

Effect of Selected Nursing Intervention on Clinical Outcomes among Patients with Nasogastric Tube in Intensive Care Units

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Abstract: Although early enteral feeding is a primary recommendation for critically ill patients, it may be considered a risk factor for high gastric residual volume, vomiting and abdominal distension that may indicate feeding intolerance. Abdominal massage is a nursing intervention that has been found to increase Serotonin level, vagal activity and gastric motility and hence reduce feeding intolerance.

The aim of this study was to determine the effect of selected nursing intervention (abdominal massage) on clinical outcomes among patients with nasogastric tube in Intensive Care Units.

Subjects: A purposive sample of all available adult patients (70) with nasogastric tube and meet the inclusion criteria. **Setting:** The study was conducted at four intensive care units of Menoufia University hospital.

Tools of the study: Two tools were utilized for data collection as follow; Tool I: Structural interviewing questionnaire and Tool II: Biophysiological measurement.

Results: Gastric residual volume, frequency of vomiting and abdominal distension were analyzed for both groups and statistical significant improvements were found among study group than their control during third day versus first day in which the mean change of gastric residual volume during third day compared to first day at 8.30 P.M decreased by 4.74 ± 28.87 for study group but increased by 0.97 ± 7.62 for control group. The mean change of abdominal circumference at 3rd day than 1st day at 8.30 P.M decreased by 5.09 ± 5.90 for study group and by 0.83 ± 5.55 for control group. The frequency of vomiting episodes was significantly reduced among study group than control group during the third day at all times of follow up (77.1% versus 48.6% respectively didn't have vomiting).

Conclusion: abdominal massage was effective in reducing gastric residual volume, frequency of vomiting episodes and abdominal distension among critically ill patients with nasogastric tube.

Recommendations: A written updated educational protocol of abdominal massage supplemented by an illustrative booklet should be available and applied for critically ill patients with nasogastric tube.

Key words: Nursing intervention, Clinical Outcomes, Nasogastric tube and Intensive Care Units

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I. Introduction

Gastrointestinal tract has many important functions for critically ill patients especially it maintains immunological functions, decreases infection and promotes better survival rate. For those patients, nutritional support is a routine care and should begin immediately after admission and should be maintained to avoid starvation that may increase patient's risk for morbidity and mortality⁽¹⁾.

Enteral feeding with nasogastric tube (NGT) is a preferred method commonly used in patients who are unable to take oral feeding such as critically ill patients especially if feeding should be used for relatively short period of time. This tube is a thin, soft tube that is passed through nostril down the esophagus and into the stomach. More than 107 million of nasogastric tubes are supplied to patients per year⁽²⁻³⁾.

Using NGT for nutritional administration is associated with some complications and side effects such as pulmonary aspiration, trauma for stomach mucosa, ulceration of pharynx, tube occlusion or displacement as well as metabolic side effects especially electrolyte disturbances⁽⁴⁾. Moreover the normal physiologic process is interrupted by the enteral feeding leading to gastrointestinal manifestations such as refeeding syndrome, abdominal bloating, nausea, diarrhea or constipation and feeding intolerance⁽⁵⁾.

One of the most important side effects of enteral feeding is the feeding intolerance (FI) which is a general incidence of high gastric residual volume (GRV), vomiting and abdominal distension⁽⁶⁾. High gastric residual volume may be caused by other complications of NGT such as aspiration pneumonia or constipation⁽⁷⁾, while vomiting is the most serious complications associated with NGT because it may increase the risk for aspiration pneumonia⁽⁸⁾.

Nurses are responsible for assessing and evaluating these side effects through GRV measurement with monitoring the occurrence of vomiting and its frequency as well as occurrence of abdominal distension⁽⁹⁾. They are also responsible for planning patient's nutritional needs and applying feeding safely and efficiently. Critical

care nurses are playing a major role in preparing, monitoring, administering and evaluating the patient's response to medication and nutritional care. Most complications that develop as a result of these problems can be prevented by nursing care⁽⁸⁾.

The nursing care for patients with enteral feeding should begin with gradual increase feeding volume across three to six days until the target caloric requirement is reached⁽¹⁰⁾. If GRV is determined to be high, the nurses should slow down the feeding rate, interrupt the feeding or terminate it⁽¹¹⁾. Rohm et al.,(2008) added that prokinetic drugs may be used for patients with slowing gastric motility but it doesn't free from side effects such as abdominal cramps, allergy, bronchospasm, cardiovascular disorders and pancreatic dysfunctions, so many literature review suggested using alternative measures to manage the motility deficiency. One of these measures is the abdominal massage⁽¹²⁾.

There are many studies suggested using abdominal massage which is a prevalent nonpharmacological intervention for relieving high gastric residual volume, vomiting frequency and abdominal distension. Abdominal massage reduces the duration of nutrition transition through the gastrointestinal tract, induces peristaltic movement and consequently lowers intraabdominal pressure. Moreover, it has been shown to be safe, effective, nonpharmacological and noninvasive methods with no side effects⁽¹³⁾.

