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## **Effectiveness of multi interventional components on gastric residual volume, abdominal distension, and gastrointestinal functioning among patients with nasogastric tube feeding admitted in the ICU's at selected hospital: A randomized controlled trail pilot study**

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**Abstract**---Abdominal massage and heat application are prevalent non pharmacological interventions for reliving high gastric residual volume, abdominal distension and other some gastro intestinal functioning. It helps to boost the nutritional transition through the gastro intestinal tract, induces peristaltic movement, and consequently lowers the intra abdominal pressure. Moreover, it has been shown to be safe, effective, no pharmacological and non-invasive methods with no side effects. The aim of the study was to determine the effectiveness of multi interventional components on gastric residual volume, abdominal distension and gastro intestinal functioning among patients with nasogastric tube feeding admitted in Intensive Care Units. Subjects: patients who are admitted in the ICU and have nasogastric tube for feeding during the period of data collection. They are divided randomly (cover slip method) in to four

groups of 15 in each group (three experimental groups and one control group). Setting: The study was conducted in the ICU's of selected hospital. Results: gastric residual volume, abdominal distension and gastro intestinal functioning were analysed for 4 groups and statistical significant improvement were found among the study groups than their control group. The frequency of vomiting episode was significantly reduced among study groups than the control group. Conclusion: Abdominal massage should be considered as part of routine nursing care performed for all patients with nasogastric tube feeding for decreasing the gastric residual volume, abdominal distension and alleviating vomiting and the heat application improves the peripheral hemodynamic induces the feeling of comfort in the abdomen and provides a beneficial environment the improvement of gastro intestinal movements.

**Keywords**---abdominal massage, heat application, gastric residual volume, abdominal distension, gastro intestinal functioning, nasogastric tube, intensive care unit.

## **Introduction**

Gastrointestinal abnormal functions are the common problems of the patients admitted in the critical care units. Increased gastric residual volume, abdominal distension, delayed gastric emptying, abnormal gastrointestinal motility patterns, and impaired intestinal barrier integrity are commonly observed problems in the intensive care unit. It has been recognized for some time that a functional gastrointestinal tract is an important factor in clinical outcome of patients in the ICU. The development of symptoms suggestive of gastro intestinal dysfunction is associated with enteral feeding failure, complications and morbidities, which may all affect survival. A functional gut in the critically ill patient is of considerable importance and clinical relevance<sup>1</sup>.

Many of the commonly occurring problems (e.g. vomiting, gastric retention, absent/abnormal bowel sounds, diarrhoea, distension, and ileus) are interpreted to be disorder of gastrointestinal motility. Indeed, motility throughout the Gastro intestinal tract is profoundly abnormal during severe illness; gastro-oesophageal sphincter tone is extremely poor and gastro-oesophageal reflux combined with poor oesophageal peristaltic clearing of refluxed contents occurs frequently. Enteral tube feeding is used to feed patients who cannot attain an adequate oral intake from food and/or oral nutritional supplements, or who cannot eat/drink safely. The aim is to improve nutritional intake and so improve or maintain nutritional status. It is used most commonly in patients with dysphagia either because they cannot meet their nutritional needs despite supplements and/or modifications to food texture/consistency, or because they risk aspiration if they try to do so<sup>2</sup>.

The Gastro intestinal tract must be accessible and functioning sufficiently to absorb the feed administered. If enteral tube feeding is unsafe or unlikely to be successful (e.g. inaccessible GI tract, severe malabsorption, excessive

gastrointestinal losses), parenteral nutrition is likely to become the therapy of choice. One of the most important side effects of enteral feeding is the feeding intolerance which is a general incidence of high gastric residual volume, vomiting and abdominal distension. Checking gastric residual volume is important when giving feeding in to stomach. High gastric residual volume may be caused by other complications of NGT such as aspiration pneumonia or constipation, while vomiting is the most serious complications associated with nasogastric tube because it may increase the risk for aspiration pneumonia. Check gastric residual volume every 4 hours during the first 48 hours for gastrically fed patients. After attaining the enteral feeding rate goal, decrease gastric residual monitoring to every 6 – 8 hours in non critically ill patients or continue every 4 hours in critically ill patient<sup>3</sup>.

