

## Effect of Gravity Feeding Versus Bolus Feeding Technique on Gastrointestinal Disturbance among Stroke Patients

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**Abstract:** Background: Mostly patients with oral nutritional problems are fed through a nasogastric tube which considered a method of enteral nutrition. They have different types of complications as diarrhea, vomiting, constipation, lung aspiration, and tube dislodgement. Aim: The aim of this study was to evaluate the effect of gravity feeding versus bolus feeding technique on gastrointestinal disturbance among stroke patients. Design: Quasi-experimental research design was used in this study. Subjects: A convenience sample of 60 adults patients with stroke and nasogastric tube feeding. Divided alternatively into to two groups, control group receive bolus feeding, and study group who receive feeding by gravity method. Setting: This study was carried at the Neurological Disorders Department, Main Mansoura University Hospital, Dakahlia Governorate Tool: Demographic and gastrointestinal disturbance assessment sheet. Results: The results noted that, there were significant differences between the study group and control group in relation to incidence of diarrhea, vomiting, and abdominal distention at  $p \leq 0.001^{**}$ ,  $0.010^{*}$ , and  $0.007^{*}$  respectively. Conclusion: Gravity feeding method is recommended to avoid gastrointestinal disturbances.

**Key words:** Bolus feeding, Gravity Feeding, Gastrointestinal, Stroke

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### I. Introduction

Enteral feeding plays a very important role in the supervision of patients with poor oral intake, difficult in swallowing, or intestinal malfunction, and in the emergent conditions (Cockfield A, Philpot U, 2009 and Zuercher JN, 2003). Enteral feeding is not only more physiological than parenteral nutrition (PN), but has also been shown to improve patient outcomes, decrease costs and reduce septic complications in comparison to PN. (Braunschweig et al, 2001; Pritchard et al, 2006; and Heyland et al, 2011).

In spite of the extensive utilize of enteral tube feeding, some patients have complications (Gomes et al, 2010). Complications consist of four main sections: mechanical, (tube blockage) GI, (diarrhea) contagious, (aspiration pneumonia, tube site infection) and metabolic, (re-feeding syndrome, hyperglycemia). despite the variety and incidence of complications arising from tube feeding differ significantly according to the selected access way, GI complications are with no doubt the mainly common (O'Keefe SJ., Foody W., and Gill S, 2003).

Complex access situations need the further expertise of a gastroenterologist, who is an essential factor of the nutrition support group. While the variety and simplicity of enteral feeding measures has been seriously improved in recent years by the provision of innovative techniques and better materials and equipments, many researches have nevertheless established a high incidence of tube feeding-related complications in patients receiving long-term enteral nutrition (Gramlich et al, 2004; and McClave et al, 2009).

Enteral nutrition can be provided for the patients through nasogastric, nasoenteric or gastrostomy tubes (Braunschweig et al, 2001). It can be administered in several ways such as syringe usage; gravity infusion; or pump-controlled infusion. Most patients were well-tolerated the bolus procedure which considered the easiest, and it can be carried out at home. On the other hand, gravity infusion is a suitable method for intermittent enteral nutrition through a nasogastric tube (Heyland et al, 2011).

Gastrointestinal, mechanical, and metabolic complications can occur. It is important to thoroughly assess patients prior to initiation of tube feeding and to closely monitor them while they are receiving tube feedings in order to identify potential problems (Pritchard et al, 2006). Approximately 20% of patients receiving enteral tube feedings experience nausea and vomiting. Vomiting increases the risk of aspiration. Causes are multifactorial but delayed gastric emptying is the most common problem. Diarrhea is common in tube fed patients, occurring in 2% to 63% of patients depending on how it is defined (Schröder O., Hoepffner N., and Stein J, 2004).

Constipation can result from inactivity, decreased bowel motility, decreased fluid intake, impaction, or lack of dietary fiber. Poor bowel motility and dehydration may lead to impaction and abdominal distension. A standard abdominal x-ray is often effective for diagnosis and will clearly differentiate constipation from bowel

obstructions. Constipation usually is improved through adequate hydration and use of fiber-containing formulas, stool softeners, or bowel stimulants (Elia *et al*, 2008).

It is necessary to prevent the associated enteral nutrition complications by a correct tube placement and a suitable nutritional preparation choice, with a patient care plan (Stroud M., Duncan H., and Nightingale J, 2003). The complications frequency of enteral nutrition indicates the care quality provided to patients, so it is important to know their frequency. Therefore, the present study was aimed to determine the most common complications related to enteral nutrition in patients using a nasogastric tube, determining the possible relationships between these problems and administration method.

