Open Access

Original Article

Frequency of Ventilator Associated Pneumonia in Patientsof ContinuousFeed versus Bolus Enteral Feed

Mahboob Meer, Syed Mazhar Ali Naqvi, Muhammad Hussain*, Sabir Khan, Muhammad Ahmad***, Nadeem Siddique****

Department of Pulmonology, Services Hospital, Lahore Pakistan, *Department of Pulmonology, Services Institute of Medical Sciences, Lahore Pakistan, **Department of Pulmonology, National Hospital and Medical Center, Lahore Pakistan, ***Department of Pulmonology, Jinnah Hospital, Lahore Pakistan,

ABSTRACT

Objective: To determine the frequency of ventilator associated pneumonia in continuous feed vs bolus enteral feeding.
Study Design: Comparative cross sectional study.
Place and Duration of Study: Department of intensive care unit, Services Hospital, Lahore and Services Institute of Medical Sciences, Lahore Pakistan, from Jan to Jun 2019.
Methodology: In this study the cases of both genders with age more than 18 years were enrolled. Patients with Previous History of gastroesophageal reflux disease, Hiatus Hernia, Esophageal & Abdominal Surgery, Gastrointestinal Bleed and those admitted already with Pneumonia, APACHE Score 20 or greater and those with Acute respiratory distress syndrome were excluded. The cases admitted in intensive care unit and requiring mechanical ventilation fulfilling inclusion and exclusion criteria were enrolled in this study. Continuous feed was offered to cases in Group A and bolus to those in B and were looked for development of ventilator associated pneumonia.
Results: In this study, eighty cases (40 per Group) were enrolled. There were 26(65%) vs 25(62.5%) males in Group A and B respectively. The mean age was 51.85±12.61 vs 51.48±10.92 with p=0.88 in Group A and B. Mean ICU stay in Group A and B was 6.40±5.07 and 5.50±2.63 (p=0.32). Ventilator associated pneumonia was observed in 4(10%) vs 6(15%) cases in Group A and B respectively (p=0.74). Mean time for development of ventilator associated pneumonia in Group A and B was 4.67±1.15 vs 4.80±1.09 day with p= 0.60.
Conclusion: Ventilator associated pneumonia was seen more in cases of bolus vs continuous feed; though it was not statistically significant.

Keywords: Bolus, Continuous feed, Enteral feed, Ventilator associated pneumonia.

How to Cite This Article: *Meer M, Naqvi SMA, Hussain M, Khan S, Ahmad M, Siddique N. Frequency of Ventilator Associated Pneumonia in Patients of Continuous Vs Bolus Enteral Feed. Pak Armed Forces Med J 2023; 73(Suppl-1) S136-139. https://doi.org/10.51253/pafmj.v73iSUPPL-1.3180.*

INTRODUCTION

In Classical Teaching, Ventilator Associated Pneumonia (VAP) is defined as the one that is seen in 48 hours or more after ventilatory support via endotracheal or tracheostomy tube. According to Recent Guidelines, VAP is Triad of 1) Fever of 100 0F or more, purulent secretions& leucocytosis 2)development of new radiologic suggestion of pulmonary infection after 48 hours of induction of ventilatory support and feed.3)Bacteriologic Evidence of Pulmonary Infection. The sensitivity is found to be around 69% and specificity as 75% of this combination criteria.[1]

Intensive care unit is an integral part of the hospital which daily comes across such cases that are hemodynamically unstable and need ICU support and few of them either due to low consciousness level or respiratory failures need airway support either to maintain it or need respiratory assistance via a mechanical ventilator. To be on ventilator for uncertain period of time need longer term care and out of this nutrition is one big concern.[2-3]

Nutrition is very important part of the critically ill patients as it can not only help in maintaining daily caloric requirement, but also provides an aid to the resuscitations and management of fluid and electrolyte balances. It has also shown a great role in early weaning as well. It can broadly be classified into parenteral and enteral feed with different benefits and limitations. Enteral feed is always preferred as the infection rate and risk of fluid route is far high with intravenous route.[4-6]

The major issues associated with enteral feed are its tolerance as aspirations and diarrhea are the two cardinal complications that are encountered after its introduction. This adds to the risk of aspiration and leading to pneumonia as the cases that are on ventilator or even if weaned off, may have poor cough and gag reflexes and so they are at increased risk of aspiration. Furthermore, nasogastric tube (NG) is another known risk factor for its development.[7,8]

