

EFFICACY OF CUFF PRESSURE MONITORING IN REDUCING THE INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA (VAP)

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ABSTRACT

Introduction: Ventilator-associated pneumonia (VAP) develops from micro aspiration of oropharyngeal secretions containing potentially pathogenic organisms. Oral intubation increases salivation and swallowing is difficult, causing oral secretions to pool. So proper cuff pressure maintenance is very essential to prevent oral secretions and microorganisms transduction to lung tissue. **Aim:** The study aimed to compare the incidence of VAP among patients who receive proper cuff pressure with routine cuff pressure monitor. **Methodology:** We conducted prospective randomized clinical trial in medical and surgical adult intensive care units in a tertiary care hospital in South India. Our study included patients' who were mechanically ventilated on either Endotracheal or tracheostomy tube for more than 48 hours, age of 18-80 years. We excluded patients having Clinical Pulmonary Infection Score (CPIS) ≥ 6 with in 48 hrs of intubation, immunocompromised, palliative and terminal care patients. Data collected included background variables (demographic variables), clinical profile and CPIS. Diagnostic criteria for VAP was based on clinical presentation and correlating the CPIS. The data was analyzed with the Chi - square test. **Results:** We had a total of 80 patients in 2 groups, 40 patients each in intervention and control groups. Reason for admission for majority of the patients were trauma (45%) and neurological (13.75%). The incidence rate of VAP was three episodes per 435 (6.80%) ventilator days in the patients receiving intervention group. In the routine oral care group the incidence of VAP was six episodes per 539(11.10%) ventilator days. There was a statistically significant ($p = 0.05$) reduction in the incidence of VAP among patients in intervention group. **Conclusions:** Our study concluded that the proper Cuff pressure is effective in reducing the incidence of VAP among intubated patients than routine ET cuff pressure monitor.

Key words: Ventilator Associated Pneumonia, Clinical Pulmonary Infection Score, cuff pressure.

I. INTRODUCTION

VAP develops in patients mechanically ventilated for more than 48 hours. VAP is one of the common Nosocomial infections and is the second leading cause of morbidity, mortality in the ICU. It is associated with increased duration of hospitalization and cost of treatment.

Oral intubation increases salivation causes difficulty in swallowing, pooling of secretions and subsequently leads to aspiration. Hence frequent oral suctioning, proper ET cuff pressure is very essential to prevent oral secretions and microorganisms transduction to lung tissue. Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA) had issued practice recommendations to prevent VAP. These practice recommendations are associated with improvement in the patient outcome and

cost-effectiveness.² so we decided to do this study to evaluate the effectiveness of subglottic aspiration, oral hygiene and cuff pressure monitoring in reducing the incidence of VAP.

III. METHODOLOGY

A Randomized Clinical Trial was adopted in this study. The Patients, who were intubated orally and mechanically ventilated in Medical and Surgical ICU, were included for this study. The data was collected from 1st April, 2015 to 30st June, 2015. This was conducted in Kovai Medical Center and Hospital 1000 bedded multispecialty hospital at Coimbatore, Tamilnadu, India.

The final sample (n=80) was selected by random sampling. Randomization was done by random table numbers⁵. The patients are allotted into interventional group (n=40) and control group (n=40). At the end of 48 hours of intubation the patients were assessed with CPIS, if more than 6 indicate that the patient had VAP and excluded.

Inclusion criteria:

- 1) Patients who are receiving mechanical ventilation for more than 48 hours.
- 2) Both male and female patients,
- 3) Age 18 – 80years.

Exclusion criteria:

- 1) Patients having CPIS ≥ 6 within 48 hrs of intubation,
- 2) Patients intubated in hospitals other than KMCH,
- 3) Immunocompromised, palliative and terminal care patients.

Descriptions of the intervention:

1. Interventional Group

Maintain an ET cuff pressure of 20cm – 30cm of H₂O and monitor every 8 hourly

2. Control Group

Routine ET cuff pressure monitor once a day

Development and description of the tool:

Part-I: It consists of patient's Age, Sex, Co-Morbidity, Area of residence, Primary diagnosis of patient, Indication for intubation, GCS before intubation, Duration of mechanical ventilation and Duration of ICU stay, VAP positive.