Also abdominal massage increases vagal activity and changes intra abdominal pressure. Increasing vagal activity leads to increase gastric motility and enhance gastric emptying⁽¹⁴⁻¹⁵⁾. Uysal et al., (2012) described abdominal massage as the preferred nonpharmacological nursing intervention for managing and preventing gastrointestinal side effects because it has many advantages such as it is easily and independently applied by nurses and free from side effects⁽⁸⁾. **So the aim of the present study** was to determine the effect of selected nursing intervention (abdominal massage) on clinical outcomes among patients with nasogastric tube in Intensive Care Units.

II. Operational definitions

Selected nursing intervention: It is a nonpharmacological nursing intervention which focused on abdominal massage that was applied for patients of study group before feeding and consisted of four consecutive strokes: stroking, effleurages, kneading and vibration.

Clinical outcomes: Is the controlling of the most common complications of nasogastric tube especially high gastric residual volume, presence of vomiting and abdominal distension.

The aim of the present study was to: Determine the effect of selected nursing intervention (abdominal massage) on clinical outcomes among patients with nasogastric tube in Intensive Care Units.

Significance of the study

Adequate nutritional support is important for the comprehensive management of patients in ICU. In spite of simplicity of administering enteral nutrition through nasogastric tube, it has serious adverse effects such as high gastric residual volume, increase frequency of vomiting and abdominal distension that may indicate feeding intolerance. The most important reasons for unsuccessfully nutritional support among those patients who have gastric feeding is the feeding intolerance that occurs in more than 60% of patients all over the world⁽¹⁶⁾. Although nutrition is a significant concern among those patients, minimal attention has been paid on how to manage nutritional support for them⁽¹⁷⁾.

Critically ill patients are usually in need for careful and continuous observation especially from nurses to avoid and/ or prevent any complication and problem associated with nasogastric tube feeding especially high gastric residual volume, occurrence of vomiting and abdominal distension that may be controlled by abdominal massage.

Research hypothesis:

The following research hypothesis was formulated in an attempt to achieve the aim of the study:

Patients of the study group who expose to abdominal massage exhibit a decrease of gastric residual volume, abdominal distension and vomiting frequency as compared to patients who don't(control group)

III. Subjects and Method

Subjects

Design: A quasi experimental research design was utilized.

Setting: The study was conducted at four Intensive Care Units at Emergency Hospital of Menoufia University. These units are one Cardiac catheter unit, two general Medical unites and one cardiac intensive unit.

Subjects: A purposive sample of all available adult patients (70) who were admitted to ICUs and had nasogastric tube for feeding during the period of data collection. They were divided alternatively and randomly into two equal groups, Thirty five for each group.

Study group I: Exposed to the selected nursing intervention (abdominal massage) along with routine hospital care which consists of measuring residual volume before meal time.

Control group II: Exposed only to the routine hospital care.

The subjects were selected according to the following criteria:

- 1- Adult patients who were being fed enterally via nasogastric tube.
- 2- The frequency of feeding for them was three times a day to be easily for the researchers to follow them.
- 3- Free from intestinal obstruction.
- 4- Didn't receive abdominal radiotherapy for the last 6 months.
- 5- Didn't have contraindications to abdominal massage such as diarrhea or recent abdominal surgeries.

Tools: In order to achieve the aim of the study, two tools were developed and utilized by the researchers for data collection. **These tools are as follow:**

Tool I: Structural interviewing questionnaire: It was developed by the researchers to assess subject's biodemographic data. It included two parts as follow:

Part one: Biodemographic Data. It consisted of information about patient's age, sex, education, marital status and medical diagnosis.

Part two: Enteral feeding follow up. It included information about reason for enteral feeding, feeding regimen: type, amount and rate of feeding as well as amount of flushing solutions.

Tool II: Biophysiological measurement tool: It was constructed by the researchers to assess gastric residual volume, abdominal circumference and number of vomiting episodes

Method

- 1- A written permission was obtained from the hospital's director and the head nurse of all included ICUs after explaining the aim of the study.
- 2- **Tools development:** After reviewing literature extensively, the study tools were developed by the researchers. They were tested for its content validity by a panel of five experts specialized in Medical Surgical Nursing, Critical Care Medicine and Nursing and clinical dietitian to ascertain relevance and completeness.
- 3- The reliability of structured questionnaire and the biophysiological measurement tools was measured using a test-retest method and Pearson correlation coefficient formula to ascertain relevance and consistency of the tools to measure its items. The values were 0.92 and 0.89 respectively.
- 4- A pilot study was carried out on 7 patients to test clarity, feasibility, applicability and relevance of the developed tools and to determine the needed time for collecting data. Modifications were done accordingly and the seven patients were excluded from the final study sample.
- 5- A written consent to participate in the study was obtained from all participants or their caregivers if they were unconscious after explanation of the aim of the study. They were reassured that any obtained information would be confidential and would only be used for the study's' aim. The researchers emphasized that participation in the study was entirely voluntary and would not affect their care. Also anonymity of the patients was assured through coding data.

