Effect of Abdominal Massage on the Occurrence of Constipation among Critically Ill Ventilated Patients at Intensive Care Unit

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Abstract: Constipation is a major gastrointestinal and poorly recognized problem among critically ill patients. There are numerous problems associated with constipation for patients admitted to Intensive Care Unit. These complications can increase mortality and delayed weaning from mechanical ventilation. **The aim** of the study was to evaluate the effect of abdominal massage on the occurrence of constipation among critically ill ventilated patients at Tanta Intensive Care Unit. **Setting**: The study was conducted at the Intensive Care Unit (ICU) affiliated to Tanta Emergency Hospital at Tanta University Hospital. **Study subjects**: A purposive sample of 60 critically ill patients with mechanical ventilation admitted to the ICU. **Tools:** 3 tools were used. **Tool I:** Patients' demographic characteristics and health related data**.** T**ool II:** Gastrointestinal Outcomes Assessment Tool**.** It included five parts**: Part (A):** Enteral feeding Assessment**, Part (B):** Gastric Residual Volume Assessment, **Part (C):** Abdominal circumference assessment, **Part (D):** Bowel movement Assessment **Part (E):** Frequency of defecation assessment**. Tool III:** Constipation assessment scale. **Results:** more than half (53.33%) of control group had severe constipation at the 7th day of the study. While severe constipation didn't reported among any patients in intervention group at seventh day of study. Statistical differences were observed between two groups throughout three times of assessment. **Conclusion:** Abdominal massage is more efficient in decreasing constipation and its adverse effect such as abdominal distension, circumference pressure and residual volume in the intervention sample. **Recommendations**: abdominal massage should be applied as a routinely care for all patients in ICU.

Key words: Abdominal massage, Constipation, Critically ill ventilated patients

Introduction

Constipation is a major gastrointestinal and poorly recognized problem in critically ill patients. It has a little attention in the literature. The reported incidence of this problem in the general population is between 2% and 25%, with the increased incidence in the critically ill patients to be between 16% and 83% [(1)]. Multiple studies defined constipation as a failure to pass stool within 72 hours of admission to the Intensive care Unit (ICU) [(2, 3)]. Risk factors of constipation in critical care unit include confinement to bed neuromuscular blocking agents, use of opioids and sedatives, vasopressors, electrolytic disorders, immobility, increased severity of disease, lack of fluids administration, and decreased fiber in enteral nutrition and fiber-free enteral diets that are recommended for critically ill patients at high risk of intestinal problems [(4,5)]. Numerous studies stated that drugs as morphine,

benzodiazepines and myo-relaxants leading to reduce intestinal mobility and increasing the risk of constipation [6]. Moreover, neurological diseases such as spinal cord injury, stroke, malnutrition and immobility caused by altered level of consciousness increase the risk of constipation in ICU[7].

Constipation among critically ill patients can lead to numerous problems such as overgrowth of bacteria in the digestive tract which had negative effects on the colon mucosa and tolerance of an enteral diet. These problems may increase mortality through intestinal obstruction and perforation, aspiration pneumonia, delayed weaning from mechanical ventilation and prolonged hospital stay[8]. Other problems associated with constipation in the critically ill patients involve gastrointestinal problems, abdominal pain, intra-abdominal pressure increased that may limit diaphragmatic movement [9].

Critical care nursing staff plays an important role in monitoring and checking bowel movements to decrease and prevent gastrointestinal complications [6]. Pharmacological and non-pharmacologic treatment is being used to prevent gastrointestinal problems. Abdominal massage is among non-pharmacologic methods considered as an acceptable method that used to enhance digestive function [10].

Abdominal massage is a light massage technique used to relax the abdominal region. It stimulates parasympathetic activity, improving gastrointestinal function, decreasing intra-abdominal pressure and producing a mechanical and reflexive effect on the intestines, reducing abdominal distension and increasing intestinal movements [11-13]. Gentle Massage is done on the abdominal wall around the intestines with a clockwise direction through rubbing, kneading, and vibrating to enhance bowel movements and stimulate the muscle contractions. In addition, changing intra-abdominal pressure and pressing on the rectum, creates a mechanical and reflex effect on the intestines and decreases pain and discomfort [14, 15].

Previous studies reported that using the abdominal massage for critically ill patients reduce gastrointestinal complications such as abdominal distension, high residual volume and constipation severity [11]. It is an independent nursing intervention that decreases the use of pharmacological treatment and has beneficial effect in preventing and treating constipation [13].