There are many studies suggests that using abdominal massage and heat application which is a prevalent non pharmacological intervention for reliving high gastric residual volume, abdominal distension and other some gastro intestinal functioning. It helps to boost the nutritional transition through the gastro intestinal tract, induces peristaltic movement, and consequently lowers the intra abdominal pressure. Moreover, it has been shown to be safe, effective, non pharmacological and non invasive methods with no side effects<sup>4</sup>

Also abdominal massage increases vagal activity and changes intra abdominal pressure. Increasing vagal activity leads to increase gastric motility and enhance gastric emptying. Uysal et al., (2012) described abdominal massage as the preferred non pharmacological 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 effect<sup>4</sup>. Heat therapy is most commonly used for rehabilitation purposes. The therapeutic effects of heat include increasing the extensibility of collagen tissues; decreasing joint stiffness; reducing pain; relieving muscle spasms; reducing inflammation, reducing abdominal distension, and aids in the post acute phase of healing; and increasing peripheral blood flow<sup>5</sup>.

Nurses are responsible for assessing and evaluating the side effects through gastric residual volume measurement with monitoring the occurrence of vomiting and its frequency as well as occurrence of abdominal distension. They are responsible for planning patient's nutritional needs and applying feeding safely and efficiently. Most complications that develop as a result of these problems can be prevented by nursing care. . So the aim of the present study is to determine the effect of multi interventional component on gastric residual volume, abdominal distension and gastrointestinal functioning among patients with nasogastric tube feeding in Intensive Care Units.

### **Need, aim and objectives of the study**

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

## **Aim**

The present study is to determine the effectiveness of multi interventional components on gastric residual volume, abdominal distension and gastro intestinal functioning among patients with nasogastric tube feeding admitted in Intensive Care Units.

## **Objectives**

Assess the mean level of gastric residual volume, abdominal distension and gastrointestinal functioning among patients with nasogastric tube feeding in the experimental groups and the control group. Evaluate the effectiveness of multi interventional components on gastric residual volume, abdominal distension, and gastrointestinal functioning among patients with nasogastric tube feeding between the experimental groups and the control group.

## **Operational definitions**

Effectiveness: it refers to extent in which the multi interventional components has achieved the desired effect on gastric residual volume, abdominal distension and gastro intestinal functioning of the patients with nasogastric tube feeding by using bio physiological measurements.

Multi interventional components: it is the planned nursing interventions which include abdominal massage and heat application for the nasogastric tube feeding patients at intensive care units by the investigator.

Gastric residual volume: it refers to the volume of gastric content remaining in the stomach at a point in time during enteral nutrition feeding measured by withdrawing the gastric content through aspiration.

Abdominal distension: it refers to when gastric content, air or fluid accumulate in the abdomen causing its expansion measured by abdominal circumference.

Gastro intestinal functioning: it refers to the peristaltic movements and vomiting episodes where the body's activities in terms of the movement of the intestine and series of contraction of the smooth muscle lining in the gastro intestinal tract.

Nasogastric tube feeding: in present study, it refers to the patient those who receive nutrients through the nasal route into stomach via a feeding tube.

## **Research hypotheses**

There will be a significant difference in the gastric residual volume among those who are undergoing multi interventional components than those who do not.

There will be a significant difference in the abdominal distension among those who are undergoing multi interventional components than those who do not.

There will be a significant difference in the gastro intestinal functioning among those who are undergoing multi interventional components than those who do not.

## **Materials and Method**

Research approach: Quantitative approach.

Research design: Experimental research design –Randomized controlled trail

Subjects: patients who are admitted in the intensive care unit and have nasogastric tube for feeding during the period of data collection. They are divided randomly in to four groups of 15 in each group (three experimental groups and one control group)

Setting: The pilot study conducted in the ICU's at setting at selected hospital.

Sampling method: A sample is fulfilled the inclusion criteria of patients who are admitting in the ICUs and have nasogastric tube for feeding during the period of data collection selected with cover slip method. Experimental group 1: exposed to the multi interventional components (both abdominal massage and heat application) along with routine hospital care. Experimental group 2: Exposed to the abdominal massage along with routine hospital care Experimental group 3: Exposed to the heat application along with routine hospital care, Control group 1: Exposed only to the routine hospital care.

### **The subjects are going to select according to the following criteria**

#### **Inclusion criteria**

1. Adult patients who are fed enterally via nasogastric tube.
2. Age group in between 21-85.
3. The frequency of feeding for them minimum three times in a day.
4. Free from intestinal obstruction, inflammatory bowel diseases, bowel atony and ascitis.