Data collections:

- a. Data was collected over a period of six months from beginning of June to beginning of December 2016.
- b. Patients who fulfilled the inclusion criteria and agreed to participate in the study were randomly and alternatively divided into two groups. Thirty five patients for each group.
- c. Every participant of both groups or his/her caregiver was interviewed individually in his/ her bed in ICU to assess demographic data using tool I part one .It took about 15 minutes.
- d. Data about medical diagnosis as well as enteral feeding for all patients of both groups such as reasons and regimen were gathered from patient's records using part two of tool I.
- e. Gastric residual volume, abdominal circumference and vomiting episodes were assessed for every patients of both groups using tool II(biophysiological measurement) just before feeding meal(at 9.30 A.M, 2.30 P.M and 8.30 P.M) . Each assessment took about 20 minutes.
- f. The researchers used a 50 ml syringe to inject 20 ml of air in the nasogastric tube while listening by a stethoscope at the epigastric region to determine the correct position of the tube.
- g. To assess the gastric residual volume, the researchers aspirated the gastric content from the nasogastric tube by the 50 ml syringe before feeding. If there is no gastric content was aspirated, the aspiration process was repeated to be sure from emptying the stomach for each subject of both groups.

- h. A measuring tape of 150 cm was used by the researchers to assess the abdominal circumference before each meal for each subject of both groups. The researchers started from the umbilical region and the measurement was taken while the patient was exhaled.
- i. The researchers lightly palpated the abdomen for every patient of both groups before feeding. Palpation was carried out by applying sufficient pressure of 2 cm deep.
- j. Abdominal circumference and abdominal palpation were used to assess presence or absence of abdominal distension. If patient had soft and not tense abdomen, his/ her abdomen was considered not distended, while if abdomen was hard, it was considered distended⁽¹⁸⁾.
- k. The researchers reviewed extensively the related materials, recent text books and DVD on regional and global electronic websites to demonstrate time, frequency and the technique of abdominal massage then trained adequately to be experienced in applying this technique.
- l. The researchers trained two bedside nurses about how to assess GRV, abdominal distension and vomiting episodes along with training about abdominal massage. These trainings were carried out because those nurses were responsible about performing the assessment of GRV, abdominal distension and vomiting as well as carrying out the abdominal massage during the night shift where the researchers were not present.
- m. For applying the abdominal massage for study group, the researchers followed the following steps:
 - Place a patient in supine position with the head of the bed elevated from 35 to 45 degree.
 - Assess GRV and presence of abdominal distension as explained before.
 - A moisture lotion was used before massage to apply it smoothly.
 - The researchers began the abdominal massage by gently relaxing stroke up the abdominal wall, then they provided four consecutive strokes: Stroking, Effleurages, Kneading and Vibration.
 - **Stroking** was applied on the dermatome of the vagus nerve, over iliac creast then toward both sides of groin. **Effleurage** strokes pass from ascending colon to the transverse one down to the descending. This strokes were applied with excess pressure to stimulate large intestine to contract that propel stool along the colon and improve feeding tolerance. These strokes were applied several times.
 - The most vital part of massage is the **palmer kneading** which follow the direction of descending colon up to the ascending one then down the descending again. It helps the fecal matter to propel into the rectum and decrease abdominal distension.
 - Lastly **vibration** over the abdominal wall was applied to relieve abdominal distension and flatus. All strokes were applied with fingers tips in a circular clockwise motion.
- n- The abdominal massage was carried out by the researchers for each subject of study group for fifteen minutes, three times daily at 9.30 A.M, 2,30 P.M and 8.30 P.M before starting the enteral feeding and for three days.
- o- A comparison between both groups about gastric residual volume, abdominal distension and frequency of vomiting episodes in all times of measurements was done to determine the effect abdominal massage on clinical outcomes among those patients.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category, comparison between two groups and more was done using Chi-square test (χ^2). For comparison between means of two groups of parametric data of independent samples, student t-test was used. For comparison between means of two groups of non-parametric data of independent samples, Z value of Mann-whitney test was used. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p < 0.05$ for interpretation of results of tests of significance⁽¹⁹⁾.

IV. Results

Table (1) shows that the mean age of study and control group was 55.34 ± 7.65 and 51.94 ± 10.03 years respectively. Majority of study group (80%) and about two thirds of control group (62.9%) were male. Regarding marital status, the majority of both groups (94.3% and 88.6% respectively) were married. 42.9% of study group and 57.1% of control group were illiterate. Regarding patient's diagnosis, the highest percentage of study group (28.6%) had sepsis, while about one fourth of control group (25.7% and 20.0%) were post arrested or had intracranial hemorrhage respectively.

Table (2) reveals that the majority of study group (80%) and about two thirds of control group (65.7%) were on mechanical ventilation. The meal for more than half of both study and control groups (51.4% and 57.1% respectively) was vegetable soup and meat. In relation to the amount of feeding, more than one third of

study group (42.9% and 40.0%) consumed 200 and 300 ml/day respectively. But less than half of control group (48.6%) consumed 300 ml/day. The rate of feeding was 100 drip/hour for more than half of both groups (54.3% and 57.1% respectively).

Table (3) presents that there were no statistical significant differences between both groups during first and second day at all times of measurements related to mean gastric residual volume. While during the third day, there were statistical significance decreases of GRV among study group than their control. Moreover, there were significant differences between both groups regarding mean change of gastric residual volume during third day compared to the first day at all times of measurements.

Figure (1) illustrates that, the mean change of gastric residual volume during third day compared to first day at 9.30 A.M was decreased by 12.11 ± 16.12 for study group and 0.57 ± 11 for control group. While at 8.30 P.M the mean change of gastric residual volume was decreased by 4.74 ± 28.87 for study group and increased by 0.97 ± 7.62 for control group.