Significance of study: Based on clinical observations, constipation is one of bowel problems that are neglected by health and nursing staff. Nurses have an important and unique role for helping critically ill patients to manage bowel problems. Incidence of constipation in critically ill patients according to Arpan and Emilia, 2017 was 67% among mechanically ventilated patients. In Egypt, it was shown that there were few researches about nursing interventions related to the effect of abdominal massage on constipation. However abdominal massage may be effective in improving bowel movements and reducing the use of medication through improvements intestinal motility [9-13]. So, the aim of the current study was to evaluate the effect of abdominal massage on the occurrence of constipation among critically ill ventilated patients at Tanta intensive care unit.

Subject and Method

Aim of the study:

Evaluate the effect of abdominal massage on the occurrence of constipation among critically ill ventilated patients at Intensive Care Unit.

Research Hypotheses

Critically ill patients who receive abdominal massage are expected to have no or minimal abdominal distension, reducing GRV and constipation severity compared to control group.

Setting:

Anesthesia Intensive Care Unit (ICU) affiliated to Tanta Emergency Hospital. Which are equipped by 4 rooms and each room had 5 beds.

Study subjects:

A purposive sample of 60 critically ill patients with mechanical ventilation admitted to the ICU, divided into 2 groups 30 patients in each. It was estimated by using Epi Info Software. Total target population (200 patients) per year, coefficient level = 95% expected frequency = 50%, accepted error= 5% and confidence.

Inclusion criteria:

Adult critically ill patients with mechanical ventilation aged 20 years or more, both sex, newly admission to the ICU, having NG tube (for checking GRV), stayed in ICU more than three days.

Exclusion criteria:

Patients on parenteral nutrition, bowel disorders, had chronic constipation, and hepatic encephalopathy was excluded from the study.

Tools:

Three tools were used for data collection.

Tool I: Demographic characteristics of the patient. It was developed by the researchers according to the recent literature [9-11]. It involved two parts**.**

Part (1): Demographic characteristics of critically ill patients: It involved Patient's age and gender.

Part (2): Critically Ill Patients' Health related Data: It included current diagnosis, past medical history, ventilator modes, gastric motility, time of starting enteral feeding and current sedation of medications.

Tool II: Gastrointestinal Outcomes Assessment Tool: It was developed by the researcher to evaluate the effect of abdominal massage on gastrointestinal complications [10,15-18]. It consisted of five parts:

Part (A): Assessment of Enteral Feeding. It included data about time of starting of enteral feeding.

Part (B): Assessment of Gastric Residual Volume: It was used to assess the amount of gastric residual.

Part (C): Assessment of Abdominal Circumference: This part used to determine presence of distension through measurement of the abdominal circumference. No distension means that the abdomen is soft, not tense and normal abdominal circumference. Distended abdomen means hard, tender, and increase in abdominal diameter. The circumference was measured one hour after massage in 3rd, 5th and 7th day of the study. Normal waist circumference for men was below 94cm (37in). For women, below 80 cm (31.5 in).

Part (D): Bowel movement Assessment sheet: This part was adopted from **Abd El Gafa, Elgaphar (2017) [17]**. It was used to assess bowel movement by listening to bowel sound with stethoscope and included the following: score (1): Normal bowel sound (hollow noises from (5-30) sound per minute). Score (2): Hypoactive bowel sound (reduction in the loudness, tone, or regularity of the sounds from (3-5) per minute). Score (3): Hyperactive bowel sound (Increased

bowel sounds can sometimes be heard even without a stethoscope greater than 34 sounds per minute).

Part (E): Frequency of Defecation Assessment [10]**:** It included assessment of defecation frequency in 3rd, 5th and 7th day.

Tool III: Constipation Assessment Scale (CAS): This tool was developed by Millan and Williams in 1989[18], to assess severity of constipation. It consisted of eight items such as abdominal distension, bloating, bowel movement, oozing stool, rectal fullness, anal pain during defecation; low stool volume; and failure to defecate for 24 hour.

The scoring system:

The total score range between 0 and 16 and was categorized as: (1–4) score indicated mild constipation; score (5–9) indicated moderate constipation and sore 10 or above indicated severe constipation.

1-Administrative and ethical consideration:

- An official permission to collect data was obtained from pertinent authorities after explaining the significance of study and its purpose.
- Nursing Ethical Committee" of Tanta Nursing Faculty was obtained with code number (147-12-2022).
- An agreement was obtained from Patient 'family member after explanation the aim of the study. They were assured that collected data would be confidential through using code number and used for the research purpose only.
- The researcher started with the control group then study group to prevent data contamination.