#### **Exclusion criteria**

1. Patient those who had recent abdominal surgery and severe diarrhoea.
2. Patient those who are in terminally ill (disease that cannot be cured and will cause death.)
3. Patient who have hypocalcaemia.
4. Patient those who are in unconscious status.
5. Emotional and psychological factors(abdominal touch made miserable)

SAMPLE SIZE: 60(15 in each group)

Tools: Tool I: Structural interviewing questionnaire: subject's demographic data. It included two parts as follow:

Part one: demographic Data.

Age, gender, duration of illness, food habits, and medical diagnosis.

Part two: clinical variables.

Reason for enteral feeding, type, amount and amount of flushing solutions.

Tool II: Bio physiological measurement tool:

Gastric residual volume assessment, abdominal circumference measurement, vomiting episodes, peristaltic movements

### **Multi interventional components**

#### **Abdominal massage**

After assessing the gastric residual volume and abdominal distension, applied moisturizing lotion smoothly over the abdomen. Begin the abdominal massage by

gently relaxing strokes up the abdominal wall and then provided four consecutive strokes: Stroking, Effleurages, Kneading and Vibration.

Stroking is applied on the dermatome of the vagus nerve, over iliac crest then toward both sides of groin. Effleurage strokes pass from ascending colon to the transverse one down to the descending. These strokes are applied with excess pressure to stimulate large intestine to contract that propel stool along the colon and improve feeding tolerance. 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.

### **Heat application**

Checked with the lotion thermometer to be sure the application is not too hot. Always make sure a patient can remove the heating device or move away from it if it is causing excessive discomfort. The warm water bag, placed in a protective cover to protect the patient from burns, over the abdominal and lumbar region. Place a towel over the area to be treated, apply for up to 10 minutes checking regularly that the skin is not becoming too hot. Temperature should not exceed more than 45 degree celcius.

### **Data collection process**

Patients who fulfilled the inclusion criteria and agreed to participate in the studies are randomly divided into four groups. Sixty patients for each group. Every participant of all groups or his/her caregiver is interviewed individually in his/ her bed in ICU to assess demographic data by using tool I .Gastric residual volume, abdominal distension ,peristaltic movements and vomiting episodes are assessed for every patients of all the groups by using tool II( biophysiological measurement ) just before feeding meal. The researchers using 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. Gastric residual volume is assessed by aspirating 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 is repeating to be sure from emptying the stomach for each subject of all the groups.

A measuring tape of 150 cm is used by the researchers to assess the abdominal distension before each meal for each subject of all the groups. The researcher lightly palpates the abdomen for every patient in all the groups before feeding. Palpation is carried out by applying sufficient pressure of 2 cm deep. Abdominal circumferences with measuring tape are used to assess presence of abdominal distension. If patient have soft and not tense abdomen, his/ her abdomen is considered not distended, while if abdomen is hard, it is considered distended. Peristaltic movement is assessed by auscultation and frequencies of vomiting also observed.

**Result**

Table 1: distribution of demographic/clinical variables between different groups to check the homogeneity

N=60

Variables		Groups(each group -15 sample)				Fishers exact p value
		Experimental group1	Experimental group2	Experimental group3	Control group1	
Age(years)	21-35	1	0	1	2	0.314
	36-50	1	2	0	2	
	51-65	4	3	7	7	
	66 and above	9	10	7	4	
Gender	Male	8	9	11	7	0.494 (Chi square p value)
	Female	7	6	4	8	
Duration of illness	Less than 1 week	7	7	6	5	0.914
	1-3 weeks	6	6	5	8	
	More than3weeks	2	2	4	2	
Food habit	Vegetarian	2	3	1	4	0.410
	Mixed	13	12	14	11	
	Non vegetarian	0	0	0	0	
Reason for enteral feeding	Unconsciousness	3	2	5	2	0.609
	Being on Mechanical ventilator	4	8	5	5	
	Inability to swallow	8	5	5	8	
Type of food	Oats	1	2	2	2	0.609
	Raggi	1	1	3	0	
	Juice	0	0	1	0	
	Grinded rice	13	12	9	13	
Amount	200ml	0	1	7	5	0.001*
	300ml	12	14	8	10	
	400ml	3	0	0	0	
Amount of flushing solution	Less than 25 ml	3	5	8	2	0.110
	25-50 ml	12	10	7	13	

Table 1 depicts that Chi square/Fishers exact test performed to check the homogeneity of distribution of demographic variables between different groups. Variable 'amount' not found to be homogeneous across different groups. [Note that sample size is too small to make any inference, whatever observed here mostly by chance happened, cannot make any decision based on the given p values.