Part-II: Clinical Pulmonary Infection Score is a standardized tool, developed by Pugin et al. (1991). It is a standardized tool and widely used in clinical research. The CPIS includes six parameters as tracheal secretions, Chest X-ray infiltrates, Temperature, Leucocytes count, Pao₂/Fio₂ and culture. Each parameter is given a scoring of 0, 1, and 2 according to their severity. The maximum score is 12. A score ≥ 6 shows the presence of VAP. The Reliability of this CPIS was, $r = 0.96$ (Metheney et al, 2010). The CPIS had a specificity and positive predictive value of 100% (Davis 2006).

Prior to the data collection, necessary permission obtained from concerned authorities and formal information given to the incharges of the Surgical and Medical Intensive care units. The study was conducted for a period of 12 weeks. Ethical clearance was obtained from the institutional ethical committee. Subjects were

allocated into both intervention and control groups by Randomizations. During the mechanical ventilation any spike of temperature greater than 102⁰ F, the CPIS was assessed. With the results, the occurrence of VAP in both interventional and control group was determined.

SPSS version 20 has been employed. Interventional group and Control group analysis with Chi – square test is performed. P value less than 0.10 are considered statistically significant.

IV. RESULTS AND DISCUSSION

1. Distribution of subjects according to Background Variables:

Table 1: Distribution of subjects according to Age

Age	Frequency	Percentage
18-35 yrs	20	25
36-50 yrs	27	33.75
51-65 yrs	23	28.75
66-80 yrs	10	12.5

Note: Total numbers of patient is 80, majority of patients from 36 – 50 years

Table 2: Distribution of subjects according to Gender

Gender	Frequency	Percentage
Male	45	56.25
Female	35	43.75

Note: Total numbers of patient is 80, majority of patients are male

2. Distribution of subjects according to Clinical Variables:

According to Clinical Variables majority of the patients were admitted for trauma 36(45%), poisoning 7(8.75%), neurologic disorders 11(13.75%) and respiratory 9(11.25%) and others conditions 17(21.25%). Assessing the reason for intubation, the majority of the patients had intubation for airway protection 42(52.5%), respiratory failure 20(25%), procedure 11(13.75%) and hemodynamic instability 7(8.75%).

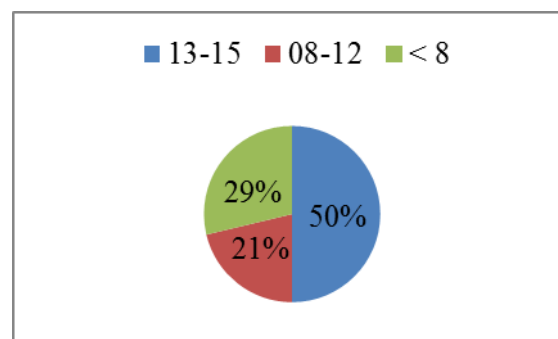


Figure 1: Patient categorized based on GCS before intubation

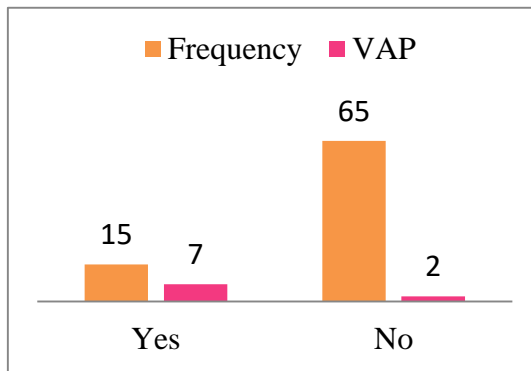
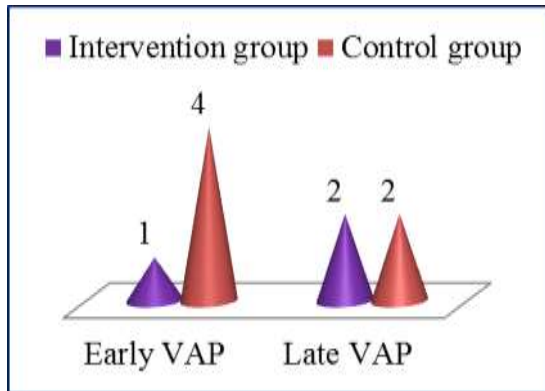


