

Complication of Continuous Versus Bolus Feeding among Critically Ill Patient: A Randomised Control Trial

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ABSTRACT

Introduction: Critically ill patients are prone to malnutrition because of their hyper metabolic condition and increased requirement of nutrition supply. The purpose of the study was to compare the complication of bolus and continuous method of enteral nutrition in critically ill patients.

Methodology: A randomised control study was done in intensive care unit of Himalayan hospital Dehradun. The study included a total of 136 patients who were randomised to continuous (n=68) and bolus (n=68) method of enteral nutrition. The data regarding complication of enteral nutrition was obtained on 1st, 2nd and 3rd day of enteral nutrition.

Result: In the study both the finding method had shown similar effects in terms of complications. There was no incidence of tube obstruction, tube displacement, gastric aspiration and vomiting seen in both the groups, but the incidence of gastric aspiration (3.3%) was seen on 2nd and 3rd day and the incidence of diarrhea (6.7%) was seen on 2nd day in bolus group. Whereas there was only 1 incidence (3.3%) of diarrhea was seen in continuous group.

Conclusion: The study concluded that continuous and bolus feeding methods had similar effect in terms complication in critically ill patients admitted in ICU.

Key Words: enteral nutrition, bolus feeding, continuous feeding, critically ill patients.

I. INTRODUCTION

Enteral nutrition is considered as a routine therapeutic intervention for patients who are critically ill. It has been seen that hospitalized patients are highly prone to disease related malnutrition which is often underdetermined. Studies showed that about 40 percent of patients who are critically ill are unable to achieve target energy from the calories intake. Enteral nutrition had been beneficial over parenteral nutrition as it maintains the intestinal alignment and function which prevents from bacterial translocation^{1,2}. As per recent clinical guidelines given by European Society for Clinical Nutrition and Metabolism (ESPEN)

had recommended early initiation of enteral nutrition should be started at within 48 hrs of admission.³

Patients admitted in intensive care unit are diagnosed with many types of acute diseases conditions which demands constant observation and monitoring of vital signs⁴. The clinical recovery of the patients admitted in hospital highly depends upon their status of nutrition.⁵

Protocols for giving nutritional support to patients suffering from severe illness is necessary but protocol on initiation of feeds, gradually increasing to higher stomach volume (250ml) need to be taken into consideration for delivering adequate

nutritional support to patient with critical illness. Enteral feeding must be given at 45 degree of bed elevation to prevent aspiration and decrease incidence of pneumonia.⁶

Enteral feeding is administered by different method such as continuous, bolus, intermittent and cyclic techniques, by using one or combination of two methods. In continuous method feed is given with the help of feeding pump on an hourly rate in twenty-four hours. In cyclic method feed is given with the help of feeding pump in the period of less than twenty-four hours. In intermittent method enteral nutrition is given for twenty to sixty minutes after every four to six hours. In bolus method feed is given with the help of syringe using gravity in the period of four to ten minutes.⁷

Various factors are considered before selecting an enteral nutrition delivery method, such as disease condition, digestion of tube feed, positioning the tip of feeding tube, types of feed to be given, nutritional needs, disease condition, accessibility of feeding pump and economic condition of the patients.⁸

There had been the dilemma about the use of continuous and bolus enteral feeding. Many studies had contentious view about the feeding methods. In Intensive care unit, researcher observed that, these two methods are being used to provide nutrition to patients. The study aim is to gain insight about the two methods with lesser complication, in order to recommend the method has for feeding in Intensive Care Unit.

II. MATERIAL AND METHODS

This is randomised control study conducted in 40 bedded Intensive care unit at Swami Rama Himalayan University, Dehradun. A total of 60 patients were equally divided into continuous and bolus groups.

Study Design: Randomised control study

Study Location: The study was done in Department of Intensive Care Unit at tertiary care hospital of Swami Rama

Himalayan University, Dehradun, Uttarakhand.

Study Duration: November 2018 to April 2019

Sample size: 60 patients.

Sample size calculation: We assumed that the confidence interval of 10% and confidence level of 95%. The sample size actually obtained for this study was 68 patients for each group. We planned to include 136 patients which were randomised into bolus group and continuous group of which 76 patient were drop out.

The sample size of patients was calculated by the formula: -

$$N = \frac{Z^2 \alpha / 2 * p * Q}{D^2}$$

Z= 1.645 at 0.10 level of significance

P= Unknown prevalence, so we assess 50%

Q= 1-P

D= relative precision at 0.20

Number of sample in each group=68

Subjects & selection method: The study population was drawn by consecutive sampling technique. The population drawn was critically ill patients who were admitted in Intensive Care Unit of Swami Rama Himalayan University and prescribed with bolus and continuous enteral nutrition. Patients were divided into two groups continuous and bolus enteral feeding groups.