Correspondence: Dr Mahboob Meer, Meer Manzil Khan Street, D Block, Satellite Town, Gujranwala Pakistan
Received: 21 Aug 2019; revision received: 04 Dec 2020; accepted: 10 Dec 2020

There are number of different ways for enteral feeding to decrease the risk of complications associated with this and comprised of continuous, intermittent and bolus feeding etc. and each carries their own benefits and limitations. Feed via syringe in a bulk of volume (100ml-250ml) over 4-10 minutes is given in bolus and with the help of slow infusion via infusion pump, is seen in continuous which is set at a certain rate.[9-10] According to a study done by Tamowicz *et al*. VAP was observed in 20% of cases with bolus and 35% cases with continuous nasogastric feeding.[10]

METHODOLOGY

The comparative cross sectional study was done at Department of Intensive Care Unit Services Hospital (SHL)/ SIMS, Lahore Pakistan during January to June 2019. The approval was taken from local eithical review committee via ref no. IRB/2019/497/SIMS. In this study 80 cases (40 in each Group) were selected by using non probability consecutive sampling.

Inclusion Criteria: Patients admitted in Intensive Care Unit and requiring mechanical ventilation of either gender with age more than 18 years were included.

Exclusion Criteria: Patients with previous history of GERD, Hiatus Hernia, Esophageal & Abdominal Surgery, GI Bleed and those admitted already with Pneumonia, APACHE Score 20 or less and those with ARDS were excluded.

The sample size was calculated by select services software as 80 (40 in each Group) by keeping the confidence level as 87%, power as 50% and frequency of VAP as 20% in cases with bolus and 35% with continuous nasogastric feeding.[10] The cases were divided into two Groups by simple lottery method. Detailed Socio-demographic and clinical information was collected. The cases in Group A were offered continuous feed (which was initiated at the rate of 10 ml per hour and approaching the adequate calories (40-50 K Calories/kg/day) within 72 hours depending upon the tolerance), while those in Group B were given bolus enteral feed6 times/day in equal volume(starting as 1/3rd of the required dose at day 1 and reaching the adequate calories within 72 hours depending upon the tolerance) with a target of 40-50 k Cal per kg/day. During this, they were assessed daily for signs and symptoms of ventilator associated pneumonia i.e.1) Development Of Fever of 100 F or more, Purulent Secretions & Leucocytosis 2) Development Of New Radiologic Suggestion of Pulmonary Infection after 48 hours of starting Feed and Mechanical Ventilation (Presence Of Both)3) Bacteriologic Evidence of Pulmonary Infection.Final results were assessed after 7 days either when the cases were extubated or died on ventilator.

The data was analyzed by using SPSS 22.0 version.Both Groups were compared with the help of independent sample t test and chi square test for numerical and nominal variables respectively and $p \leq 0.05$ was considered significant.

RESULTS

In this study, eighty cases (40 per Group) were enrolled. There were 26(65%) vs 25(62.5%) male patients in Group A and B respectively as shown in Table-I. The mean age was 51.85±12.61 vs 51.48±10.92 with p=0.88 in Group A and B. Mean ICU stay in Group A and B was 6.40±5.07 and 5.50±2.63 (p=0.32) as in Table-II. VAP was observed in 4(10%) vs 6(15%) cases in Group A and B respectively(p=0.74) as in Table-III. Mean time for development of VAP in Group A and B was 4.67±1.15 vs 4.80±1.09 with p=0.60

Table-I: Descriptive statistics (n=80)

Gender	Group A n=40	Group B n=40	*p*-value
Male	26(65%)	25(62.5%)	
Female	14(35%)	15(37.5%)	
Ionotropic Support			
Yes	11(25%)	13(30%)	0.65
No	29(75%)	27(70%)	0.81
Age	51.85±12.61	51.48±10.92	0.88
Duration of ICU stay	6.40±5.07	5.50±2.63	0.32

Table-II: Ventilator Associated Pneumonia in Study Groups (n= 80)

VAP	Group A n=40	Group B n=40	*p*-value
Yes	4(10%)	6(15%)	0.74
No	36(90%)	34(85%)	

Table-III; Time to VAP in study Groups (n= 80)