Figure 3: Patient categorized based on Types of VAP

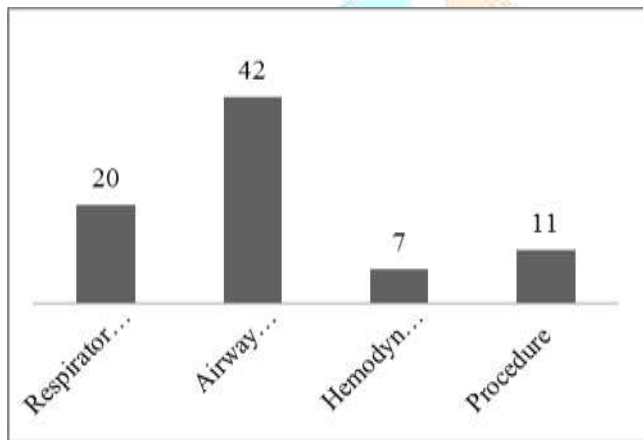


Figure 4: Patient categorized based on Re-intubation & VAP

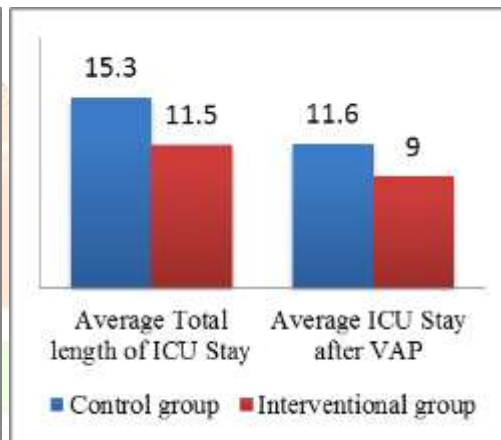


Figure 5: Patient categorized based on Reason for intubation

Figure 6: Length of ICU Stay

Table 3: Comparison of incidence of VAP

Groups	Positive	Negative	P value
Control group	6	34	0.05
Interventional group	3	37	

Note: There was a statistically significant reduction in the incidence of VAP among patients in intervention group which is significant at 0.05 levels. So the proper Cuff pressure is effective in reducing the incidence of VAP among intubated patients than routine oral care group

DISCUSSION

The INICC study (2012) reported that VAP ranged from 10% to 41.7% per 1000 ventilator days, Crude mortality attributable to VAP ranged from 16% to 94%, Length of ICU stay was more than 7 days. 86% of Nosocomial pneumonia was associated with intubation and mechanical ventilation¹.

An RCT done in 83 intubated patients showed that persistent cuff pressure below 20 cm H₂O (RR = 4.23, 95% CI = 1.12 to 15.92) was independently associated with the development of pneumonia. This study confirms the importance of maintaining adequate cuff pressure in preventing pneumonia in intubated patients.^{3,4}

A collaborative meta-analysis done in 263 patients shows that 36 (13.6 %) VAP were diagnosed in continuous control group, and 72 (25.7 %) in routine care group (HR 0.47, 95 % CI 0.31-0.71, $p < 0.001$). Continuous control of cuff pressure might be beneficial in reducing the risk for VAP.

A prospective observational study done in 284 patients shows that a lower incidence of VAP with the continuous ($n = 150$) than with the intermittent ($n = 134$) pressure control system (22.0% versus 11.2%; $p = 0.02$).

Our study found that proper Cuff pressure significantly reduced the incidence of VAP.

CONCLUSION: The study concluded that there was a significant reduction in the occurrence of VAP in interventional group patients than the control group. These interventions seemed to reduce the VAP rate effectively.

V. ACKNOWLEDGMENTS

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CONFLICTS OF INTEREST

There are no conflicts of interest

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