

ORIGINAL ARTICLE

Outcome of Mechanical Ventilation in Critically ILL Patients

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Abstract:

Method: This is a prospective study carried out during the period of Nov^r 2006 to Nov 2007 in a modernized private hospital, Dhaka. The patients were admitted to ICU after primary assessment that they may need organ support or life support and all the patients fulfilled the complete code of ICU. Patients who were weaned and extubated and subsequently shifted to ward were considered good outcome and adverse who cannot be extubated, if they died, or sought discharge against medical advice.

Result: Total number of patient admitted were 844 during this period. Male and female ratio was 16:9 and the mean age for the ventilated patients was 52±SD (10.25). Among them, 370 (43.68%) patients needed artificial respiration by mechanical ventilation in the course of their management. Among the ventilated patients 199(52.45%) has successful weaning, 5(1.35) needed tracheostomy, 171 (46.25%) expired. The rate of survival from ventilator support is statistically significant, P value is < .05.

Conclusion: Mechanical ventilation is a very effective measure in the course of management of critically ill patients when there is definite indication. This single centred study must be justified with other large scale study from different worldwide.

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Introduction:

The concept of artificial respiration was recognized in the 16th century by Vesalius and it is the 20th century that mechanical ventilation became a widely used therapeutic modality¹. Over the past decade, there has been an explosion of new ventilatory techniques that present a bewildering array of alternatives for the treatment of patients with respiratory failure.

Respiratory support for respiratory failure can be given through lung in intubated or tracheostomised patient as positive pressure ventilation. This support can also be given

through the devices not primarily applied to the lung, such as extra corporeal membrane oxygenation (ECMO)^{2,3}, extracorporeal carbon dioxide removal (ECCO2R)⁴ or intravascular blood gas exchanger (IVOX)⁵

The main objectives of mechanical ventilation are to support pulmonary gas exchange, to increase lung volume & to decrease the WOB. All these necessities can be obtained by setting up different mode of ventilator & by adjustment of different parameters appropriate for a particular clinical setting.

This is a long process consisting of endotracheal intubation, appropriate use of sedative or

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paralyzing agents, ventilator setting, monitoring & an artistic process of weaning. All these events pass through the risk of complication & many adverse situations.

Mechanical ventilation is not a curative measure for the disease entity but it is the life support during which primary disease should be treated vigorously. It is the gold standard support for the respiratory failure patients⁶. As the process is not without hazards it should not be used until there is clean cut indication.

Objectives of the study:

To show the effectiveness of this supportive system.

To change the attitude towards its use.

To improve the overall awareness

Study procedure:

This prospective study carried out during the period of Nov' 2006 to Nov 2007 in a modernized private hospital, Dhaka. The patients were admitted to ICU after primary assessment that they may need organ support or life support and all the patients fulfilled the complete code of ICU

Indications for mechanical ventilation:

Severe dyspnoea using accessory muscle of respiration & features of exhaustion.

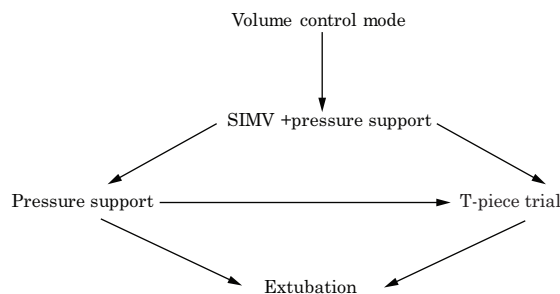
Life threatening hypoxemia ($P_{aO_2} < 50$).

Severe acidosis $PH < 7.25$.

Respiratory arrest.

Increase P_{CO_2} with change of mental status.

For all the patients having definite indication of mechanical ventilation a written consent was taken from the close relative after proper counseling. The patients were sedated properly, pain killer and paralytic agents were used as necessary. Intubation was done very carefully with maintaining all precaution. Then it was connected to the mechanical ventilation with appropriate setting. When the patients were improving, support is at baseline, then the process of weaning started following the below mentioned protocol



Results:

This pie chart below shows that total 844 patients were admitted to the ICU during that period. Among them 370(43.68%) patients needed mechanical ventilation. This indicates that a significant bulk of patients needed mechanical ventilation and mechanical ventilation is a main supporting system in the ICU which will by time to treat the primary disease.

Total patients distribution:

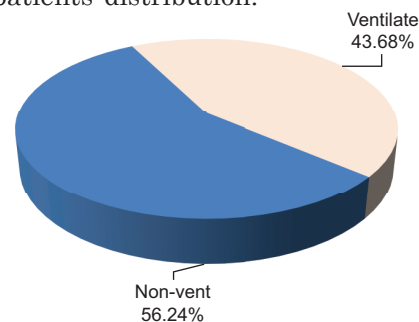


Fig.-1: Patients with mechanical ventilation versus without ventilation

Demographic profile;

Among the 370 patients ventilated patients 236 (64%) were male and 134(36%) were female. The number of male patient is significantly higher than the female. Pvalue is $>.05$. This indicates that male patients are more hospitalized than female getting priority in the treatment in our culture and also valuable in socio-economic perspective.