	Group A n=40	Group B n=40	*p*-value
Time to VAP	4.67±1.15	4.80±1.09	0.60

DISCUSSION

Critical care is gaining its role in the developing countries and feeding is one important part of this, which is highly under rated in the context of complex diagnosis and the other medical interventions. Feeding is essential for the daily requirement and the increased catabolic state due to infections as well as for disuse or a use atrophies. But on the other hand, aspiration pneumonia is a dreadful complication. Different feeding techniques including low volume continuous or large volume bolus feed have been tried. Even

Tropic Feeding is being used to avoid VAP and other complications.[11-12]

We compared between low volume continuous and large volume bolus feeding in critical patients and it was seen that VAP was observed in 4(10%) vs 6(15%) cases in Group A and B respectively(p=0.74). These results were comparable to the findings of the previous studies.

Brown A *et al*. carried out a similar randomized controlled trial on pediatric population and it was seen that VAP was seen in more number of cases that were managed with bolus feeding as compared to continuous feed, but that was statistically insignificant with p=0.86.13

Nasiri M *et al*. in their trial used bolus feeding to compared it with intermittent feeding and it was seen that there was not much difference in these modalities in terms of tolerance that was assessed on the basis of gastro intestinal symptoms like nausea, vomiting and diarrhea and they further described that there was also no difference in terms of development of sepsis which was once thought to be another variable associated with this.[14] Similar results were observed by another study, but they also did not find any significant difference.[15]

A randomized controlled trial was carried out at Neuro intensive care unit by Kocan *et al*. to compare continuous vs intermittent feed and frequency of VAP was aspiration was higher with intermittent Group and was seen in 3(17.65%) vs 1(5.88%) cases respectively with p=<0.05.[16] The other studies have favored the increased risk of aspiration and development of VAP with bolus feedings because it decreases the pressure at lower esophagus and hence the risk of aspiration increases.[17-19] The data has shown that NG tube has greater risk for development of VAP as compared to other feeding technique i.e. percutaneous endoscopic gastrostomy (PEG) and is frequently practiced especially in cases where there is prolonged ventilation is required and those admitted to neuro units due to strokes where the central drive is lost and there is inability to cough and gag and hence the risk of aspiration increases.[20]

According to a Chinese study, where multidimensional feeding techniques were compared, it was observed that the risk was highest with intermittent as well as bolus feeding as compared ton continuous one and the risk of VAP was significantly higher with former techniques (p=<0.05). Furthermore, another variable identified in their study to be associated with VAP was low gastric pH.[21]

Kadamani *et al*. also compared these two feeding techniques and also did not find any significant difference; although all the studied variable in their study pointed a high risk of bolus feed regarding VAP, increased GI symptoms etc. VAP was seen in 6.7% with continuous vs 20% with bolus feed with p=0.025.9

According to a study done by Elke G *et al*. residual gastric volume was an important predictor for the risk of aspiration pneumonias which in majority of the above mentioned studies found that, it was higher in cases with bolus feed as compared to continuous feed in critically ill cases.[22] The study done by Fermont RD *et al*. also analyzed variable factors and found that each feeding technique carried its own benefits and there is no urgency of start of feed in critically ill cases, if they are not malnourished.[23] They also found that feeding and especially in cases with hemodynamic instabilities led to increase in demands of vasopressors due to altered distribution of blood flow and limited reserve in the body.

CONCLUSION

Ventilator associated pneumonia was seen more in cases of bolus vs continuous feed; though not significant. Large Sample Randomized Controlled Trail is required to confirm the results.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

MM & SMAN: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

MH & SK: Conception, study design, drafting the manuscript, approval of the final version to be published.

MA & NS: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investi-gated and resolved.

REFERENCES

1. Timsit J. Updates On Ventilator Associated Pneumonia. F1000 Res 2017; 6(1): 1-13.
2. Hooper MH, Marik PE. Controversies and Misconceptions in intensive care unit Nutrition. Clin Chest Med 2015; 36(3): 409–418.
3. Ridley E, Gantner D, Pellegrino V. Nutrition therapy in critically ill patients- a review of current evidence for clinicians.Clin Nutr 2015; 34(4): 565–571.