Group A- Bolus Feeding Group (n=30)

Group B-Continuous feeding Group (n=30)

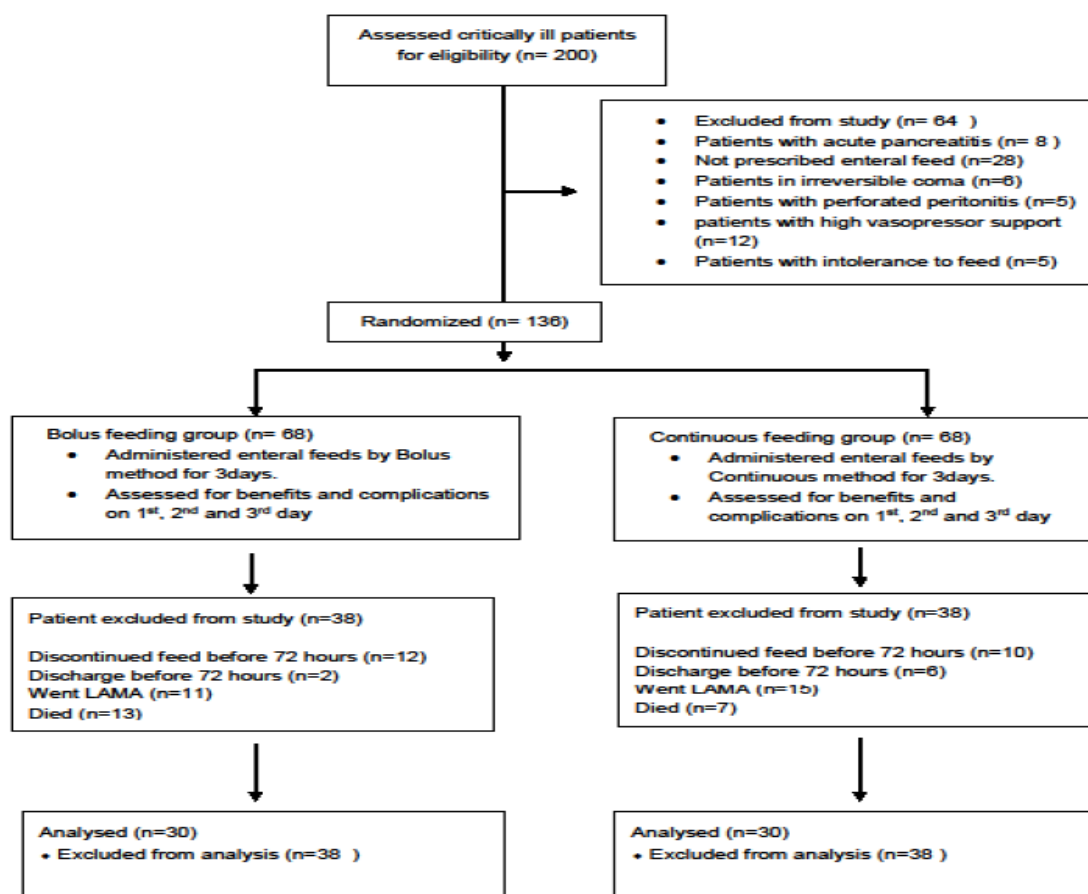
Inclusion criteria

1. Adult patients above age of 20 years.
2. Patients who were not able to ingest feed orally but had preserved gastrointestinal function.
3. Staff nurses who were confident in providing enteral nutrition by both methods.

Exclusion criteria

1. Patients in Irreversible coma

2. Patients who died or got discharged from ICU before 72 hours of observations.
3. Patients who had Intestinal fistula, obstruction, peritonitis, pancreatitis and necrosis
4. Patient having intolerance to the prescribed nutrition or infusion.
5. Patient who were on high vasopressor support.
6. Staff nurses who were posted in ICU from other ward for short duration.
7. Staff nurses who had no exposure to continuous and bolus feeding methods.