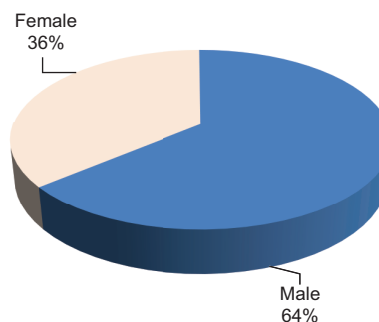


Fig.-2: Demographic profile; Sex distribution of study population

Age distribution of the patients shows that majority of patients were >60 years (48.64%) and mean age were 52±(SD 10.34). This distribution is shown in the Bar graph.

Mean Age = 52± SD(10.34)

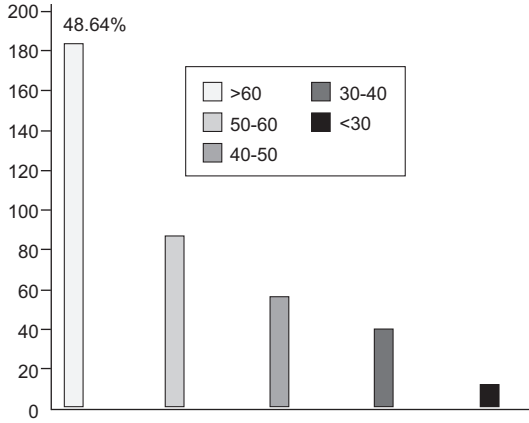


Fig-3: Demographic profile; Age distribution of study population

Distribution of disease profile requiring ventilation

This pie chart below shows that 37.17% patients were CVD complicated with respiratory failure, 11.65% patients were CKD complicated with respiratory failure, next bulk of patients were septicemia 11.23%. and respiratory failure due to pulmonary disease were 9.15. As this was an general ICU, CVD patients with poor GCS were more in number admitted through emergency department. Septicemia and ARDS patients requiring organ support are also required ventilation 11.23%.

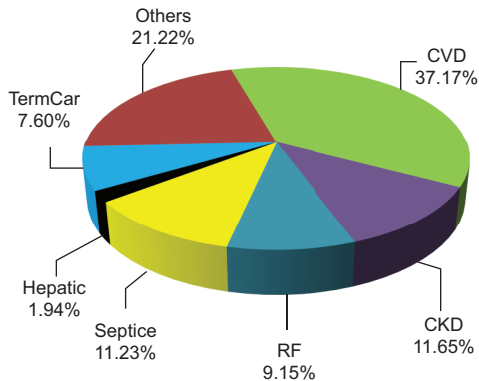


Fig-4: Distribution of patients according to disease profile

This bar graph below shows the out come of ventilated patients and nonventilated patients in ICU. Out of 370 ventilated patients 199(52.45%) improved and 171(46.25%) patients died. Non ventilated patients 298(87.6%) improves and 52 (15.2%) died. In the ventilated patients 52% improved with discharge from hospital and 46% expired. The difference between improvement and death was not statistically significant (P value>.05%). This means that improvement and death rate in ventilated patients is nearer to equal. Total 134(15.85%) out of 844 patients left the ICU either signing DAMA or DNR

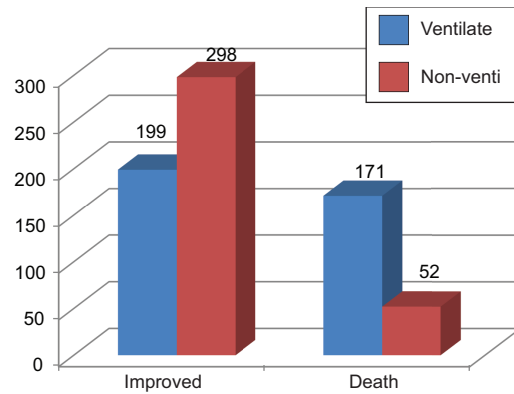


Fig-5: Outcome of ventilated patients in ICU

This bar chart below shows the disease wise outcome of ventilated patients. It shows that in patients with respiratory disease required ventilation has highest outcome (97.22%). Among the respiratory disease respiratory failure due to acute exacerbation of COPD and Asthma predominant. ARDS , diffuse parenchymal lung disease having MOF shows moderate outcome. Next to respiratory disease CKD was with good outcome (61.36%)

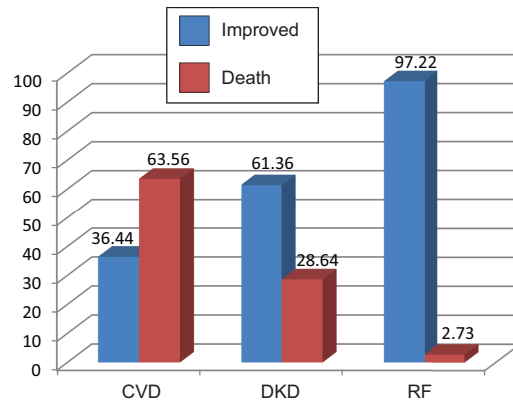


Fig-6: Disease wise outcome of ventilated patients

Outcome of ventilation in respiratory diseases:

This bar graph below shows the outcome of ventilation in lung disease which was better than any other disease causing respiratory failure. Data showed 97.33% of patients were successfully extubated and discharge home in stable condition and death occurred only in 2.77%. This is statistically significant P value $<.01$. a few 6.2 % of patients needed tracheostomy for prolong intubation but majority of them successfully weaned from mechanical ventilation.