4. Flordelís Lasierra JL, Pérez-Vela JL, Montejo González JC. Enteral nutrition in the hemodynamically unstable critically ill patient. Med Intensiva. 2015; 39(1): 40–48.
5. McClave SA, Martindale RG, Rice TW, Heyland DK. Feeding the critically ill patient. Crit Care Med 2014; 42(12): 2600–2610.
6. Blaser AR, Starkopf J, Kirsimägi Ü, Deane AM. Definition, prevalence, and outcome of feeding intolerance in intensive care: a systematic review and meta-analysis. Acta Anaesthesiol Scand 2014; 58(8): 914–922.
7. Gungabissoon U, Hacquoil K, Bains C, Irizarry M, Dukes G, Williamson R. et al. Prevalence, risk factors, clinical consequences, and treatment of enteral feed intolerance during critical illness.J Parenter Enteral Nutr 2015; 39(4): 441–448. https://doi: 10.1177/0148607114526450.
8. Serpa LF, Kimura M, Faintuch J, Ceconello I. Effects of continuous versus bolus infusion of enteral nutrition in critical patients. Rev Hosp Clin Fac Med Sao Paulo 2003; 58(1): 9–14.
9. Kadamani I, Itani M, Zahran E, Taha N. Incidence of aspiration and gastrointestinal complications in critically ill patients using continuous versus bolus infusion of enteral nutrition: a pseudo-randomised controlled trial. Aust Crit Care 2014; 27(4): 188–193. https://doi: 10.1016/j.aucc.2013.12.001.
10. Tamowicz B, Mikstacki A, Grzymislawski M. The influence of the feeding therapy model on pulmonary complications in patients treated under conditions of intensive therapy. Adv Clin Exp 2007; 16: 365–373.
11. Braun J, Bein T, Wiese CH, Graf BM, Zausig YA. Enteral feeding tubes for critically ill patients. Anaesthesist 2011; 60(4): 352–365.
12. Lavrentieva A, Kontakiotis T, Bitzani M. Enteral nutrition intolerance in critically ill septic burn patients. J Burn Care Res 2014; 35(4):313–318.
13. Brown A, Fisher E, Forbes ML. Bolus vs continuous nasogastric feeds in mechanically ventilated pediatric patients: a pilot study. J Parenteral Ent Nutr 2019; 43(6): 750-758. https://doi.org/ 10.1002/jpen.1495
14. Nasiri M, Farsi Z, Ahangari M, Dadgari F. Comparison of intermittent and bolus enteral feeding methods on enteral feeding intolerance of patients with sepsis: a triple-blind controlled trial in intensive care units. Middle East J Dig Dis 2017; 9(4): 218-227. https://doi.org/10.15171/mejdd.2017.77
15. Ichimaru S, Amagai T. Intermittent and bolus method of feeding in critical care. In book: Diet and Nutrition in Critical Care, Publisher: Springer New York, Editors: Rajkumar Rajendram, Victor R. Preedy, Vinood B. Patel 2014.pp 1-17.
16. Kocan MJ, Hickisch SM. A comparison of continuous and intermittent enteral nutrition in NICU patients. J Neurosci Nurs 1986; 18(6): 333-337.
17. Heyland DK. Critical care nutrition support research: lessons learned from recent trials. Curr Opin Clin Nutr Metab Care 2013; 16(2): 176–181.
18. Steevens EC, Lipscomb AF, Poole GV, Sacks GS. Comparison of continuous vs intermittent nasogastric enteral feeding in trauma patients: perceptions and practice. Nutr Clin Pract 2002; 17(2): 118-122.
19. MacLeod JB, Lefton J, Houghton D. Prospective randomized control trial of intermittent versus continuous gastric feeds for critically ill trauma patients. J Trauma 2007; 63(1): 57-61.
20. Kostadima E, Kaditis AG, Alexopoulos A. Early gastrostomy reduces the rate of ventilator-associated pneumonia in stroke or head injury patients. Eur Resp J 2005; 26(1): 106-111.
21. Chen Y. Critical analysis of the factors associated with enteral feeding in preventing VAP: a systemic review. J Chin Med Assoc 2007; 72(4): 171-178.
22. Elke G, Felbinger TW, Heyland DK. Gastric residual volume in critically ill patients: a dead marker or still alive? Nutr Clin Pract 2015 30(10) 59–71. https://doi: 10.1177/0884533614562841.
23. Fremont RD, Rice TW. Pros and cons of feeding the septic intensive care unit patient. Nutr Clin Pract. 2015; 30(3): 344–350. https:// doi: 10.1177/0884533615578457.

.....