



Journal Homepage: - [www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14198

DOI URL: <http://dx.doi.org/10.21474/IJAR01/14198>



### RESEARCH ARTICLE

#### COMPARATIVE STUDY OF PRESSURE CONTROL VENTILATION VERSUS VOLUME CONTROL VENTILATION IN PEDIATRIC ICU PATIENTS NEEDING MECHANICAL VENTILATION FOR OXYGENATION AND AIRWAY PRESSURES

Dr. Chayan Sarkar<sup>1</sup>, Dr. Akash Bang<sup>2</sup> and Dr. Manish Jain<sup>3</sup>

1. Senior Resident, Dept of Paediatrics, Tripura Medical College, Hapania, Tripura.
2. Assoc Professor, Dept of Paediatrics, All India Institute of Medical Sciences, Nagpur, Maharashtra.
3. Professor and HOD, Dept of Paediatrics, Mahatma Gandhi Institute of Medical Sciences, Sewagram, Wardha, Maharashtra.

#### Manuscript Info

##### Manuscript History

Received: 05 December 2021

Final Accepted: 09 January 2022

Published: February 2022

#### Abstract

**Background:** To evaluate whether in pediatric patients requiring mechanical ventilation does volume control ventilation as compared to pressure control ventilation improve the oxygenation and other airway parameters. We conducted a randomized, prospective study on 133 patient who were randomly allocated in volume control and pressure control modes and the partial pressure of oxygen and carbon-di-oxide in the blood gas analysis of patients in both the groups were compared.

**Results:** The results of outcome variables were suggestive of improved oxygenation but raised airway pressure in VC group compared to PC.

**Conclusions:** Improved oxygenation was observed in Volume control mode as compared to pressure control mode. However airway pressure was significantly higher in the volume control group. The difference in outcome due to these differences needs further research.

Copy Right, IJAR, 2022,. All rights reserved.

#### Introduction:-

Pneumonia accounts for 19 percent of under five mortality.(1) A large percentage of these pneumonia patients require mechanical ventilation due to respiratory failure. Further, mortality rate in ventilated PICU children can be quite high- Lee et al recently found that 56% the ventilated children died (2). Hence Mechanical ventilation is an important aspect of management of children in pediatric intensive care unit.(3) There is a paucity of literature about the preferred mode of ventilation in children.

#### Aims and Objectives:-

To evaluate whether in pediatric patients requiring mechanical ventilation does volume control ventilation improve oxygenation as compared to pressure control ventilation.

#### Objectives:-

To Compare following outcome measures between PICU patients ventilated by volume control ventilation and pressure control ventilation

1. Peak airway pressure

**Corresponding Author:- Dr. Chayan Sarkar**

Address:- Senior Resident, Dept of Paediatrics, Tripura Medical College, Hapania, Tripura.

2. PaO<sub>2</sub>/FiO<sub>2</sub> ratio
3. PCO<sub>2</sub>

### Materials And Methods:-

After taking approval from the institutional ethics committee, written informed valid consent was taken from patients' relatives after explaining the study protocol. We enrolled 65 patients of either sex, 3 months to 12 years, having respiratory failure and requiring mechanical ventilation. Computer generated table of random numbers was prepared allotting equal number of patients in both groups. In the VC group 3 patients were excluded due to less than 12 hours of ventilation and 4 patients were excluded in the PC group as duration of ventilation was less than 12 hours. Ultimately 62 study participants were enrolled in VC group and 61 participants were enrolled in the PC group.

Volume control ventilation Volume-controlled mechanical ventilation is delivered with a constant inspiratory flow, resulting in increasing airway pressure through inspiration. To maintain this fixed rate of gas flow the pressure must rise through inspiration. The actual preset tidal volume remains constant as lung compliance and resistance change. High inspiratory flow during volume-controlled ventilation has detrimental effects on lung ventilation. Therefore, low inspiratory flow rates should be used to keep the peak ventilator pressure as low as possible. This ensures more homogeneous ventilation.

The baseline demographic parameters like age, sex for all the study participants were entered in datasheet and the baseline parameters for SAPS scoring like heart rate, systolic blood pressure, temperature, urine output, blood urea, total leucocyte count, serum potassium, serum sodium, serum bicarbonate, serum bilirubin, GCS score were also recorded. After 12 hours of ventilation the outcome parameters like PaO<sub>2</sub>/FiO<sub>2</sub> ratio, peak airway pressure and pCO<sub>2</sub> were recorded and the final outcome like length of stay in hospital, duration of mechanical ventilation, mortality and complications like shock and ventilator associated pneumonia were noted.

### Results:-

All the baseline parameters for the study participants in both groups like age, sex, heart rate, systolic blood pressure, temperature, urine output, blood urea, total leucocyte count, serum potassium, serum sodium, serum bicarbonate, serum bilirubin, GCS score and SAPS scoring were analysed and were found to be comparable in both the groups.

The results of outcome variables were suggestive of improved oxygenation but raised airway pressure in VC group compared to PC. The possible mechanism for the ventilator induced lung injury like barotrauma and volutrauma might not be the only mechanism behind ventilator induced lung injury. (4) There might be release of inflammatory mediators due to mechanical ventilation, which might be a major contributing factor for mortality and morbidity in mechanically ventilated patients and this might be a possible explanation for the similar rate of mortality in both modes of ventilation. (5) However further research is needed to confirm the exact mechanism behind the complications of mechanical ventilation.

### Conclusion:-

The present study was conducted to compare the clinical parameters and outcome between two modes of ventilation SIMV –VC and SIMV –PC and the results obtained from the study concludes that though SIMV – VC mode improves oxygenation in the form of better PaO<sub>2</sub>/FiO<sub>2</sub> ratio and SIMV –PC mode maintains lower airway pressure but the final outcome in the form of mortality need to be evaluated. However more research needs to be done regarding quantification of inflammatory mediators to confirm their possible correlation. From the study we can conclude that volume control ventilation is better than pressure control ventilation in terms of oxygenation but leads to increased airway pressure also.

### References:-

1. Bassani DG, Kumar R, Awasthi S, Morris SK, Paul VK, Shet A, et al. Causes of neonatal and child mortality in India: a nationally representative mortality survey. *Lancet* (London, England). 2010;376(9755):1853-60.
2. Jung SH, Choi WJ, Lee JA, Kim JA, Lee MW, Shin HS, et al. Comparison of Respiratory Mechanics and Gas Exchange between Pressure-controlled and Volume-controlled Ventilation. *Tuberculosis and Respiratory Diseases*. 1999;46(5):662-73.

3. Ge Y, Wan Y, Wang D, Su X, Li J, Chen J. Treatment of acute respiratory distress syndrome using pressure and volume controlled ventilation with lung protective strategy. *Zhongguo wei zhong bing ji jiu yi xue= Chinese critical care medicine= Zhongguo weizhongbing jijiuyixue.* 2004;16(7):424-7.
4. Dreyfuss D, Soler P, Basset G, Saumon G. High inflation pressure pulmonary edema: respective effects of high airway pressure, high tidal volume, and positive end-expiratory pressure. *American Review of Respiratory Disease.* 1988;137(5):1159-64.
5. Björklund LJ, Ingimarsson J, Curstedt T, John J, Robertson B, Werner O, et al. Manual ventilation with a few large breaths at birth compromises the therapeutic effect of subsequent surfactant replacement in immature lambs. *Pediatric research.* 1997;42(3):348.