Table 2 Assess the mean level of gastric residual volume, abdominal distension and gastrointestinal functioning among patients with nasogastric tube feeding in the experimental groups and the control group

Groups	Residual volume (in ml)(GRV)	Abdominal distension	Presence of Bowel movement Frequency (%)
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	Mean (SD)	Mean (SD)	
ABDOMINAL MASSAGE AND HEAT APPLICATION [ n=15 ]	86.60 (12.61)	92.20 (11.78)	7(46.7%)
ABDOMINAL MASSAGE [ n=15 ]	86.80(13.62)	94.73 (6.70)	5 (33.3%)
HEAT APPLICATION [ n=15 ]	78.93 (15.19)	95.13 (7.27)	6 (40.0%)
CONTROL GROUP [ n=15 ]	76.67(15.74)	90.33 (6.17)	9 (60.0%)

Table 2 reveals that, in experimental group 1, the mean score of gastric residual volume was 86.60(SD-12.61), mean score of the abdominal distension was 92.20(SD-11.78) and presence of bowel movement frequency in experimental group 1 was 7 (46.7%). In experimental group 2 the mean score of gastric residual volume was 86.80(SD-13.62), mean score of the abdominal distension was 94.73(SD-6.70) and presence of bowel movement frequency in experimental group 2 was 5(33.3%). In experimental group 3 the mean score of gastric residual volume was 78.93(SD-15.19), mean score of the abdominal distension was 95.13(SD-7.27) and presence of bowel movement frequency in experimental group 3 was 6(40.0%). In control group the mean score of gastric residual volume was 76.67(SD-15.74), mean score of the abdominal distension was 90.23(SD-6.17) and presence of bowel movement frequency in control group was 9(60.0%).

Table 3 Effectiveness of multi interventional components on Gastric residual volume among patients with naso gastric tube feeding

Groups	Residual volume (in ml)(GRV) Mean (SD)				Within group comparison (Bonferroni adjusted)	
	Pre test	Post 1	Post 2	Post 3	F value	P value
ABDOMINAL MASSAGE AND HEAT APPLICATION	86.60 (12.61)	77.37 (9.64)	75.97 (7.37)	74.82 (9.55)	25.75	<0.001*
ABDOMINAL MASSAGE	86.80(13.62)	78.033(8.10)	78.37 (7.45)	77.15 (9.95)	17.67	<0.001*
HEAT APPLICATION	78.93 (15.19)	72.13(11.88)	70.77 (12.05)	71.28 (11.53)	10.64	<0.001*
CONTROL GROUP	76.67(15.74)	71.90(9.87)	69.66 (11.15)	70.97 (13.18)	6.22	0.001*

Table 3 demonstrate that, in experimental group 1 the mean change of gastric residual volume during the third day compared to first day first time measurement was decreased by 86.60 to 74.82. In experimental group 2 the mean change of gastric residual volume during the third day compared to first day first time measurement was decreased by 86.80 to 77.15. In experimental group 3 the mean change of gastric residual volume during the third day compared to first day first time measurement was decreased by 78.13 to 71.28. In

control group the mean change of gastric residual volume during the third day compared to first day first time measurement was decreased by 74.67 to 70.97. Two way repeated measures ANOVA performed to check is there any significance difference in the average GRV at different time points as well as between experimental groups and control group. It is observed from the Bonferroni pair wise comparison that there is a significant difference in the average Gastric residual volume across different time points in the experimental groups as well as in the control group ( $p < 0.001$ ). Also, it was observed from the between *group's* comparison that there is a clinical significant difference in the gastric residual volume between experimental groups and control group ( $p = 1.00$ ). Hence it is concluded that the interventions are effective in reducing the GRV.

