ejpmr, 2019,6(8), 331-334

SJIF Impact Factor 4.897

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

MECHANICAL VENTILATION-RELATED OUTCOMES IN PATIENTS RECEIVING MECHANICAL VENTILATION IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA

Dr. Kiran G. Kulirankal, Dr. Sobha George*, Dr. George Paul and Dr. Sudhagar Mookkappan

Dept. of General Medicine Amrita Institute of Medical Sciences Kochi, Kerala, India.

***Corresponding Author: Dr. Sobha George**
Dept of Community Medicine, Amrita Institute of Medical Sciences Kochi, Kerala, India.
DOI: 10.20959/ejpmr20198-6928

Article Received on 24/05/2019 **Article Revised on 13/06/2019** **Article Accepted on 04/07/2019**

INTRODUCTION

Mechanical ventilation is an important organ support treatment given to patients admitted in intensive care units (ICU)s. Providing effective life support with minimum risk and optimum comfort is the principal objective of mechanical ventilation. Growing numbers of critically ill patients receive prolonged mechanical ventilation.[1] Although mechanical ventilation is a life-saving strategy in critically ill patients, it also acts as a double-edged sword. Mechanical ventilation is instrumental in the rescue and maintenance of the patient with failing cardiorespiratory function.[2] But there is chance of infection, hemodynamic consequences and ventilator-induced lung injury. The goal of mechanical ventilatory support should be not only to provide effective life support, but also to minimize iatrogenesis and improve coordination between patient demand and machine-delivered breathing cycles. Modern machines provide options to reduce breathing work load, improve comfort, and enhance coordination.

The aim was to study the characteristics and mechanical ventilation-related outcomes in patients receiving mechanical ventilation in a tertiary care hospital in South India. The mechanical ventilation related outcomes studied were duration of ventilation, tracheostomy, development of ventilator associated pneumonia (VAP), complications like barotraumas, endotracheal tube block, unplanned extubation, reintubation, weaning failure. The percentage of nosocomial infections like Urinary tract infection and Blood stream infection were noted. The in-hospital mortality rate was also noted among patients receiving mechanical ventilation.

MATERIALS AND METHODS

A prospective observational study was conducted at Pondicherry Institute of Medical Sciences, Pondicherry. Pondicherry Institute of Medical Sciences is a tertiary care hospital in Pondicherry which is a state situated in South of India. The study population included 245 patients who were admitted to the medicine ICU of Pondicherry Institute of Medical Sciences and were mechanically ventilated during the study period, August 2013 to August 2015. The inclusion criteria was patients aged 18 years and above, presenting with medical illness as a cause of hospitalization and requiring mechanical ventilator support. Patients intubated and transferred from other hospitals, patients who had received mechanical ventilation support for a period less than 24 hours and patients in whom baseline investigations could not be done in first 24 hours were excluded.

Sample size was calculated based on a study done by Esteban et al[3] where the mortality rate is reported to be 30% among patients receiving mechanical ventilation, with power of 20%, the minimum sample size was calculated to be 233.

The study protocol was reviewed and approved by the ethics committee. Patients were included in the study after obtaining informed written consent from the next of kin. The parameters such as age, sex, provisional diagnosis, comorbidities such as diabetes, hypertension, bronchial asthma, chronic kidney disease, coronary artery disease and habits such as smoking and alcohol consumption were recorded. Baseline laboratory parameters such as complete blood count, blood urea, serum creatinine, electrolytes, LFTs, and blood gas analysis were noted within the first 24 hours. Severity of illness scores (Acute Physiology and Chronic Health Evaluation II-APACHEII) and Simplified Acute Physiology Score (SAPS II) were noted. Patients were followed up during the ICU stay and mechanical ventilation related outcomes were recorded.

The outcomes studied were duration of ventilation, tracheostomy, development of ventilator associated pneumonia (VAP), complications like barotraumas, endotracheal tube block, unplanned extubation, reintubation, weaning failure. The patients who developed nosocomial infections like Urinary tract infection and Blood stream infection were also noted.

The in-hospital mortality rate was also noted among patients receiving mechanical ventilation.