2- Tools Development:

- The first and second tool was developed by the researcher after extensive review of the relevant literature and tool III was developed by Millan and Williams in 1989 [18].

3- Validity:-

- The tools were reviewed by five experts from Faculty of Nursing and Medicine to assess tool for its clarity, relevance, completeness and content validity. Their opinions were elicited regarding tools format, consistency and scoring system.

4- Reliability of the tools:

- The researcher used a test – retest methods to test the internal consistency of the tools, by administration of the same tools to the same subjects under similar condition on two different occasions. The reliability of tool (I) was 0.86, tool (II) was 0.83 and tool (III) was 0.87.

5- Pilot study:

- It was conducted on 10% of the study sample (6) patients to test feasibility, clarity and applicability of the tools then necessary modifications were carried out. The data obtained from the pilot study were excluded from the study sample. Data collection started from November 2022 to August 2022.
- Three phases are used in this study: Assessment phase, implementation phase and evaluation phase.

Assessment phase: (for both study and control group)

- During this phase the researcher collected baseline data as socio-demographic and health related data using tool (I) for both study and control group.
- Both groups were assessed for abdominal distension, bowel sound and constipation using tool II and III.
- Both groups were assessed for using tool III (constipation scoring system).

- The researcher received a training course about correct technique of abdominal massage from one of the professional physiotherapists.

Implementation phase:

Control group: This group underwent only routine unit care which included given laxatives medication.

Study group: Subjects received the abdominal massage.

- The intervention period for the study group was 7 days. These patients received 20 min of abdominal massage intervention twice a day, and the interval between two massages was 2 h. The GRV was measured each day one hour after the second massage.
- During massage application, the subject is placed in a supine position with the head-of-bed elevated at 30°–45°. The abdominal massage was applied in a clockwise direction over the abdominal wall with movements like brushing the skin in the abdominal area with adequate pressure of hand, the skin of under pressure area was squeezed [10, 19].
- ***Gastric Residual Volume*:** Both groups were assessed for GRV before each feeding. First, the feeding tube position was confirmed by listening to 20 ml of injecting air with a stethoscope at the epigastric area. Then, aspirate the stomach content slowly until no further content. The aspirated content measured by measuring container and discarded according to the ICU guidelines.
- **Measurement of abdominal circumference**: This part was used by the researches to determine the presence of abdominal distension through measurement of the abdominal circumference. It measured through using tape measure directly placed on skin or over no more than 1 layer of light clothing. The correct place to measure waist is halfway between lowest rib and the top of hipbone. This is roughly in line with your belly button.

Evaluation phase:

- The researchers evaluated both control and intervention groups for presence of constipation, abdominal distension using tool II and III three times (at 3rd, 5th and 7th day of admission).
- Comparison was done between the two groups at the end of the study to evaluate the effect of abdominal massage on the occurrence of constipation among critically ill ventilated patients at Tanta intensive care unit

Statistical analysis:

- Data were collected, coded, and organized into tables and then, analyzed using (SPSS 25). P-value was statistically significant at a level <0.05%.

Results

Table (1) reveals that near one half (43.33%) of intervention group and 40.00% of control group had age between (50-≤ 60) years old. Only (6.67%) of both groups aged more than 60 years. Regarding gender, more than half (53.33% and 60%) of two groups were male respectively.

Table (2) represents that 36.67% of control group and near half (43.33%) of intervention group had traumatic brain injury, the same percentages of both groups (26.67%) had respiratory diseases. In relation to enteral feeding more than half (53.33%) of intervention group and near to two third (63.33%) of control group started enteral feed after 48hours of admission respectively. Also, more than tow third (70%) of intervention group and half (50%) of control group had diabetes mellitus as a

past history. Moreover, 83.33%, 73.33% of control group were sedated and on control mode respectively compared to 66.67% of intervention group.

Table (3) reveals distribution of the samples regarding constipation assessment scale. It can be seen that, more than half (60%) of control group had severe constipation at the 3rd day of admission according to constipation assessment scale and the percentage become (53.33%) at 7th day of the study

On the other hand, more than one third (40%) of intervention group had severe constipation at the 3rd day of admission. Interestingly, severe constipation didn't reported among any patients in intervention group at seventh day of study. Moreover, significant differences were observed between both groups through three time of assessment (3rd, 5th, and 7th day) where, P= 0.15, 0.007 and 0.000 respectively.