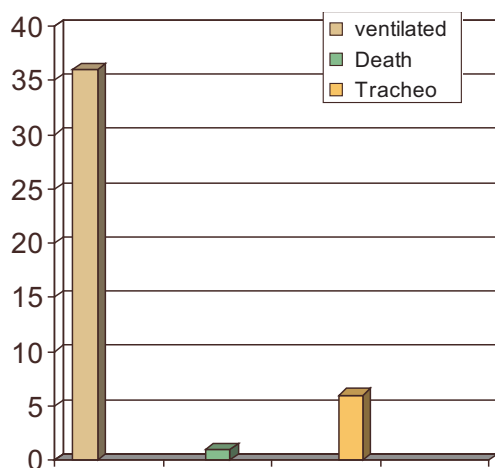


Fig.-7: Outcome of ventilation in respiratory diseases.

Discussion:

This prospective study done in the department of ICU in a specialized private hospital in Dhaka, Bangladesh to see the overall outcome of ventilation support, to see the negative prediction for the outcome and to alleviate the fear of mechanical ventilation. It was observed from the study that male patients (64%) are more than female (36%). This may be due to the fact that male are socially more important than female in contest of our society and more adhere to even in costly treatment. It was also observed that most of the patients were elderly and most of the patients have multiple diseases that are age related co-morbid illness.

In the year November 2016 to November 2017 total 844 patients were admitted to the ICU Among them 370 patients received mechanical ventilation, with an average of 8 ventilation day for each patient. For those who were

mechanically ventilated 199 (52.45%) patients survive to ICU and hospital discharge 171 patients expired and Hospital mortality rate was 46.25%.

Note worthy, ventilation was used in 370 (43.68%) patients who were deemed irrecoverable as confirmed by very poor vitals and unstable hemodynamic parameter;

And fulfilling the criteria of intubation. Out of which 171 (46.25%) died in the average 8 days of intubation. Mortality rate would have been modest in our study if there had been judicious admission criteria as seen in studies which excluded patients deemed irrecoverable from the selection criteria

Out of 370 patients on mechanical ventilation AKI on CKD (11.65%), sepsis (11.25%) and neurological causes (37.17%) accounting for nearly 90% of total cases in need of invasive mechanical ventilation. Only 9.15% patients had a respiratory pathology. Cases with respiratory cause and other causes like poisoning or unknown causes were associated with relatively less mortality 2.77%; whereas sepsis, neurological, renal, hepatic causes and malignancy were associated with ~*75% mortality. Absence of significant dysfunction in other organ system and the potentially reversible nature of bronchospasm may explain their better survival. This is contrary to other studies where most of the admissions were due to pneumonia and chronic obstructive pulmonary disease⁷. This finding also differs from other studies performed in rural India where poisoning and envenomation were leading causes of high mortality⁸.

Factors like age and comorbidities are also independently associated with hospital mortality. Patients enrolled in the study were a decade older than other Indian studies (52±SD10.25 vs 43±SD12.43 years). In fact, in some studies, patients enrolled were much younger⁹. The finding in this study correlates with studies in which increasing age is independently associated with hospital mortality^{10,11,12}. Male cases accounted for more than half of the patients in the present study; however, various studies have shown that the gender was not independently associated with

hospital mortality. In the present study, comorbidities like CKD, cardiac diseases like CAD, diabetes and hypertension were found to be significantly associated with mortality and these findings were in line with other published studies¹³.

In addition, elevated serum urea and creatinine levels were observed in the study indicating altered kidney functions in patients on IMV. It is noteworthy that most of the cases placed on IMV had acute kidney injury. Also CKD was the commonest comorbidity reported. In these patients, early dialysis could have led to improved outcome. This is also another invasive management which most patients decline to avail. ABG had an important role in determining acid base status in patients on IMV. Metabolic acidosis is a finding in sepsis, renal failure, shock and diabetes. In our study decreased partial pressure of oxygen and low bicarbonate levels along with low pH suggested metabolic acidosis. Findings were in line with other studies which show that abnormal kidney function and acid–base imbalance indicated poor prognosis^{13,14}.

There should be effective ‘team communication which is a simple and the easiest way to help improve outcomes in an open ICU¹⁵⁻¹⁵. In addition, the most important aspect in developing countries is, timely screening of patients in the outpatient department and need for an early referral to a tertiary care facility should be considered a priority to improve outcome of ventilation patient.

Conclusion:

Increasing number of critically ill elderly patients are admitting to ICU & getting ventilation support. Outcome is affected to some extent by age which is also reflected by APACHE II score. Success rate is significant & increasing day by day due to development of newer ventilation strategy. So the rational use is recommended. It is the gold standard therapy for RF when needed.

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