Prolonged ventilation was defined as ventilation for more than 21 days. Presence of fever with development of new patches on X-ray was taken to be VAP. Weaning failure was grouped into simple, difficult and prolonged weaning. Simple weaning was defined as successful extubation following the first spontaneous breathing trial, difficult was success in two or three attempts and prolonged was successful extubation after more than three attempts. Barotrauma was development of interstitial emphysema, pneumomediastinum, pneumothorax, pneumoperitoneum or subcutaneous emphysema which could not be attributed to iatrogenic injury. Endotracheal tube block was when the tube was found to have partial or complete block on routine visual inspection after a planned/unplanned extubation. Self extubation by the patient or accidental extubation during patient movement was considered as unplanned extubation Statistical analysis- Data was entered in Microsoft Excel and analysed using SPSS version 20. Quantitative variables were expressed as mean and standard deviation. Qualitative variables expressed using percentages.

RESULTS

There were 245 patients in the study. The demographic characters are given in Table No. 1. The mean age of patients was 54.2 (± 18.7 SD). Majority (48.5%) were above 60 years of age. 54% were smokers and 47% were addicted to alcohol.

Table No. 1: Demographic characteristics and comorbidities of the mechanically ventilated patients.

	Number	Percentage (%)
Age		
18-30	34	14
31-40	20	8
41-50	34	14
51-60	38	15.5
Above 60	119	48.5
Sex		
Male	168	68
Female	77	32
Habits		
Smoking	134	54
Alcohol abuse	115	47
Comorbidities		
Systemic Hypertension	147	60
Diabetes Mellitus	136	55
COPD/Asthma/PTB	27	11
Coronary Artery Disease	26	10
Chronic Kidney Disease	24	9

The most common comorbidity among the 245 patients who received ventilation was Systemic hypertension (60%) followed by Diabetes (55%).

On categorizing the mechanically ventilated patients into different groups according indication for hospitalization, respiratory diseases including infections constituted 32%, while neurological diseases constituted 28%, Sepsis (21%), Cardiovascular (18%), poisoning (17%) and others (22%) which included hanging, snakebite and renal failure. Indications for which ventilation was required are listed in Table No.2.

Table No. 2: Indications for mechanical ventilation.

Indication	Number	Percentage (%)
Impending respiratory failure	98	40
Type 1 respiratory failure	101	41
Type 2 respiratory failure	28	12
Airway protection	18	7

For all patients, APACHE 11 and SAPS 11 scores were assessed at baseline. The mean APACHE 11 score was 22.4 with median of 22 and SD of 6.75. The mean SAPS 11 score was 44.96 with median of 43 and SD of 16.12.

Of the 245 patients who received mechanical ventilation, the mean duration of ventilation was 4.2 days with SD of 3.6. The minimum duration was 1 day and maximum was 25 days.

All patients were initiated on Volume controlled – Synchronized Intermittent Mandatory Ventilation. Mean tidal volume used for ventilation was 400ml. The mean plateau pressure and PEEP were 20 cm of H_2O and 5 respectively.

Of the 245 patients who received mechanical ventilation, 7% had tracheostomy done.

Out of 245 patients who received mechanical ventilation, 87 (36%) developed ventilator associated pneumonia. 56 (23%) developed Urinary tract infection and 34 (14%) developed Blood stream infection Table No.3.

Table No. 3: Nosocomial infections.

Infection	Number	Percentage (%)
VAP	87	36
UTI	56	23
Blood stream infection	34	14

The most common organism associated with VAP was Acinitobacter (53%) followed by Pseudomonas (25%), Klebsiella(18%).

The most common complication encountered was weaning failure which occurred in 18.7%, followed by

Endotracheal tube block which occurred in 8.5%.Table No. 4.

Table No. 4: Complications associated with mechanical ventilation.

Complication	Number	Percentage (%)
Weaning failure	46	18.7
Endotracheal tube block	21	8.5
Reintubation	16	6.5
Unplanned extubation	9	3.6
Barotrauma	2	0.8

Of the 245 patients, 53(22%) died during the hospital stay. However 40(16%) patients were discharged against medical advice. Table No.5.

Table No. 5: In-hospital outcome associated with mechanical ventilation.

Outcome	Number	Percentage (%)
Survived	152	62
Expired	53	22
Discharged against medical advice	40	16

DISCUSSION

This study was done to note mechanical ventilation-related outcomes in patients receiving mechanical ventilation.

Of the 245 patients studied 68% were males and 32% were females. Similar male predominance is seen in both Indian and International studies.[4] The mean age of patients was 54.2 (± 18.7 SD). Studies conducted in India show the mean age of patients who received mechanical ventilation to be 41 to 43 years, while studies in developed countries show a higher mean age of 59 years.[5] Majority (48.5%) were above 60 years of age in this study.