### **Aim of the study**

To evaluate the effect of gravity feeding versus bolus feeding technique on gastrointestinal disturbance among stroke patients.

### **Research Hypothesis**

Patients who receive tube feeding by gravity method will remain free of GIT disturbances (vomiting, diarrhea, abdominal distention, and constipation).

## **II. Methodology**

### **Materials**

**Design:** Quasi-experimental research design was used in this study.

**Setting:** This study was carried at the Neurological Disorders Department, Main Mansoura University Hospital, Dakahlia Governorate.

**Subjects:** A convenience sample of 60 adults patients with stroke and nasogastric tube feeding. They will be divided into two matched equal group, 30 patients for each group. Group I (control group) will be exposed to bolus feeding as routine hospital care. Group II (study group) will be exposed to gravity feeding. With the following criteria, age 20-60 years, receive food by nasogastric tube for at least five days, both sex, no metabolic disorders and willing to participate in the study. The study sample was selected according to power analysis using Epi info program to estimate the sample size using the following

**Tools:** One tool was used in this study as the following:

**Tool I: Demographic and gastrointestinal disturbance assessment sheet.**

This tool included two parts;

**Part A: Socio- demographic Structure Interview**

This part developed by the researchers to assess socio-demographic data which include age, sexes, marital status, level of education, and occupation. This part collects one time at the beginning of the study.

**Part II: GIT Disturbance Assessment Sheet:**

It was comprised of three parts, five days assessment aimed to assess gastrointestinal disturbance one time per day; part A and B were adopted from **American Society of Clinical Oncology, (2003)**.

**A: Vomiting Assessment Scale:**

This part aimed to assess the incidence and the severity of vomiting. Its scoring system ranged from zero to four. (Zero) none, grade (1) - one episode per 24 hours, grade (2) means 2 to 5 episode per 24 hours, grade (3) means  $\geq 6$  episodes per 24 hours; IV fluids, or total parenteral nutrition (TPN) indicated, and grade (4) Life-threatening consequences.

**B: Diarrhea Assessment Scale**

This part was aimed to assess the incidence and the severity of diarrhea. The scoring ranged from grade (one) to grade (5) as the following; grade (1) < 4 times pass stool per day over baseline (mild), grade (2) > 4-6 stools per day over baseline, grade (3) > 7 stools per day over baseline; incontinence, grade (4) Life-threatening consequences e.g. hemodynamic collapse, and grade (5)- Death (death due to event).

**C: Constipation and Abdominal Distention**

This part developed by the researchers as checklist to assess incidence of constipation and abdominal distention by Yes or No one time per day for five days.

### **Method**

- Data collection was conducted during a period of 3 months, started from the first of October 2016 to the end of January 2017.
- Official approval for conducting the study was obtained from the accountable authorities.

- Permission to hold out the study was obtained from the responsible authorities of the Mansoura University Hospital.
- Tool was tested for content validity by a jury of 7 experts in the related fields of medical surgical nursing, neurological medical specialized. The necessary modifications were done consequently.
- Tool I; part II, A and B were adopted from **American Society of Clinical Oncology, (2003)**. Then tested for reliability by test-retest methodology. The reliability was tested by means of Cronbach's coefficient alpha has a reliability of 0.87.
- A pilot study carried out on 10 % of patients diagnosed with stroke and feeding was done through nasogastric tube to evaluate the clarity and applicability of the tool, and accordingly the necessary modifications was done. The pilot subjects were excluded from the actual study sample.
- Patients who agreed to participate in the study and fulfilled the inclusion criteria were included in the study. They were selected randomly and divided alternatively into two equal groups, study group (gravity method) and control group (bolus method) 30 patients each.
- Subjects of control group followed a routine hospital method in feeding (bolus), while subjects in study group followed gravity method in feeding. Time and amount of feeding prescribed by specialist for both groups.
- Patients of both groups study and control were assessed using tool I to collect baseline data and to ensure that all patients were free from any signs and symptoms of gastrointestinal disturbances at the beginning of the study. All patients were assessed by researchers for GIT disturbance one time daily for five days using tool I, part II.