Patient enrollment diagram

Procedure methodology: Intensive Care Unit includes all types of patients with disorder such as neurological, respiratory disease, endocrine disease, and renal disease etc. the patients who were fulfilling inclusion criteria were selected. After the informed consent was obtained, a well designed questionnaire was selected which include socio-demographic variable such as age, gender, marital status, dietary pattern, admission, addiction, dietary pattern of one month, admission category, co-morbidity, intubation and reason for intubation were

included. The complication like tube obstruction, high gastric residue, tube Displacement, Gastric aspiration, vomiting, Diarrhea were observed. Patient were randomized into bolus enteral nutrition group (n=30) and continuous enteral nutrition group (n=30) using consecutive sampling technique. Bolus group received formula feed using syringe with gravity drip by nasogastric tube approximately 150-250 ml over a certain period of time and continuous group received enteral nutrition 20–50 milliliter per hour, advancing by 10-

25 ml every 4-24 h by using an electrical Enteral feeding pump.

The data was collected after the randomization of sample in both the groups. The total number of patients after the dropout was (n=30) in each group. The diet was prescribed by the physician and the dietary chart as per calories requirement was prepared by the dietician. The feed provided to the patients were kitchen feed which was administered by the nasogastric tube. The tube is regularly checked for displacement by daily chest X-ray. Tube obstruction was observed by inability to pass the liquid feed. High gastric residue was considered when there was gastric aspiration more than 200ml before the next feed upon negative suctioning of the nasogastric tube by 50cc syringe. Incidence of vomiting and diarrhea was noted at every 24 hours for the next 3days.

Statistical analysis

The data collection was done and the data was analyzed using Statistical Package for Social Science (SPSS, version 22) and p-value was considered statistically significant at the value less than 0.05. Percentage, frequency and Chi-Square test were used.

III. RESULT

Table 1: shows that maximum 13 (43%) participants of bolus and continuous group

were in the age group 60-80 years and least 7 (23%) in bolus group and 6 (20%) in continuous group was in age of 20-39 years. Maximum 21 (70%) participant in bolus group and 23 (76.7%) participant in continuous group were male and 9 (30%) and 7 (23.3%) of participant in continuous group were female. Maximum 28 (93.3%) participant in bolus and continuous group were married and 2 (6.7%) participant bolus and continuous were unmarried. Maximum 24 (80%) in bolus and 23 (76.7%) in continuous group were non vegetarian and least of 6(20%) in bolus group and 7 (23.3%) in continuous group were vegetarian. Maximum 23 (76.7%) patient in bolus group and 24 (80%) in continuous group were admitted from Emergency ward, 5 (16.7%) in bolus and 6 (20%) in continuous groups were admitted from ward and least 2 (6.7%) in bolus group and none participant in continuous group were admitted from other hospital. Maximum patient 24 (80%) in bolus group and 22 (73%) in continuous group had no addiction and least 6 (20%) in bolus and 8 (23%) in continuous group were having addiction to alcohol and smoking. Maximum 25 (83%) participant in bolus and continuous group had normal dietary intake of last one month and least 5 (17%) of participant in both continuous and bolus group had decreased dietary intake in last one month.

Table 1: Frequency and percentage of demographic characteristics of study participants, N=60

Demographic characteristics	characteristics	Bolus Feeding (n=30)		Continuous Feeding (n=30)		P* value
		Frequency	Percentage	Frequency	Percentage	
Age	20-39	7	23	6	20	0.94
	40-59	10	34	11	37	
	60- 80	13	43	13	43	
Gender	Male	21	70	23	76.7	0.55
	Female	9	30	7	23.3	
Marital status	Married	28	93.3	28	93.3	-
	Unmarried	2	6.7	2	6.7	
Dietary pattern	Vegetarian	6	20	7	23.3	0.75
	Non vegetarian	24	80	23	76.7	
Admitted from	Emergency	23	76.7	24	80	0.35
	Ward	5	16.7	6	20	
	Other hospital	2	6.7	0	0	
Addiction	No	24	80	22	73	0.54
	Yes	6	20	8	23	
Dietary pattern 1 month	Normal	25	83	25	83	-
	Not fed well	5	17	5	17	

Chi- square test was applied to check the homogeneity between the groups. The results showed that there was no significant difference between the group as p-value was >0.05. This showed that participants in both the groups were homogenous in term of their demographic variables.

Table 2: Maximum 21(70%) participant in bolus and 22(73.3%) in continuous group were admitted to ICU due to medical condition and least 9(30%) in bolus and 8(26.7%) in continuous group were having surgical conditions. Maximum 22(73.3%)

in bolus group and 20(67.7%) in continuous group were intubated and least 8(26.7%) in bolus group and 11(32.3%) in continuous group were not intubated. The reason of intubation was 14(46.7%) in bolus group for low GCS and 11(36.7%) in continuous group was respiratory failure.

Chi- square test was applied to check the homogeneity between the groups. There was no significant difference between the group as p-value was >0.05. This showed that participants in both the groups were homogenous in term of their clinical variables except for co-morbidity.