Table (4): shows distribution of the studied patients regarding character of stool throughout period of the study, it was noticed that two fifth (40%) of control group had stool like metal and hard to pass at 3rd day of study and the percentage reached to more than one half (53.33%) at the 7th day of assessment with statistical significant difference throughout period of the study as P=0.018.

In addition, more than one third (36.67%) of the intervention group had stool like metal and hard to pass at the first time of assessment, however 40.00% of them had smooth, soft stool and easy to pass at the 7th day of assessment. Also, Statistical differences were observed between control and study groups throughout three times of assessment where P=0.041, 0.000, 0.000 respectively.

Table (5) represents distribution of the studied patients regarding gastro-intestinal assessment. Regarding frequency of defecation, 60.00% of control group didn't have any defecation at the third day of admission and this percentage increased to 83.33% at 7th day of admission. Also, about one fifth (23.33%) of control group defecates one time per day at the 3rd day and the percentage increased to more than half (53.33%) at 7th day with a statistical significant deference with P=0.000. While, near one third (26.67%) of patients in intervention group had two times of defecation at 3rd day and the percentage reached to more than half (53.33%) at the 7th day of intervention.

Concerning abdominal circumference, 60% of intervention group had normal circumference compared with only (6.67%) of control group at 7th day of intervention with statistical significant difference among study group with P=0.042. Finally, majority (86.67%) of intervention group had normal bowel movement at 7th day of admission compared to only (20%) of control group.

Table (6): It was noted that 60.00% and 23.33% of control group had tympany and floating increased diameter of the abdomen at 3rd day of the study respectively and the percentage become (53.33%) and (46.67%) at the 7th day of study.

In relation to intervention group, two fifth (40%) of them had tympany abdomen at 3rd day of study and near to half (43.33%) of them didn't had distended abdomen at 7th day of intervention with P=0.000.

Also, the mean residual volume score was 467.70±13.68 at 7th day among control compared with 242.87±8.73 in study group with statistical significant difference at 5th

and 7th day of admission when P= 0.011 and 0.000 respectively.

Table (7) Represents relation between demographic characteristics of sample and constipation severity. 40.00% of control group and 33.33% of study group that had severe constipation was in age between of 50 to 60 years. Statistical differences were observed among both groups with P= 0.006, 0.000 respectively. Also two fifth (40%) of both groups that had severe constipation were male with statistical and significant difference where P=0.040 and 0.000 respectively.

Table (8): Shows relation between of health relevant data of the studied patients and constipation severity. It was seen that near two third (64.67%) and one third (33.33 %) of control and study group with diabetes mellitus had severe constipation with P=0.004 and, 0.012 respectively.

In relation to medication, 53.33% and 33.33% of control and study group that had severe constipation were sedated respectively. Finally, 40.00% and near one third (30.00%) of control and study group that reported sever constipation started enteral feeding after 48 hours respectively with P=0.017among intervention group.

Table (1): Distribution of the studied patients regarding their socio-demographic characteristics

Characteristics	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Intervention group (n=30)		
	N	%	N	%	
Age (in years)					
- (18-<30)	1	3.33	3	10.00	7.707 0.103
- (30-<40)	4	13.33	5	16.67	
- (40-<50)	11	36.67	7	23.33	
- (50-<60)	12	40.00	13	43.33	
- (≥60)	2	6.67	2	6.67	
Gender					
- Male	16	53.33	18	60.00	FE 0.795
- Female	14	46.67	12	40.00	

FE: Fisher' Exact test

Table (2): Distribution of critically ill patients regarding health relevant data.

Health relevant data	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Intervention group (n=30)		
	N	%	N	%	
Diagnosis					
- Traumatic brain injury	11	36.67	13	43.33	0.722 0.982
- Respiratory disease	8	26.67	8	26.67	
- Cardiac disease	5	16.67	3	10.00	
- Liver disease	4	13.33	4	13.33	
- Renal disease	2	6.67	2	6.67	
Enteral feeding:					
- Early enteral feeding	11	36.67	14	46.67	FE 0.601
- Delay enteral feeding	19	63.33	16	53.33	
Past medical history					
- Hypertension	15	50.00	9	30.00	FE 0.187
- Diabetes mellitus	15	50.00	21	70.00	
Past surgical history					
- None	22	73.33	24	80.00	1.254 0.263
- cardiac surgery	6	20.00	3	10.00	
- abdominal surgery	2	6.67	3	10.00	
Gastrointestinal motility					
- Normal	30	100.00	30	100.00	-
# Medication					
- Opioids	15	50.00	13	43.33	0.758 0.685
- Sedatives	25	83.33	20	66.67	
- Antiacids	30	100.00	2230	100.00	
Modes of mechanical ventilation					
- Control mode	22	73.33	20	66.67	FE 1.00
- SIMV mode	8	26.67	10	33.33	

More than one answers FE: Fisher' Exact test

Table (3): Distribution of patients regarding constipation assessment scale.