Figure (2) shows that during the first day of follow up, the mean value of abdominal circumference for study group was about 127 compared to about 122 for control group. While during the third day, the mean value of abdominal circumference for study group was about 122 compared to about 121 for control group.

Table (4) demonstrates that there were significant decreases of mean change of abdominal circumference during third day compared to first day at all times of follow up among study group than control group.

Table (5) reveals that more than half of both study and control groups (57.1% and 51.4% respectively) had vomiting either once or twice during the first day at all times of follow up. While during second day of follow up, about three fourths of study group (71.4%) versus 48.6% of control group didn't complain of vomiting. Moreover the frequency of vomiting episodes was significantly reduced among study group than control group during the third day at all times of follow up (77.1% versus 48.6% respectively didn't have vomiting).

Figure (3) presents that patients of study group who didn't have vomiting during the first day at the three times of follow up (42.9%) was significantly increased during the third day at the three times of follow up to 77.1%.

Figure (4) shows that almost the frequency of vomiting episodes among control group remained constant during first and third day of follow up.

Table (6) reveals that there were significant positive correlations between mean change of gastric residual volume and mean change of abdominal circumference among study and control groups in approximately all times of follow up.

Table (1): Distribution of biodemographic characteristics of the studied patients of study and control groups (n=70).

Biodemographic characteristics	Studied patients (n=70)				χ^2	P
	Study group (n=35)		Control group (n=35)			
	n	%	n	%		
Age years:						
38-57	19	54.3	23	65.7	0.952	0.329
>57	16	45.7	12	34.3		
Range	38-66		33-66		t- test	0.115
Mean \pm SD	55.34 \pm 7.65		51.94 \pm 10.03		=1.594	
Sex:						
Male	28	80.0	22	62.9	2.520	0.113
Female	7	20.0	13	37.1		
Marital status:						
Single	1	2.9	0	0	3.396	0.335
Married	33	94.3	31	88.6		
Widow	1	2.9	2	5.7		
Divorced	0	0	2	5.7		
Educational level:						
Illiterate	15	42.9	20	57.1	3.472	0.324
Basic education	12	34.3	6	17.1		
Secondary education	6	17.1	5	14.3		
University education	2	5.7	4	11.4		
Diagnosis:						
Ischemic heart disease	4	11.4	6	17.1	10.590	0.225
Sepsis	10	28.6	4	11.4		
Intracranial hemorrhage	4	11.4	7	20.0		
Diabetic ketoacidosis	1	2.9	0	0		
Acute coronary syndrome	3	8.6	3	8.6		
Polytrauma	1	2.9	3	8.6		

Chronic obstructive pulmonary disease	4	11.4	0	0		
Post arrest	6	17.1	9	25.7		
Respiratory failure	2	5.7	3	8.6		

Table (2): Distribution of studied patients of both groups according to their enteral feeding regimen (n=70).

Enteral feeding regimen	Studied patients (n=70)				χ^2	P
	Study group (n=35)		Control group (n=35)			
	n	%	n	%		
Reason for enteral feeding:*						
Unconsciousness	21	60.0	21	60.0	2.403	0.301
Being on mechanical ventilation	28	80.0	23	65.7		
Type of feeding:						
Vegetable soup with salt	9	25.7	11	31.4	2.705	0.439
Vegetable soup and meat	18	51.4	20	57.1		
Milk and juice	2	5.7	0	0		
Vegetable soap without salt	6	17.1	4	11.7		
Amount of feeding/ml:						
200	15	42.9	14	40.0	0.725	0.696
300	14	40.0	17	48.6		
400	6	17.1	4	11.4		
Rate of feeding:						
80 drip/hour	10	28.6	11	31.4	0.473	0.789
100 drip/hour	19	54.3	20	57.1		
120 drip/hour	6	17.1	4	11.4		

*Some subjects had the both reasons for enteral feeding.

N.B : The amount of flushing solution for all subjects of both groups was 50 ml

Table (3): Mean and standard deviation of gastric residual volume for studied patients of both groups at three days of follow up (n=70).

Gastric residual volume (ml)	Studied patients (n=70)		Z value	P
	Study group (n=35)	Control group (n=35)		
	Range Mean ±SD	Range Mean ±SD		
First day:				
At 9.30 am	10-200 44.34±35.60	0-200 56.08±48.95	1.049	0.294
At 2.30 pm	10-120 40.63±24.39	0-200 54.77±50.21	0.989	0.323
At 8.30 pm	10-120 39.03±26.13	0-210 54.71±53.62	0.917	0.359
Second day:				
At 9.30 am	0-200 38.20±36.41	0-205 54.54±52.73	1.396	0.163
At 2.30 pm	0-180 36.46±33.98	0-210 55.00±54.04	1.706	0.088
At 8.30 pm	0-180 36.17±34.16	0-200 54.03±51.48	1.730	0.084
Third day:				
At 9.30 am	0-180 32.23±34.03	0-210 50.23±46.83	2.219	0.026*
At 2.30 pm	0-170 31.71±32.70	0-210 50.57±46.66	2.254	0.024*
At 8.30 pm	0-170 31.43±32.93	0-210 50.26±47.04	2.285	0.022*
Mean changes of gastric residual volume at 3rd day than 1st day:				
At 9.30 am	-90.00 : 0.00 -12.11±16.12	-30.00 : 28.00 -0.57±11.	3.884	0.0001*
At 2.30 pm	-40.00 : 50.00 -8.91±14.36	-20.00 : 23.00 1.23±8.41	5.040	0.0001*
At 8.30 pm	-52.00 : 150 -4.74±28.87	-10.00 : 25.00 0.97±7.62	4.555	0.0001*

*Significant (P<0.05)

Figure (1): Mean changes of gastric residual volume among studied patients of study and control groups third day than first day (n=70).