**Ethical considerations:**

An informed consent was taken from the study sample before inclusion in the study, after explanation the purpose of the study. The researcher emphasized that participation in the study was voluntary and anonymity, each patient was informed that refusal to participate in the study wouldn't affect their care. At any time of the study the patient has the right to withdraw from the study. Privacy, confidentiality, anonymity and also the right to withdraw any time was assured.

**Statistical analysis:**

Data was analyzed using PC with statistical package for social science (SPSS) version 16. The difference was considered significant if  $P \leq 0.05$ . Descriptive statistics (Count and percentage: Used for describing and summarizing data (Arithmetic mean (X). Additionally, Graphs were done for data visualization and using SPSS and Microsoft.

**III. Results**

**Table (1):** percentage distribution of patients of both groups according to socio-demographic characteristics.

Demographic data	Group				X2 (P)
	Control (n30)		Study(n30)		
	No	%	No	%	
<b>Age (years)</b>					
▪ <50	11	36.7	9	30.0	0.3 (0.584)
▪ 50-60	19	63.3	21	70.0	
<b>Sex</b>					
▪ Male	15	50.0	19	63.3	1.1 (0.297)
▪ Female	15	50.0	11	36.7	
<b>Education</b>					
▪ Illiterate	16	53.3	20	66.7	0.375^

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▪ Basic education	5	16.7	5	16.7	
▪ Secondary education	4	13.3	4	13.3	
▪ University/more	5	16.7	1	3.3	
<b>Marital status</b>					
▪ Single	1	3.3	0	0.0	
▪ Married	20	66.7	24	80.0	0.566 <sup>^</sup>
▪ Divorced	2	6.7	1	3.3	
▪ Widow	7	23.3	5	16.7	
<b>Occupation</b>					
▪ Officer	1	3.3	3	10.0	
▪ Worker	11	36.7	16	53.3	0.293 <sup>^</sup>
▪ Housewife	6	20.0	3	10.0	
▪ Others	12	40.0	8	26.7	

<sup>^</sup>: P value based on Mont Carlo exact probability

**Table (1):** This that 63.3%&70.0% of patients control and study group respectively had age group 50 to 60 years old. Majority of them were male, more than half of both groups are Illiterate53.3%, 66.7 % respectively. In addition, 66.7%, 80.0% of them were married, and36.7%, 53.3% of them were worker.

**Table (2):** percentage distribution of patients of both control and study groups according to gastrointestinal disturbance.

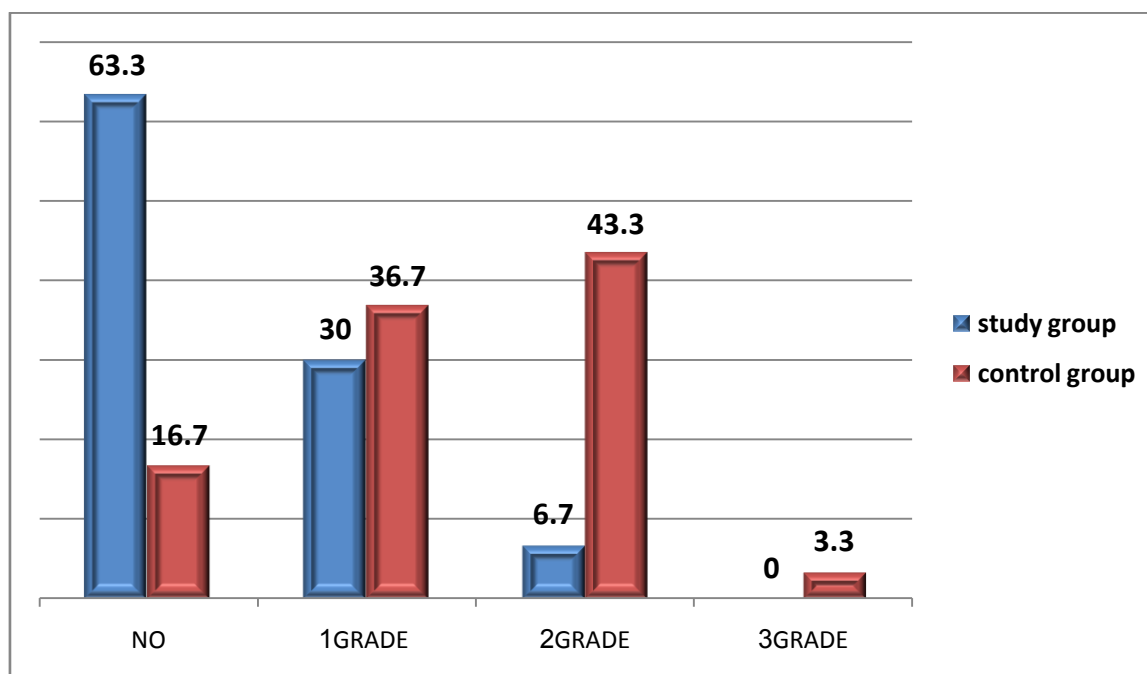
Clinical data	Group				MCP
	Control (n30)		Study (n30)		
	No	%	No	%	
<b>Diarrhea symptoms grade</b>					
▪ No	5	16.7	19	63.3	
▪ Grade 1	11	36.7	9	30.0	0.001*
▪ Grade 2	13	43.3	2	6.7	
▪ Grade 3	1	3.3	0	0.0	
<b>Vomiting</b>					
▪ No	20	66.7	29	96.7	0.010*
▪ 1 episode/day	7	23.3	1	3.3	