Constipation assessment scale	The studied patients (n=60)													
	Control group (n=30)						χ^2 P	Intervention group (n= 30)						χ^2 P
	3rd day		5th day		7th day			3rd day		5th day		7th day		
	N	%	N	%	N	%		N	%	N	%	N	%	
- Non	2	6.67	0	0.00	0	0.00		6	20.00	9	30.00	12	40.00	
- Mild	3	10.00	2	6.67	0	0.00	**14.088**	8	26.67	5	16.67	14	46.67	**44.319**
- Moderate	7	23.33	14	46.67	14	46.67	**0.029***	4	13.33	15	50.00	4	13.33	**0.000***
- Severe	18	60.00	14	46.67	16	53.33		12	40.00	1	3.33	0	0.00	
Gp1 Vs Gp2 χ^2 P	**10.460 0.015***		**12.238 0.007***		**34.800 0.000***									

* Significant at level P<0.05

Table 4: Distribution of the studied patients regarding character of stool throughout period of the study.

Character of stool	The studied patients (n=60)											
	Control group (n=30)						Intervention group (n=30)					
	3rd day		5th day		7th day		3rd day		5th day		7th day	
	N	%	N	%	N	%	N	%	N	%	N	%
- Smooth, soft and easy to pass	2	6.67	0	0.00	0	0.00	6	20.00	8	26.67	12	40.00
- Sausage with cracks on surface	3	10.00	5	16.67	0	0.00	3	10.00	9	30.00	14	46.67
- Sausage shaped but lumpy	4	13.33	2	6.67	4	13.33	4	13.33	13	43.33	4	13.33
- Separate hard lumps	9	30.00	12	40.00	10	33.33	6	20.00	0	0.00	0	0.00
- Like metal and hard to pass	12	40.00	11	36.67	16	53.33	11	36.67	0	0.00	0	0.00
χ^2 , P	**18.495 , 0.018***						**23.495 , 0.000***					
Gp1 Vs Gp2 χ^2 P	**9.00 0.041***		**30.781 0.000***		**48.00 0.000***							

Gp1: Control group **Gp2:** Intervention group

* Significant at level P<0.05

Table 5: Distribution of the studied patients regarding Gastro-intestinal assessment throughout period of the study.

Gastro-intestinal Assessment	The studied patients (n=60)											
	Control group (n=30)						Intervention group (n=30)					
	3rd day		5th day		7th day		3rd day		5th day		7th day	
	N	%	N	%	N	%	N	%	N	%	N	%
Frequency of defecation												
- None	18	60.00	14	46.67	25	83.33	12	40.00	1	3.33	0	0.00
- One time/day	7	23.33	16	53.33	5	16.67	10	33.33	17	56.67	14	46.67
- 2 times/day	5	16.67	0	0.00	0	0.00	8	26.67	12	40.00	16	53.33
χ^2 , P	**31.050 , 0.000***						7.707 , 0.103					

Abdominal circumference												
- Normal	7	23.33	5	16.67	2	6.67	7	23.33	16	53.33	18	60.00
- (94-102)/or (80-88)	18	60.00	13	43.33	13	43.33	19	63.33	11	36.67	11	36.67
- >102 (or > 88)	5	16.67	12	40.00	15	50.00	4	13.33	3	10.00	1	3.33
χ^2 , P	8.788 , 0.067						**9.896 , 0.042***					
Bowel movement												
- Normal	7	23.33	7	23.33	6	20.00	14	46.67	18	60.00	26	86.67
- Hypoactive	23	76.67	23	76.67	24	80.00	16	53.33	12	40.00	4	13.33
χ^2 , P	**11.250 , 0.02***						**10.870 , 0.013***					

* Significant at level P<0.05

Table 6: Distribution of the studied patients regarding adverse effects of constipation throughout period of the study.