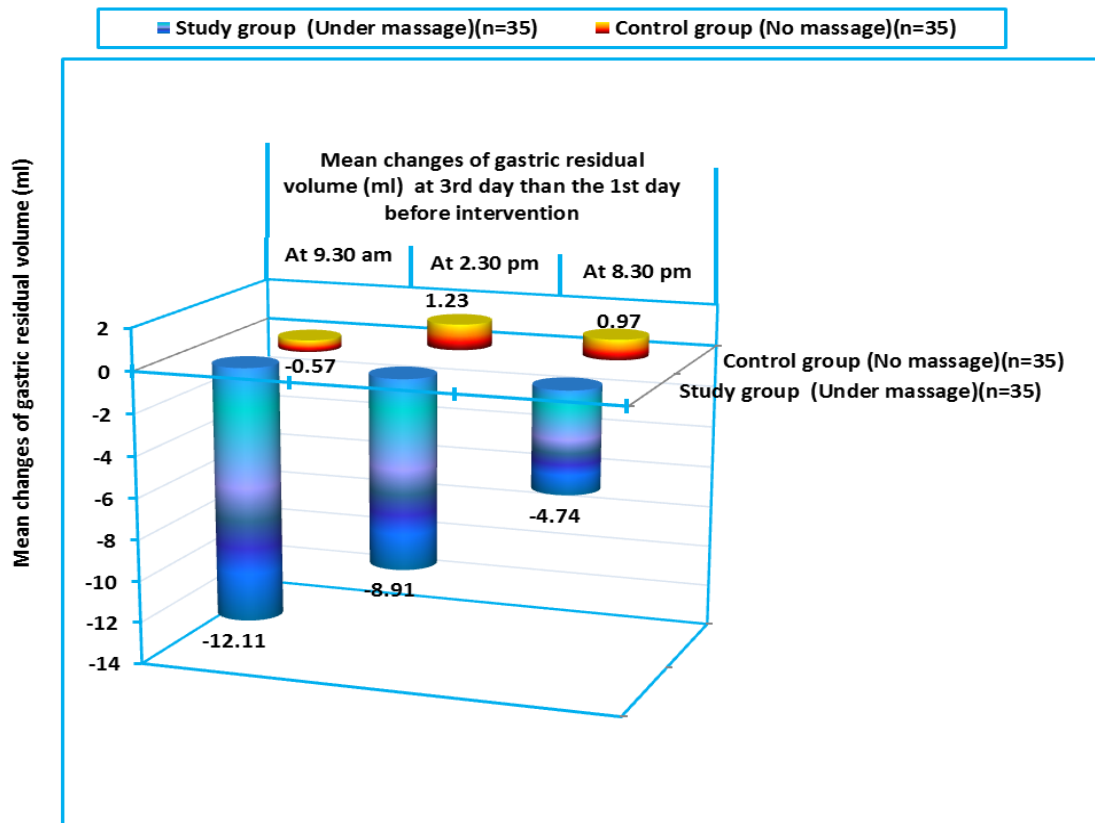


Figure (2): Mean values of abdominal circumference among studied patients of study and control groups at three days of follow up (n=70).