In this study the admissions for respiratory and neurologic causes accounted for 32% and 28% of the total admissions requiring mechanical ventilation, which is comparable with study done in developed countries.[6]

Major portion of the population studied were intubated for impending respiratory failure(40%) and type 1 respiratory failure(41%). 7% was intubated for airway protection which is less comparable to international studies where 17% was intubated for airway protection.

All patients were started on Volume controlled – Synchronized Intermittent Mandatory Ventilation (VC-SIMV). Other international studies show initial initiation of mechanical ventilation with Assist control. This difference might be due to local variation in practice and institutional guidelines.

The mean duration of mechanical ventilation in this study was 4.2 days. This is comparable to other studies done in developed countries where mean duration of ventilation was 5.9.[3]

In this study 36% developed VAP, which is high when compared to studies done in developed countries. Another study done in South India show rate of 30.6%.[3] VAP is a major factor influencing mortality and ranges from 24 to 50%. Diagnosis of VAP was based on physician's diagnosis and not all cases were culture proven. ET cultures lack specificity for differentiating colonization. Emergency intubations done in casualty might give rise to a high rate of VAP. The most common organism isolated from our ICU was Acinitobacter (53%). Patients with VAP had a longer duration of stay.

Complications associated with mechanical ventilation were less compared to other studies. Barotraumas were present in only 0.8% as compared to 2.9% in other studies.[7] The most common complication encountered in our study was endotracheal block accounting for 8.5% patients. Other studies have showed an endotracheal tube block of 2-5%.[8] Unplanned extubation occurred in 3.6% patients and it could be due to inadequate sedation.

There was a high rate of nosocomial infections in this study with 36% developing VAP, 23% developing urinary tract infection and 14% developing blood stream infection. This is high when compared to other studies.[3]

In this study the in-hospital mortality was 22%. In a study done by Estaban et al the overall in-hospital mortality was 30%[3] and in a study by Douglas et al it was 47%.[9] However the percentage of discharge against medical advice was high in this study (16%).

Limitation of the study is that, the nutritional support and use of sedation, neuromuscular blockers was not looked into which might have affected the study outcomes.

CONCLUSION

The hospital has a high rate of VAP for which measures should be taken. Further improvements in care processes and prevention of nosocomial infections are required.

REFERENCES

1. Unroe M, Kahn JM, Carson SS, Govert JA, Martinu Tet al. One-year trajectories of care and resource utilization for recipients of prolonged mechanical ventilation: a cohort study. Ann Intern Med., 2010 Aug 3; 153(3): 167-75.
2. Marini JJ: Mechanical ventilation: past lessons and the near future. Crit Care., 2013; 17 Suppl 1: S1. 10.1186/cc11499.
3. Esteban A, Anzueto A, Frutos F, Alía I, Brochard L, Stewart TE, et al. Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA., 2002 Jan 16; 287(3): 345–55.
4. Husain Shabbir Ali, Fahmi Yousef Khan, Saibu George, Nissar Shaikh, Jameela Al-Ajmi.

Epidemiology and Outcome of Ventilator-Associated Pneumonia in a Heterogeneous ICU Population in Qatar. Biomed Res Int., 2016; 2016: 8231787.
5. Mohamed A.Zamzama Amal A.Abd El Aziza Maha Y.Elhefnawya1Nagia A.Shaheen Study of the characteristics and outcomes of patients on mechanical ventilation in the intensive care unit of EL-Mahalla Chest Hospital. Egyptian journal of chest diseases and tuberculosis, July 2015; 64(3): 693-701.
6. Slutsky AS. History of Mechanical Ventilation. From Vesalius to Ventilator-induced Lung Injury. Am J Respir Crit Care Med., 2015 May 15; 191(10): 1106–15.
7. Anzueto A, Frutos-Vivar F, Esteban A, Alía I et al Incidence, risk factors and outcome of barotrauma in mechanically ventilated patients. Intensive Care Med., 2004 Apr; 30(4): 612-9.
8. Lone NI, Walsh TS.Prolonged mechanical ventilation in critically ill patients: epidemiology, outcomes and modelling the potential cost consequences of establishing a regional weaning unit. Crit Care, 2011; 15(2).
9. Douglas SL, Daly BJ, Gordon N, Brennan PF. Survival and quality of life: short-term versus long-term ventilator patients. Crit Care Med., 2002 Dec; 30(12): 2655–62.