	The studied patients (n=60)											
	Control group (n=30)						**Intervention group (n=30)**					
	3rd day		**5th day**		**7th day**		**3rd day**		**5th day**		**7th day**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Abdominal Distention												
- No distention	2	6.67	0	0.00	0	0.00	6	20.00	9	30.00	13	43.33
- Hard, tender	3	10.00	2	6.67	0	0.00	8	26.67	5	16.67	14	46.67
- Floating/Increase diameter	7	23.33	14	46.67	14	46.67	4	13.33	15	50.00	4	13.33
- Tympany	18	60.00	14	46.67	16	53.33	12	40.00	1	3.33	0	0.00
χ^2 , P	5.417 , 0.492						**28.225 , 0.000***					
Gastric residual												
Range	(200-680)		(200-570)		(200-560)		(199-555)		(189-600)		(199-366)	
Mean ± SD	368.13±14.61		445.23±13.27		467.70±13.68		299.87±12.28		266.00±11.53		242.87±8.73	
F , P	0.349 , 0.706						2.486 , 0.089					
Gp1 Vs Gp2 (t , P)	**3.996 , 0.050**		**6.897 , 0.011***		**13.908, 0.000***							

* Significant at level P<0.05

Table (7): Relation between Demographic Characteristics of the studied patients and constipation severity

Characteristics	**The studied patients (n=60) Constipation level**															
	Control group (n= 30)								**Intervention group (n=30)**							
	None (n=2)		**Mild (n=3)**		**Moderate (n=7)**		**Severe (n=18)**		**None (n=6)**		**Mild (n=8)**		**Moderate (n=4)**		**Severe (n=12)**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Age (in years)																
- (18-<30)	0	0.00	0	0.00	0	0.00	1	3.33	3	10.00	0	0.00	0	0.00	0	0.00
- (30-<40)	2	6.67	1	3.33	1	3.33	0	0.00	3	10.00	2	6.67	0	0.00	0	0.00
- (40-<50)	0	0.00	2	6.67	6	20.00	3	10.00	0	0.00	6	20.00	4	13.33	0	0.00
- (50-<60)	0	0.00	0	0.00	0	0.00	12	40.00	0	0.00	0	0.00	0	0.00	10	33.33
- (≥60)	0	0.00	0	0.00	0	0.00	2	6.67	0	0.00	0	0.00	0	0.00	2	6.67
χ^2 , P	**27.744 , 0.006***								**55.490 , 0.000***							

Gender																
- Male	0	0.00	2	6.67	2	6.67	12	40.00	2	6.67	3	10.00	1	3.33	12	40.00
- Female	2	6.67	1	3.33	5	16.67	6	20.00	4	13.33	5	16.67	3	10.00	0	0.00
χ^2 , P	**8.332 , 0.040***								**19.815 , 0.000***							

* Significant at level P<0.05

Table (8): Relation between of health relevant data of the studied patients and the constipation severity.

Health relevant data	**The studied patients (n=60) Constipation level**															
	Control group (n= 30)								**Intervention group (n=30)**							
	None (n=2)		**Mild (n=3)**		**Moderate (n=7)**		**Severe (n=18)**		**None (n=6)**		**Mild (n=8)**		**Moderate (n=4)**		**Severe (n=12)**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Past medical history	2	6.67	2	6.67	3	10.00	4	13.33	2	6.67	2	6.67	1	3.33	2	6.67
- Hypertension	0	0.00	1	3.33	4	13.33	14	46.67	4	13.33	6	20.00	3	10.00	10	33.33
- Diabetes mellitus																
χ^2 , P	**13.476 , 0.004***								**10.952 , 0.012***							
Medication																
- Sedated	0	0.00	2	6.67	5	16.67	16	53.33	1	3.33	5	16.67	3	10.00	10	33.33
- Not sedated	2	6.67	1	3.33	2	6.67	2	6.67	5	16.67	3	10.00	1	3.33	2	6.67
χ^2 , P	**15.432 , 0.003***								**11.652 , 0.011***							
Enteral feeding																
- Early	2	6.67	1	3.33	2	6.67	6	20.00	5	16.67	3	10.00	0	0.00	3	10.00
- Delay	0	0.00	2	6.67	5	16.67	12	40.00	1	3.33	5	16.67	4	13.33	9	30.00
χ^2 , P	**0.523 , 0.914**								**10.134 , 0.017***							

* Significant at level P<0.05

Discussion

Constipation remains an important and poorly recognized problem in patients admitted to critical care unit and often neglected which can leads to a host of problems for critically ill patients[9]. The current study hypothesized that critically ill patients who will receive abdominal massage will have significant lower rate of constipation as compared to those in the control group who will not. There were decreased rate of constipation among the intervention group and this indicate the effectiveness of the abdominal massage.