▪	2-5 episodes/day	3	10.0	0	0.0	
<hr/>						
Constipation						
▪	Yes	12	40.0	6	20.0	0.091
▪	No	18	60.0	24	80.0	
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Abdominal distention						
▪	Yes	16	53.3	6	20.0	0.007*
▪	No	14	46.7	24	80.0	

MCP: P value based on Mont Carlo exact probability\* $P < 0.05$  (significant)

**Table (2):** The table clarified that, there were significant differences between the study group and control group in relation to incidence of diarrhea, vomiting, and abdominal distention at  $p \leq 0.001^{**}$ ,  $0.010^{*}$ , and  $0.007^{*}$  respectively. With no significant difference between two groups in relation to incidence of constipation.

**Figure (1):** Shows severity of diarrhea post five days of nasogastric feeding for the study and control groups. It was observed that, 30.0% of the study group have grade 1 diarrhea, compared to 43.3 % have grade 2 diarrhea frequency in the control group.



**Figure (1):** Severity of diarrhea post five days nasogastric feeding for the study and control groups.

**Figure (2):** Shows severity of vomiting post five days of nasogastric feeding for the study and control groups. It revealed that, 3.3% of the study group have grade 1 episode in 24 hours diarrhea, compared to 23.3 % have 1 episode in 24 hours and 10.0% have 2-5 episode in 24 hours frequency in the control group.