Table 4: Effectiveness of multi interventional components on abdominal distension among patients with nasogastric tube feeding

Groups	Abdominal distension Mean (SD)				Within group comparison (Bonferroni adjusted)	
	Pre test	Post 1	Post 2	Post 3	F value	P value
ABDOMINAL MASSAGE AND HEAT APPLICATION	93.93 (6.69)	93.93 (9.69)	92.77 (9.57)	92.08 (9.55)	35.64	<0.001*
ABDOMINAL MASSAGE	94.73 (6.70)	94.66 (6.59)	93.93 (6.63)	93.26 (6.82)	49.65	<0.001*
HEAT APPLICATION	95.13 (7.27)	94.86 (7.26)	94.37 (7.18)	93.46 (7.36)	22.91	<0.001*
CONTROL GROUP	90.33 (6.17)	90.46 (6.13)	90.18 (5.95)	89.68 (5.87)	7.07	<0.001*

Table 4 illustrate that, in experimental group 1 the mean change of abdominal distension during the third day compared to first day first time measurement was decreased by 93.93 to 92.08. In experimental group 2 the mean change of abdominal distension during the third day compared to first day first time measurement was decreased by 94.73 to 93.26. In experimental group 3 the mean change of abdominal distension during the third day compared to first day first time measurement was decreased by 95.13 to 93.46. In control group the mean change of abdominal distension during the third day compared to first day first time measurement was decreased by 90.33 to 89.68. Two way repeated measures ANOVA performed to check is there any significance difference in the average abdominal distension at different time points as well as between experimental groups and control group. It is observed from the Bonferroni pair wise comparison that there is a significant difference in the average AD across different time points in the experimental groups as well as in the control group ( $p < 0.001$ ). Also, it was observed from the between *group's* comparison that there is a clinical significant difference in the Abdominal distension between experimental groups and control group ( $p > 0.05$ ). Hence it is concluded that the interventions are effective in reducing the abdominal distension.

### Effectiveness of multi interventional components on gastrointestinal functioning among patients with nasogastric tube feeding

Table 5.1: Effectiveness of 'abdominal massage and heat application' on gastrointestinal functioning

Groups	Presence of Bowel movement Frequency (%)				Within group comparison (Cochrane Q test) P value	Between group comparison (GEE) P value
	Pre test	Post1	Post2	Post3		
ABDOMINAL MASSAGE & HEAT APPLICATION (n=15)	7 46.7%	7 46.7%	13 86.7%	15 100%	<0.001*	0.099
Control group (n=15)	9 60%	9 60%	11 73.3%	11 73.3%	0.184	

Table 5.1 presents that, in experimental group 1 the presence of bowel movement frequency significantly increased from 46.7% to 100% and in control group the presence of bowel movement frequency increased from 60% to 73.3% only. To study the Effectiveness of multi interventional component- abdominal massage and heat application on gastrointestinal functioning among patients with nasogastric tube feeding, Cochrane Q test and GEE is performed. Cochrane Q test reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (abdominal massage & heat application) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ).

Table 5.2: Effectiveness of 'abdominal massage' on gastrointestinal functioning

Groups	Presence of Bowel movement Frequency (%)				Within group comparison (Cochrane Q test) P value	Between group comparison (GEE) P value
	Pre test	Post1	Post2	Post3		
ABDOMINAL MASSAGE (n=15)	5 33.3%	5 33.3%	8 53.3%	15 100%	<0.001*	0.712
Control (n=15)	9 60%	9 60%	11 73.3%	11 73.3%	0.184	

Table 5.2 shows that, in experimental group 2 the presence of bowel movement frequency significantly increased from 33.3% to 100% and in control group the presence of bowel movement frequency increased from 60% to 73.3% only. To study the Effectiveness of abdominal massage on gastrointestinal functioning among patients with nasogastric tube feeding, Cochrane Q test and GEE is performed. Cochrane Q test reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (abdominal massage) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ).

Table5.3: Effectiveness of 'heat application' on gastrointestinal functioning

Groups	Presence of Bowel movement Frequency (%)				Within group comparison (Cochrane Q test) P value	Between group comparison (GEE) P value
	Pre test	Post1	Post2	Post3		
HEAT APPLICATION(n=15)	6 40.0%	6 40.0%	11 73.3%	15 100%	<0.001*	0.242
Control(n=15)	9 60%	9 60%	11 73.3%	11 73.3%	0.184	

Table5.1 presents that, in experimental group 3 the presence of bowel movement frequency significantly increased from 40% to 100% and in control group the presence of bowel movement frequency increased from 60% to 73.3% only. To study the Effectiveness of heat application on gastrointestinal functioning among patients with nasogastric tube feeding, Cochrane Q test and GEE is performed. Cochrane Q test reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (heat application) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ).