The current result revealed that the two groups had nearly similar age between 50 to less than 60 years, as constipation is known to increase with ageing and more than half of both groups were male reflecting a higher prevalence of the problem among male patients. These results were quite consistent with **Mohamed et al, (2021) [14]**. Who found that nearly half of studied groups were in age between 40 to 60 years old and were male. On the contrary, **Etinkaya et al (2020) [20]** reported that most of studied patient in their study were female.

Regarding their health relevant data, it was seen that the most common diagnosis among studied groups was traumatic brain injury and respiratory disease. In addition, most of studied groups were on control mode of mechanical ventilation and sedated. These medical problems and sedation administration can decrease gut motility and positive pressure induced by

mechanical ventilation lower cardiac output, intestinal blood flow which contributes to increasing risk of constipation in ICU [21].

These findings were supported by **Ali et al. (2022)**[22] who found that mechanically ventilated patients who received continuous sedation and analgesia leads to reduced gut motility and increased incidence of constipation in these patients.

Concerning enteral feeding, majority of studied groups received enteral feed within 48hours of admission. A possible explanation is that the majority of them was nothing per nothing and connected to mechanical ventilation. Early initiation of enteral feeding is considered very important science it preserves gut health and then modulates the stress response to critical illness. However, it may increase risk of constipation. This result was agreed with **Song et al (2018)**[23] who revealed that given enteral feeding within 48 hours after admission is efficient and safe for critically ill patients. Moreover **Araujo et al (2020)** [24] reported that constipation is more frequent as diarrhea in patients fed by enteral nutrition.

In relation to constipation assessment scale, the current finding represented that more than half of control group had severe constipation at the 3rd and 7th day of the study. This could be related to nursing staff give little attention to problems regarding patient's elimination in control group. On the other hand, only one third of intervention group had severe constipation at the 3rd day and there was no severe constipation reported among patients in intervention group at seventh day of study. This may be due to the effect of abdominal massage that improves the intestinal movements and enhancing the gastrointestinal function. This result was consistent with **Abd-Elraheem et al (2020)** [25] who found that nearly three fourth of the control group had constipation versus less than one quarter of the study group that had constipation.

Also, **Ugras et al (2020)**[26] concluded that, abdominal massage improved bowel evacuation and decreased incidence of constipation among intervention groups. In contrast a study conducted by **McClurg et al (2016)**[27] revealed that patients in their study did not have any improvements in their bowel movements from the abdominal massage.

Regarding character of stool**,** it was found that two fifth of control group had stool like metal and hard to pass at the 3dr day of assessment and the percentage increased to more than one half at the seventh day of assessment. This can be explained as majority of the patients were immobilized and had enteral nutrition that may be lack of fibers, which cause the stool stays in the colon for a longer time and becomes hard to pass. Similarly, **Alimoradzadeh et al (2017)**[28] reported that decreased level of immobility lead to hard stool and comes out more difficult.

On the other hand, the entire patient in the intervention group didn't have stool like metal and hard to pass at 7th day of assessment, nearly more than one third of them had smooth, soft and easy to pass. This may be attributed to the effect of abdominal massage which may increase the bowel movements and improve evacuation process. This result was consistent with **Çevik et al. (2018)**[29] who showed that abdominal massage increases the number of bowel movements, and stool consistency, and reduces the mean scores of straining and inability of the bowel to empty completely .

As for frequency of defecation, more than half of control group didn't have any defecation at the 3rd and 7th day of

admission. However, more than half of patients in intervention group defecated two times per day at 7rd day of intervention. This may be due to abdominal massage improve defecation through stimulation of parasympathetic nervous system which reducing abdominal muscle tension and relaxing digestive sphincter muscles to promote bowel movements.

This finding was in line with **Tang et al (2020)**[30] who reported that studied patients who received abdominal massage defecated more often compared to patients in the control group. Similarly **Mohamed et al (2021)** [31] stated that the frequency of defecation significantly increased in study group who received abdominal massage.

As regard abdominal circumference and bowel movement, the current result showed that near two third of intervention group had normal circumference score and normal bowel movement with statistical significant among study group, while nearly half of control group had large abdominal circumference score and majority of them had hypoactive bowel movement at 7th day of intervention. It seems that abdominal massage increases peristalsis, changes abdominal pressure, and had a mechanical and reflexive effect which leads to improved bowel movement in intervention groups [10].