Table 2: Frequency and percentage of Clinical Variables of study participants, N=60

Demographic characteristics		Bolus Feeding (n=30)		Continuous Feeding (n=30)		P* value
		Frequency	Percentage	Frequency	Percentage	
Admission category	Medical	21	70	22	73.3	0.77
	Surgical	9	30	8	26.7	
Co-morbidity present	Diabetes	14	46.7	9	30	0.18
	Hypertension	14	46.7	10	33.3	0.29
	Obesity	7	23.3	3	10	0.16
	Renal disease	5	16.7	2	6.7	0.29
	endocrine	3	10	3	10	-
Intubation	Yes	22	73.3	20	67.7	0.57
	No	8	26.7	11	32.3	0.54
Reason of intubation	Respiratory failure	9	30	11	36.7	0.58
	Shock	1	3.3	0	0	0.31
	Low GCS	14	46.7	9	30	0.18
	Postoperative	2	6.7	1	3.3	0.54
	Other	1	3.7	2	6.7	0.55

Table 3 shows 1st and 2nd day that on high gastric residue was present in 3.3% of patients in bolus group and not in continuous group. Diarrhea was noted on 2nd day in bolus group whereas in

continuous group day 2nd and 3rd. The complications which were not noted in both groups were tube obstruction, tube displacement, gastric aspiration and vomiting.

Table 3: Comparison of Frequency and percentage distribution of complications of bolus and continuous enteral nutrition in critically ill patients, N=60

Feeding Complications	Days	Bolus feeding (n=30)		Continuous feeding (n=30)	
		Frequency	Percentage	Frequency	Percentage
Tube obstruction	Day1	0	0	0	0
	Day2	0	0	0	0
	Day3	0	0	0	0
High Gastric residue (>200ml)	Day1	1	3.3	0	0
	Day2	1	3.3	0	0
	Day3	0	0	0	0
Tube displacement	Day1	0	0	0	0
	Day2	0	0	0	0
	Day3	0	0	0	0
Gastric aspiration	Day1	0	0	0	0
	Day2	0	0	0	0
	Day3	0	0	0	0
Vomiting	Day1	0	0	0	0
	Day2	0	0	0	0
	Day3	0	0	0	0
Diarrhea	Day1	0	0	0	0
	Day2	2	6.7	1	3.3
	Day3	0	0	1	3.3

Therefore, it could be inferred that patients in bolus and continuous enteral nutrition methods had complication such as high gastric residue, and diarrhea.

IV. DISCUSSION

The result of the study demonstrated that there was no incidence of tube obstruction, tube displacement, gastric aspiration and vomiting within 72 hours of both continuous and bolus feeding. The study showed that incidence of high gastric volume was seen on second and third day of bolus feeding and diarrhea was common in both feeding methods.

The results were consistent with a prospective controlled study carried by Serpa. L. F et al.⁹ (2003) the study finding showed that there were no incidences of nausea seen in both group although there were few incidence of Vomiting, diarrhea, tube displacement, tube obstruction, high gastric residue in both the groups. Furthermore, the study conducted by Abdelsalam Y (2012)¹⁰ on comparison of bolus and continuous method of enteral feeding also showed that there was no statistical difference between the complication like vomiting, diarrhea, tube obstruction and tube displacement.

V. CONCLUSION

The study results showed that bolus and continuous enteral nutrition are controversial in terms of determining which enteral nutrition has less complication. The study had helped in ability to manage and control the incidence of gastrointestinal symptoms among patient who are given enteral feeding by nasogastric feeding tube. The study concluded that the complications were comparatively less in continuous feeding but there was no statistical difference seen.

VI. Limitation

The study had limitation of small sample size which had reduced its generalizability with a limited time frame of 3 months and the natures of patients

admitted in ICU were varied which lead to high dropout rate. So the recommendation for the future studies is to perform the study on multicenter design with homogenous population on larger same size and extended feeding periods.

VII. ACKNOWLEDGMENT

The author shows his gratitude to the Critical Care Medicine medical and nursing faculty and patients that made the study possible. Also thankful to university administration for their permission to conduct the study.

VIII. Ethical consideration

Ethics approval and consent was taken from close relative of patient. The study protocol was approved by the university ethics committee.

IX. Conflict of interest

There was no conflict of interest in the study.

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- How to cite this article: Rana PS, Prakash K, Khanduri S et.al. *Complication of Continuous Versus Bolus Feeding among Critically Ill Patient: a Randomised Control Trial.* *Int J Health Sci Res.* 2021; 11(1): 127-133.