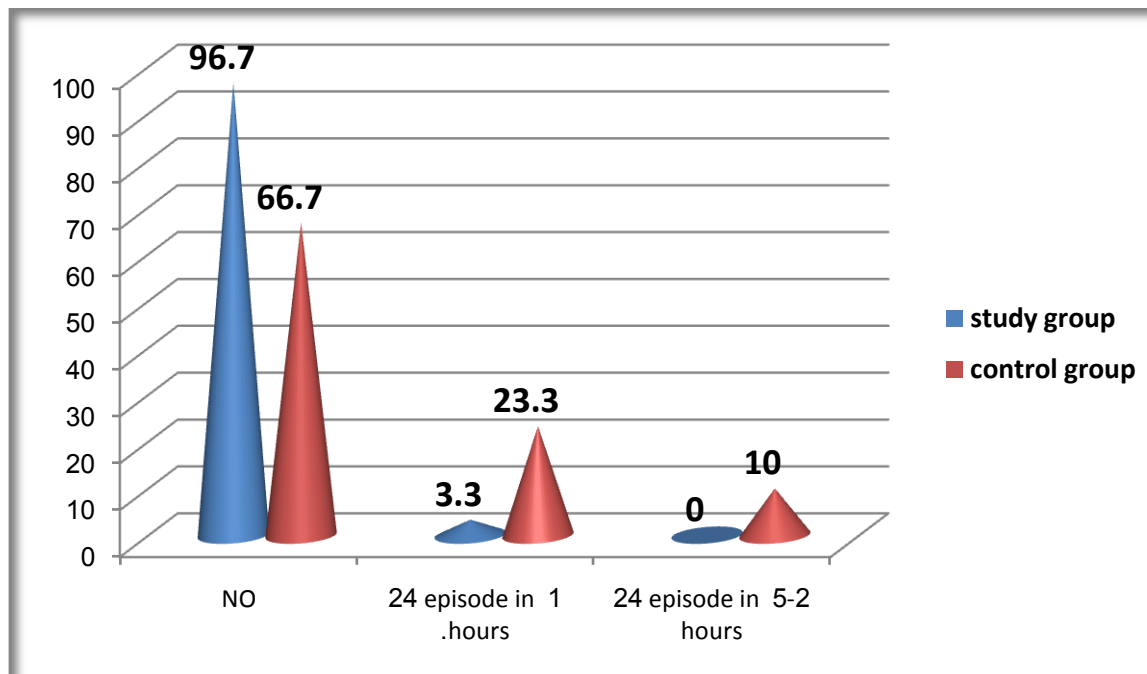


Figure (2): Severity of vomiting post five days nasogastric feeding for both study and control groups.

#### IV. Discussion

There are a lot of gastrointestinal complications that associated with tube feeding as nausea, vomiting, constipation and diarrhea. These complications relatively reflect the method of feeding. So, the present study aimed to evaluate the effect of gravity feeding versus bolus feeding technique on gastrointestinal disturbance among stroke patients. (Cioconet *et al*, 2004) showed that, the average age of enteral nutrition patients was 51 years, and half of them were over 55 years old and this agreed with the present study which showed that more than half of control and study group respectively had age group 50 to 60 years old.

There are a lot of gastrointestinal complications that associated patients with tube feeding as nausea, vomiting, constipation and diarrhea. Regarding vomiting, the study result revealed that, there was a statistically difference among both groups in relation to incidence of vomiting at  $P= 0.010^*$ . This finding comes in agree with (Moreno *et al*, 2004) who reported that, nausea and vomiting frequency among the patients was 13% in Spanish hospital.

In relation to **diarrhea**, findings showed that, there was a statistically significant difference between the study and control group in relation to incidence of diarrhea at  $P= 0.001^*$ . Diarrhea is mentioned as a one of the major enteral feeding complications, although its definition appears problematic, there is approximately 14 of its definitions (Mobarhan& DeMeo, 2005). In several different references on this topic, diarrhea incidence of enteral nutrition patients with ranges from 2.3% to 68% (Mobarhan& DeMeo, 2005; Kirby *et al*, 2010;).

Diarrhea was observed more frequently in the bolus feeding group in another study conducted by (Ciocon *et al*, 2004). Several authors (Ciocon *et al*, 2004; Mobarhan&DeMeo, 2005; Kirby *et al.*, 2010 and Pons *et al.*, 2012) The appearance of diarrhea in enteral nutrition patients is a multi-factorial process affected by: (i) formula composition (osmolality, fiber content, fatty acids and lactose); (ii) administration mode (temperature, infusion rate and containers contamination and infusion tubes); (iii) patient factors (hypoalbuminaemia and alteration of the bowel micro-organisms); and (iv) pharmacological treatment (antibiotics or laxative drug usage).

At the same line, the result of the current study showed that, one third of patient in the study group have grade 1 diarrhea, compared to 43.3 % have grade 2 diarrhea frequency in their control. One of the associated factors of administration method is the infusion type and frequency of the infusion system change which may affect the diarrhea frequency. This come in agreement with (Pons *et al*, 2012) they noted that, [continuous infusion reduces the diarrhea frequency], while bolus feeding with high volumes increases it.

As regards **constipation**, the present study revealed that, no significant difference between two groups in relation to incidence of constipation. This result disagree with (Elia *et al*, 2008) reported that, about one third of their patients had constipation. Frequency figures of this problem aren't given although it is cited as a complication (Ciocon *et al.*, 2004; Suner *et al*, 2016). Nutritional formulas which contain fiber are advised by some authors (Ciocon *et al*, 2004) to

enhance the bowel function and increase defecations number. On the contrary, there are some who see it is not improve the problem (**Kirby et al, 2010**)

Regarding abdominal distention, the study showed that, a significant differences between the study and control group in relation to incidence of abdominal distention at  $p= 0.007^*$ . This comes in agree with (**Brantley and Mills, 2012**) report that, rapid infusion can cause GI intolerance and discomfort. In the other hand (**Dormann AJ., and Huchzermeyer H, 2002**) emphasize that while gravity feeding method is more physiological, it is not without its disadvantages, such as gastric distention.

## V. Conclusion

It was evident from the study findings that the incidence of gastrointestinal disturbance were significant decreased with feeding by gravity method when compared with patients who received feeding by bolus method.

### Recommendations:

Replicate study on large probability sampling.

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