 days after mechanical ventilation. 16 (25.4%) patients underwent tracheostomy between 11-14 days of mechanical ventilation. 12 (19.1%) patients underwent tracheostomy after 14 days of mechanical ventilation. The incidence of ventilator-associated pneumonia was seen in 18 (28.6%) patients who underwent tracheostomy. Out of them, 5 (27.7%) developed VAP in the period 7 to 10 days after mechanical ventilation whereas in those who underwent tracheostomy between 11-14 days 6 (33.3%) patients developed VAP and those who underwent tracheostomy after 14 days, 7 (38.8%) patients developed VAP. (Table 3)

Table 4: distribution according to ventilator associated pneumonias.

Group	Number of ventilator associated pneumonias
Tracheostomized patients	18 (28.6%)
Non-tracheostomized patients	33(38%)
Total	51 (34%)

In the present study, out of 150 patients, 51 (34%) patients reported to had ventilator-associated pneumonia. Out of these 150 patients, 87 were in a non-tracheostomized group, and among them, 33 (38%) had developed VAP. Out of 63 patients who had undergone tracheostomy 18 (28.6%) patients had VAP. Hence the incidence of ventilator-associated pneumonia was higher (8.4% higher incidence rate) among non-tracheostomized patients compared to patients who underwent tracheostomy. (Table 4)

DISCUSSION

In the present study, out of 150 patients that were enrolled 100 (66.6%) were males and 50 (34.4%) were females. Out of these150 patients, 63 patients underwent tracheostomy. Out of these 63 patients, 44 (69.8%) were males, and 19 (30.2%) were females. Out of 150 patients, 87 patients did not undergo tracheostomy. Out of these 87 non-tracheostomized patients, 56 (64.4%) were males, and 31 (35.6%) were females. Similar results were seen in a study

conducted by Chaari et al. on 106 subjects with a mean age of 38 ± 15.5 years. Mean Glasgow Coma Scale (GCS) reported was 8.6 ± 3.6along with mean Injury Severity Score (ISS) of 53 ± 23. In their study tracheotomy was carried out in 53 (50%) subjects because of prolonged ventilation history and 83 (78.3%) subjects had tracheotomy because of the projected long mechanical ventilation. The mean duration of tracheotomy performed was 8.5 ± 5.4 days **(15)**.

In the present study, among tracheostomized group majority of patients were in the age group 66-75 years, i.e. 17, followed by 11 in 46-55 years. Among non-tracheostomized group majority of patients were in the age group 46-55 years, i.e. 25, followed by 16 in 36-45 years. Similar results were seen in a study conducted by Huang et al. in their meta-analysis study reported from nine randomized clinical trials including 2072 study participants **(16)**.

In our study, Out of 63 patients that underwent tracheostomy 35 (55.5%) patients underwent trachea-stomy between 7-10 days after mechanical ventilation. 16 (25.4%) patients underwent tracheostomy between 11-14 days of mechanical ventilation. 12 (19.1%) patients underwent tracheostomy after 14 days of mechanical ventilation. The incidence of ventilator-associated pneumonia was seen in 18 (28.6%) patients who underwent tracheostomy. Out of them, 5 (27.7%) developed VAP in the period 7 to 10 days after mechanical ventilation whereas in those who underwent tracheostomy between 11-14 days 6 (33.3%) patients developed VAP and those who underwent tracheostomy after 14 days, 7 (38.8%) patients developed VAP. Similar results were seen in a study conducted by Peter J et al. in their meta-analysis study reported from nine randomized clinical trials and found no statistical difference in the prevalence of VAP **(17)**.

In our study, out of 150 patients, 51 (34%) patients reported to had ventilator-associated pneumonia. Out of these 150 patients, 87 were in a nontracheo-stomized group, and among them, 33 (38%) had developed VAP. Out of 63 patients who had undergone tracheostomy 18 (28.6%) patients had VAP. Hence the incidence of ventilator-associated pneumonia was higher (8.4% higher incidence rate) among non-tracheostomized patients compared to patients who underwent tracheostomy. Similar results were seen in a study conducted by Combes A et al. in their study reported including 124 patients and found prevalence of VAP is 52% in their study (18).

CONCLUSION

Ventilator-associated pneumonia is a major cause for mortality and morbidity among patients, and in the present study it was found in both tracheostomized patients and non-tracheostomized patients. The incidence of VAP was higher among non-tracheostomized patients compared to patients who underwent tracheostomy. Tracheostomy was done early as 7-10 days after mechanical ventilation results in a lesser incidence of VAP. Hence in cases where long term mechanical ventilation is required early tracheostomy should be considered.

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