#### **Effectiveness of multi interventional components on Episode of vomiting among patients with nasogastric tube feeding**

Table6.1: Effectiveness of 'abdominal massage and heat application' on Episode of vomiting

Groups	No of vomiting	Pre test		Post 1		Post 2		Post 3		P value	
		F	%	F	%	F	%	F	%	within	Between
Control group (n=15)	0	8	53.3	10	66.7	9	60.0	9	60.0	0.450	0.414
	1	5	33.3	5	33.3	6	40.0	6	40.0		
	2	2	13.3	0	0	0	0	0	0		
Abdominal massage and heat application (n=15)	0	7	46.7	7	46.7	5	33.3	15	100	0.160	
	1	5	33.3	8	53.3	9	60.0	0	0		
	2	3	20.0	0	0	1	6.7	0	0		

Table6.1 depicts that, in experimental group 1 the number of vomiting frequency during third day compared to first day decreased from 7-0 (no vomiting) 5-0 (one episode of vomiting) 3-0 (two episode of vomiting) and in control group there was no much changes. To study the Effectiveness of multi interventional component- abdominal massage and heat application on episode of vomiting among patients with nasogastric tube feeding, GEE is performed. GEE test reveals that there is significant difference in the number of episodes of vomiting across different time points in the intervention group (abdominal massage and heat application) ( $p = 0.160$ ) and no significant difference observed in the control group ( $p = 0.450$ ).

Table 6.2: Effectiveness of 'abdominal massage' on Episode of vomiting

Groups	No of vomiting	Pre test		Post 1		Post 2		Post 3		P value	
		F	%	F	%	f	%	F	%	within	Between
Control group (n=15)	0	8	53.3	10	66.7	9	60.0	9	60.0	0.450	0.700
	1	5	33.3	5	33.3	6	40.0	6	40.0		
	2	2	13.3	0	0	0	0	0	0		
ABDOMINAL MASSAGE (n=15)	0	8	53.3	8	53.3	7	46.7	15	100	0.278	
	1	5	33.3	7	46.7	7	46.7	0	0		
	2	2	13.3	0	0	1	6.7	0	0		

Table 6.2 presents that, in experimental group 2 the number of vomiting frequency during third day compared to first day decreased from 5-0 (one episode of vomiting) to 2-0 (two episode of vomiting) and in control group there was no much changes. To study the Effectiveness of multi interventional component- abdominal massage on episode of vomiting among patients with nasogastric tube feeding, GEE is performed. GEE test reveals that there is significant difference in the number of episodes of vomiting across different time points in the intervention group (abdominal massage and heat application) ( $p=0.278$ ) and no significant difference observed in the control group ( $p=0.450$ ).

Table 6.3: Effectiveness of 'heat application' on Episode of vomiting

Groups	No of vomiting	Pre test		Post 1		Post 2		Post 3		P value	
		F	%	F	%	f	%	f	%	within	Between
Control group (n=15)	0	8	53.3	10	66.7	9	60.0	9	60.0	0.450	0.074
	1	5	33.3	5	33.3	6	40.0	6	40.0		
	2	2	13.3	0	0	0	0	0	0		
HEAT APPLICATION (n=15)	0	7	46.7	5	33.3	5	33.3	14	93.3	0.076	
	1	6	40.0	10	66.7	9	60.0	1	6.7		
	2	2	13.3	0	0	1	6.7	0	0		

Table 6.3 presents that, in experimental group 3 the number of vomiting frequency during third day compared to first day decreased from 6-1 (one episode of vomiting) to 2-0 (two episode of vomiting) and in control group there was no much changes. To study the Effectiveness of multi interventional component- abdominal massage and heat application on episode of vomiting among patients with nasogastric tube feeding, GEE is performed. GEE test reveals that there is a significant difference in the number of episodes of vomiting across different time points in the intervention group (abdominal massage and heat application) ( $p=0.076$ ) and no significant difference observed in the control group ( $p=0.450$ ).

## Discussion

Biodemographic/ clinical variables: Variable 'amount' not found to be homogeneous across different groups. [Note that sample size is too small to make any inference, whatever observed here mostly by chance happened, cannot make any decision based on the given p values.