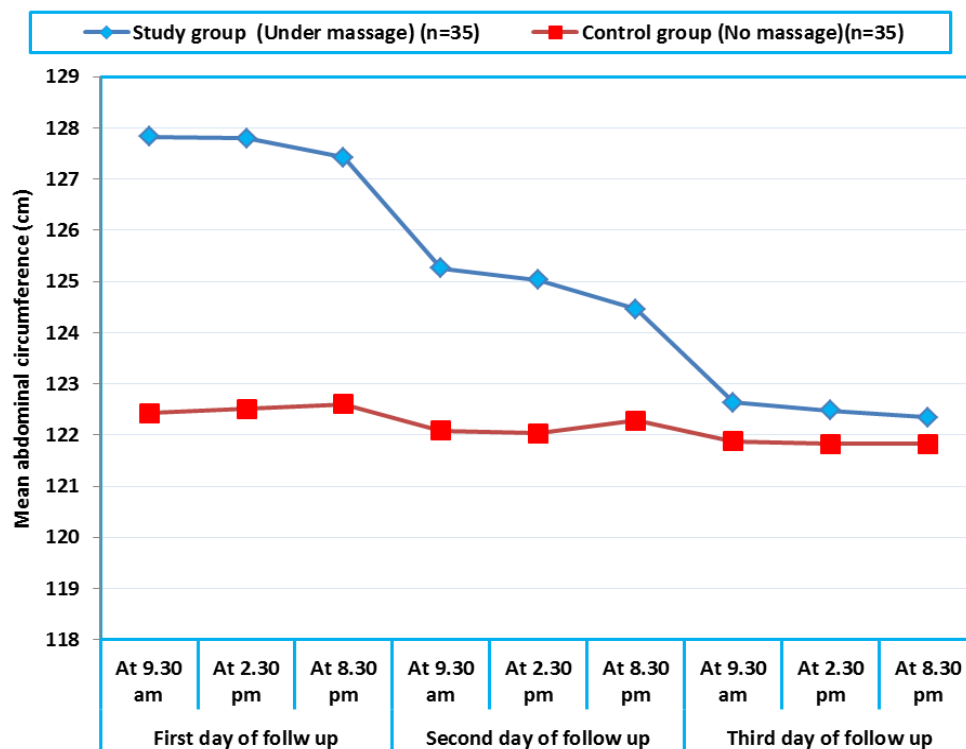


Table (4): Mean change of abdominal circumference measurements for studied patients of study and control groups third day than first day (n=70).

Changes of abdominal circumference at 3 rd day than 1 st day (ml)	Studied patients (n=70)		t-test or Z value	P
	Study group (n=35)	Control group (n=35)		
	Range Mean ±SD	Range Mean ±SD		
At 9.30 am	-16.00 : 0.00 -5.20±5.37	-16.00 : 9.00 -0.54±5.47	4.026	0.0001*
At 2.30 pm	-16.00 : 0.00 -5.31±5.70	-16.00 : 9.00 -0.69±5.59	3.901	0.0001*
At 8.30 pm	-16.00 : 0.00 -5.09±5.90	-16 : 9.00 -0.83±5.55	3.805	0.001*

*Significant (P<0.05)

N.B: All subjects of both groups had soft and non tense abdomen in all times of follow up .

Table (5): Frequency of vomiting episodes among studied patients of both groups at three days of follow up (n=70).

Number of vomiting episodes	Studied patients (n=70)				χ ²	P
	Study group (n=35)		Control group (n=35)			
	n	%	n	%		
First day:						
-At 9.30 am						
None	15	42.9	17	48.6	0.242	0.886
Once/day	13	37.1	12	34.3		
Twice/day	7	20.0	6	17.1		
-At 2.30 pm						
None	15	42.9	17	48.6	3.325	0.190
Once/day	18	51.4	12	34.3		
Twice/day	2	5.7	6	17.1		
-At 8.30 pm						
None	15	42.9	17	48.6	0.583	0.747
Once/day	13	37.1	10	28.6		
Twice/day	7	20.0	8	22.3		
Second day:						
-At 9.30 am						
None	25	71.4	17	48.6	4.324	0.115
Once/day	8	22.9	12	34.3		
Twice/day	2	5.7	6	17.1		
-At 2.30 pm						
None	25	71.4	17	48.6	4.324	0.115
Once/day	8	22.9	12	34.3		
Twice/day	2	5.7	6	17.1		
-At 8.30 pm						
None	25	71.4	17	48.6	4.324	0.115
Once/day	8	22.9	12	34.3		
Twice/day	2	5.7	6	17.1		
Third day:						
-At 9.30 am						
None	27	77.1	17	48.6	7.909	0.019*
Once/day	8	22.9	14	40.0		
Twice/day	0	0	4	11.4		
-At 2.30 pm						
None	27	77.1	17	48.6	7.909	0.019*
Once/day	8	22.9	14	40.0		
Twice/day	0	0	4	11.4		
-At 8.30 pm						
None	27	77.1	17	48.6	7.909	0.019*
Once/day	8	22.9	14	40.0		
Twice/day	0	0	4	11.4		
χ² (P) (Number of vomiting episodes at 3 rd day versus at 1 st day):						
-At 9.30 am	11.620 (0.003*)		0.550 (0.758)			
-At 8.30 pm	9.721 (0.010*)		0.550 (0.758)			
-At 10.30 pm	11.620 (0.003*)		2.300 (0.368)			

*Significant (P<0.05)

Figure (3): Frequency of vomiting episodes among study group at first day versus third day of follow up (n=35).

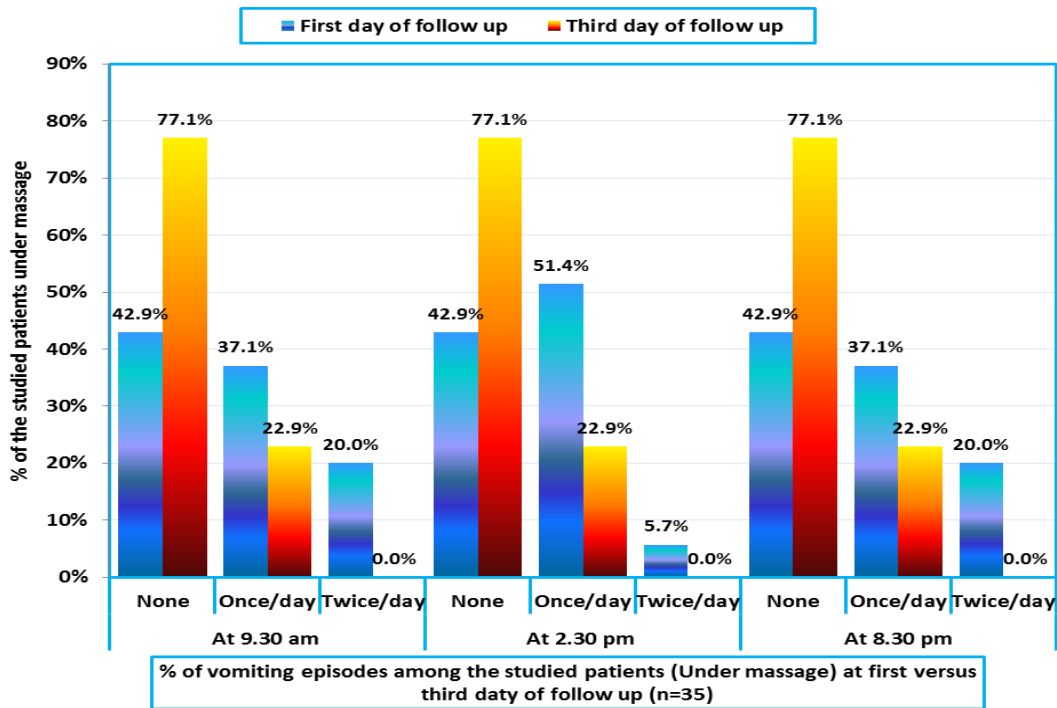


Figure (4): Frequency of vomiting episodes among control group at first day versus third day of follow up (n=35).

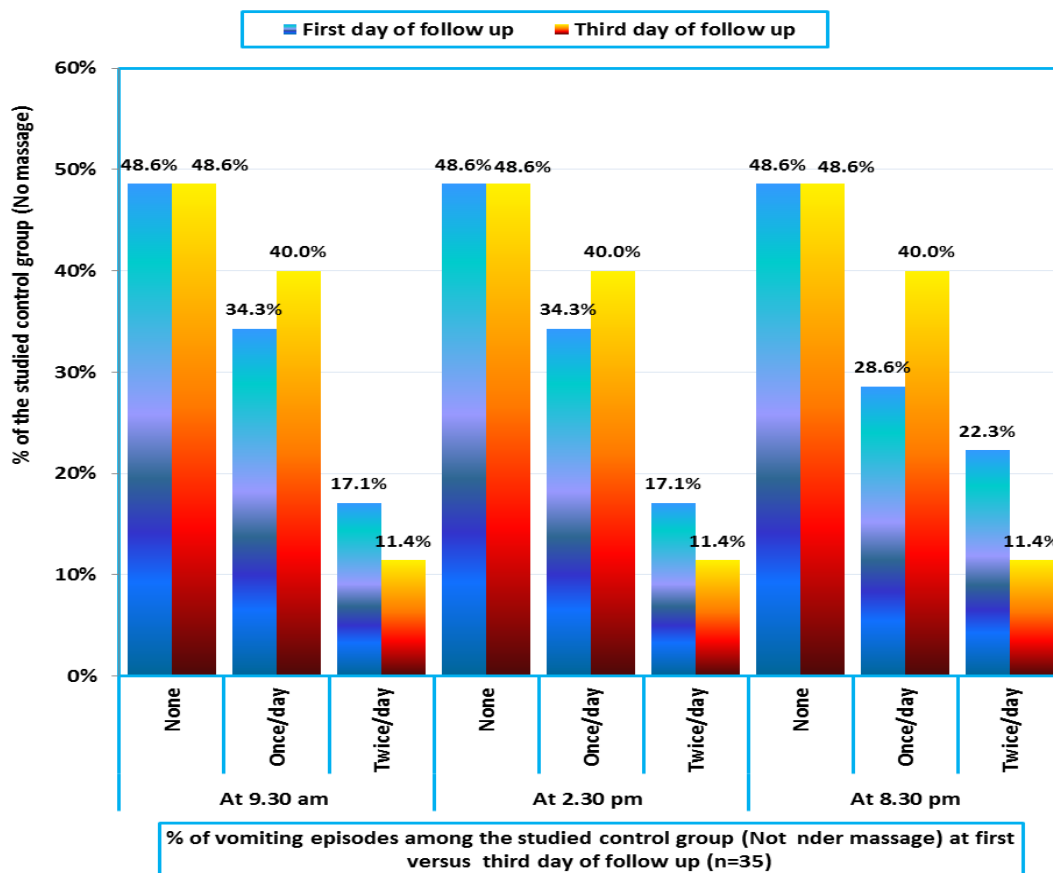


Table (6): Correlation between gastric residual volume and abdominal circumference among studied patients of study and control group at all times of follow up (n=70).