In experimental group 1 the mean score of gastric residual volume was 86.60(SD-12.61), mean score of the abdominal distension was 92.20(SD-11.78).presence of bowel movement frequency in experimental group 1 was 7 (46.7%).In experimental group 2 the mean score of gastric residual volume was 86.80(SD-13.62), mean score of the abdominal distension was 94.73(SD-6.70).presence of bowel movement frequency in experimental group 2 was 5(33.3%).In experimental group 3 the mean score of gastric residual volume was 78.93(SD-15.19), mean score of the abdominal distension was 95.13(SD-7.27).presence of bowel movement frequency in experimental group 3 was 6(40.0%).In control group the mean score of gastric residual volume was 76.67(SD-15.74),mean score of the abdominal distension was 90.233(SD-6.17).presence of bowel movement frequency in control group was 9(60.0%).

A similar study conducted to assess the effect of abdominal massage on reducing gastric residual volume in intensive care units of Fatemeh Zahra Hospital, Ahvaz, Iran in 2017. The results of this study showed that abdominal massage can have an important effect on the reduction of GRV in patients hospitalized in intensive care units who are fed through NG tube, as the total mean of GRV in all days was significantly less than the control group, and also, it was low in all days in the case group. Controlling and reducing the GRV could be an important measure for improving nutritional status and reducing complications in critically ill patients, and consequently decreasing the rate of malnutrition<sup>6</sup>

Two way repeated measures ANOVA performed to check is there any significance difference in the average gastric residual volume and abdominal distension at different time points as well as between experimental groups and control group. It is observed from the Bonferroni pair wise comparison that there are significant difference in the average of gastric residual volume and abdominal distension across different time points in the experimental groups as well as in the control group ( $p < 0.001$ ).Also, it was observed from the between *group's* comparison that there is a clinical significant difference in the GRV between experimental groups and control group ( $p = 1.00$ ) and there is a clinical significant difference in the Abdominal distension between experimental groups and control group ( $p > 0.05$ ) Hence it is concluded that the interventions are effective in reducing the gastric residual volume and abdominal distension.

A similar study conducted to determining the effects of abdominal massage on high gastric residual volume seen in patients intermittently fed with enteral nutrition through a nasogastric tube. The study also investigated consequent abdominal distension and vomiting complications. The study was carried out in a University Hospital, Turkey. The result of the study suggests that nurses should apply abdominal massage to subjects receiving enteral feedings intermittently to prevent high gastric residual volume and abdominal distension<sup>7</sup>.

To study the Effectiveness of multi interventional component on gastrointestinal functioning among patients with nasogastric tube feeding, Cochran Q test and GEE is performed. Cochran Q test reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (abdominal massage & heat application) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ). Cochran Q test

reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (abdominal massage) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ). Cochrane Q test reveals that there is a significant difference in the proportion of presence of bowel movement across different time points in the intervention group (heat application) ( $p < 0.001$ ) and no significant difference observed in the control group ( $p = 0.184$ ).

A study conducted to examine the effect of abdominal massage on gastrointestinal functions of the intensive care patients with an endotracheal tube at Kerman University of Medical Sciences, Iran. The results revealed that abdominal massage could improve gastrointestinal functions in enterally fed patients with an endotracheal tube. It is suggested to use abdominal massage as an adjunct therapy for improving gastrointestinal functions in intensive care patients<sup>8</sup>

Abdominal massage should be considered as part of routine nursing care performed for all patients with nasogastric tube feeding for decreasing the gastric residual volume, abdominal distension and alleviating vomiting and the heat application improves the peripheral vasodilation, induces the feeling of comfort in the abdomen and provides a beneficial environment the improvement of gastrointestinal movements.

### **Conclusion**

There was significant reduction in the gastric residual volume, abdominal distension and gastro intestinal functioning after the interventions for a period of 15 minutes daily for 3 consecutive days. Hence the pilot study report concluded that abdominal massage and heat application is very effective for reducing the gastric residual volume, abdominal distension and other gastro intestinal functioning among the patients with nasogastric tube feeding admitted in the intensive care units.

### **Ethics and consent**

Formal written permission was obtained from the appropriate authorities of selected hospital. Researcher explained the purpose of the study to the subject and took written consent for their participation in the study. All subjects were assured about their confidentiality and anonymity.

### **Conflict of interest**

The authors declare no conflict of interest

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