Times of follow up	Studied patients (n=70)			
	Study group (n=35)		Control group (n=35)	
	r	P	r	P
First day:				
At 9.30 am	-0.259	0.133	-0.059	0.736
At 2.30 pm	-0.181	0.299	0.044	0.803
At 8.30 pm	-0.278	0.106	0.041	0.813
Second day:				
At 9.30 am	-0.293	0.088	0.018	0.919
At 2.30 pm	-0.220	0.205	0.026	0.882
At 8.30 pm	-0.175	0.314	0.066	0.708
Third day:				
At 9.30 am	-0.150	0.390	0.061	0.729
At 2.30 pm	-0.159	0.362	0.062	0.723
At 8.30 pm	-0.123	0.480	0.067	0.703
Mean change at 3rd day than the first day				
At 9.30 am	0.393	0.020*	0.304	0.010*
At 2.30 pm	0.450	0.007*	0.311	0.009*
At 8.30 pm	0.543	0.001*	0.113	0.351

*Significant (P<0.05)

r=Pearson correlation coefficient

V. Discussion

Enteral tube feeding is the most common form of artificial feeding in hospitalized patients. In clinical practice, many observed complications related to tube feeding have been documented among critically ill patients such as delayed gastric emptying and feeding intolerance that can be detected by high gastric residual volume, increase frequency of vomiting and presence of abdominal distension⁽²⁰⁾. Abdominal massage is assumed to prevent the development of these complications by reducing gastric residual volume and abdominal distension, but little studies have been given to the efficiency of abdominal massage in preventing or reducing these gastrointestinal problems in enterally fed patients^(8 and 21).

It is documented that abdominal massage accelerates peristalsis by changing intra abdominal pressure and creating a mechanical and reflexive effect on the intestine, decreasing fecal incontinence and abdominal distension and increasing intestinal movement⁽²²⁾.

Biodemographic characteristics:

The current study revealed that there were no statistical significant differences between both groups regarding biodemographic data. These results are in accordance with Uysal et al.,(2012) who mentioned that there were no statistical significant differences between groups in term of age, sex and diagnosis⁽⁸⁾.

The mean age of subjects of study group in the present study was about fifty five years and fifty one for control group. These results are in agreement with McClurg et al., (2011) who reported that the mean age of their sample was fifty five years⁽²³⁾.

Regarding sex, the finding of the present study showed that the majority of study group and about two thirds of control group were males. In contrast to this result McClurg et al., (2011) stated that about two thirds third of their subjects were females_females⁽²³⁾. This may be related to the small sample size of their study (30 patients) in relation to the present study that doesn't allow their results to be generalized.

Enteral feeding is given for patients who are unable to meet their nutritional needs⁽²⁴⁾. This report explains the result of the current study which found that the reasons for enteral feeding for the subjects either unconsciousness or being mechanically ventilated. Moreover about two thirds of both groups were unconscious. But this result is less than the result of Uysal et al., (2012) who stated that all of their subjects were unconscious⁽⁸⁾. This may be due to the difference among both studies in relation to the patients' diagnosis.

Gastric residual volume (GRV)

It is necessary for critically care nurses to correctly assess presence of warning signs of possible complications of enteral feeding such as feeding intolerance and correctly try to prevent or reduce these complications. To assess presence of feeding intolerance, the nurses should continually assess gastric residual volume⁽²⁵⁾.

Tekgunduz et al., (2014) reported that no statistical significant differences were found between both groups during first day in term of GRV⁽²⁶⁾. These findings support the result of the present study. While Uysal et al.,(2012) stated that gastric residual volume in massage group is statistically less than control group after

massaging the abdomen⁽⁸⁾. This statement is in line with the result of the current study which showed that during the third day of follow up, there were significant reductions of gastric residual volume among study group than control group in all times of follow up.

Abdominal circumference:

Tekgunduz et al., (2014) studied the effect of abdominal massage for prevention of feeding intolerance. They analyzed abdominal circumference and found a statistical significant difference between first and last day among the study massage group than the other group⁽²⁶⁾. This result coincides the result of the current study which showed that there was significant decrease of mean change of abdominal circumference between study and control group during third day than first day at all times of follow up. Also Uysal et al.,(2012) reported that when the results of abdominal circumference of both groups were compared during first and last day, abdominal circumference was significantly more among control group⁽⁸⁾.

Frequency of vomiting:

The results of the present study showed that during the third day, there were significant decreases of vomiting frequency among study group than control group in all times of follow up. These results are in agreement with the results of Uysal et al.,(2012) who stated that vomiting was found to be significantly reduced among massage group than control group⁽⁸⁾.

Moreover the results of the current study revealed that there were significant differences among study group at third day than first day. This result is in line with Tekgunduz et al.,(2014) who concluded that the difference between first day and last day for the study group regarding number of vomiting episodes was statistically significant⁽²⁶⁾.

All these results support the research hypothesis of the current study.

The findings of the current study showed that there were significant positive correlation between mean change of gastric residual volume and mean change of abdominal circumference. These may be related to increase gastric residual volume may increase abdominal distension that is indicated by increasing abdominal circumference.

VI. Conclusion

Based on the results of current study, it was concluded that abdominal massage is effective in reducing gastric residual volume, frequency of vomiting and abdominal distension among critically ill patients with nasogastric tube.

VII. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

1. Abdominal massage should be considered a part of routine nursing care performed for all patient's with nasogastric tube feeding for decreasing gastric residual volume, alleviating vomiting and abdominal distension.
2. A written updated protocol of abdominal massage supplemented by an illustrative booklet should be available for critically ill patients with nasogastric tube to help them carrying abdominal massage for themselves.
3. Replication of the study with large probability sample to allow for greater generalization of the results.

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