Similarly, a study conducted by Onur **et al (2020)**[32] presented that improved bowel movements and reduced waist circumference among studied patients who managed by abdominal massage. While large abdominal circumference score was observed among control group on the first day and sixth day of study. Also, **Diab et al (2021)**[33] reported a significant improvement among study group only in the 7 day of study after applying of abdominal massage.

Concerning adverse effects of constipation, the present findings revealed that more than one half of control group had tympanic and floating abdominal distention at 3rd day and the last day of the study. On the other hand, less than half of intervention group had tympanic abdominal distention at 3rd day of study and none of them had tympanic abdominal distention at 7th day of intervention.

This may be attributed to that massage of the abdomen lead to activation of intestine and stomach that cause easy digestion of food, hasting peristalsis, stimulating the nutrients absorption, and facilitating the passage of nutritional components in the intestine, resulting in decreasing abdominal distension [34]. This result was similar with **Seiiedi (2020)**[35],**Wang, (2019)**[36] and **Uysal (2017)**[37]who showed that massage of abdomen helps to decrease abdominal circumference, distension, GR, and vomiting.

Gastric residual volume is the amount of liquid drained from a stomach following administration of enteral feed. Monitoring of GRV is very important and remarkable standard for nutrition status improvement[38]. In this regard the present result showed that GRV was high in control group at 5th and 7th day of study and become within normal range among study group at 5th and 7th day after intervention with abdominal massage with statistical significant difference between both groups. This might be attributed that abdominal massage stimulating the parasympathetic division of the autonomic nervous system and relaxing the sphincter in the gut and improving peristalsis that results in increasing the gastric emptying and decreasing the residual volume [34].

This results were supported by **El-Feky and Ali (2020)** [39] and **Momenfar et al., (2018)** [40] found high GRV in the control

group who didn't receive abdominal massage. However these findings were inconsistent with **Dehghan et al (2018)** [10] who showed that GRV didn't change significantly among control and experimental groups after abdominal massage.

Regarding effect of patients' demographic data on constipation severity**,** our results represented that the most common age and gender that had severe constipation were male patients with age between (50-60) years old. This may be attributed that aging is associated with increased comorbidities with the health status, and physical inactivity which affect prevalence of constipation.

This result was matched to a study done by **Mansouri et al.(2018)**[41] who reported that elderly age of 60 years and older had severe constipation. Also, **Fargetal (2020)** [42] revealed that most of male patients in his study had constipation. On the other hand, this study was contradicted with **Black and Ford,(2018)**[43] that concluded that constipation was common among female than male patients.

As regard the Effect of health relevant data of the studied patients on the constipation severity. It was seen that past history of diabetes mellitus were the most common disorders among both groups that had severe constipation. This may be attributed that diabetes for long duration can lead to neuropathy and damage to the nerves controlling the digestive tract which lead to constipation, diarrhea, and incontinence[44]. This result was agreed with **Atasever et al (2018)** [45] who revealed that more than of their sample had past history of diabetes mellitus and cardiac diseases. Also **Piper and Saad (2018)**[46] concluded that constipation was one of the most commonly reported GI symptoms by diabetics patients.

Medications such as sedatives, analgesics are commonly prescribed to patients who are critically ill and often decreasing gastrointestinal motility and absorptive ability of the small intestine and increasing risk for constipation. In this regard the current study noted that sedation and delayed enteral feeding after 48 hours were the most common disorders among both groups that had severe constipation. Similarly **Guerra et al (2016)** [2] showed that the incidence of constipation was increased in patients receiving sedative and vasopressor medication.

Also our results revealed that one third of patients who received delayed enteral feeding after 48 hours had severe constipation. In the same line, **Chawla et al. (2021**)[47] concluded that early enteral nutrition is useful than delayed enteral feeding in managing patients who are critically ill through the maintenance of gut integrity and decreasing gastrointestinal disorders. Also **El-Saman and Ahmed (2017)** [48] reported that most of patients receiving delayed enteral feeding and low fiber diet was constipated

Conclusion

It can be concluded that massage that applied on abdomen is effective in decreasing constipation and its adverse effect such as abdominal distension, abdominal circumference pressure, gastric residual volume (GRV) and increasing defecation frequency in intervention group.

The study limitations

Inability to generalize the results due to conveniently selection of sample from one clinical setting.

Recommendations

- Applying abdominal massage as a routinely care for all patients in ICU by critical care nurses

- Providing training program about abdomen massage to enhance gastrointestinal motility for patients with critical illness,
- Replicating the study with larger probability sample to ensure generalizability of findings.
- Conducting further study, evaluate the effect of abdomen massage on physiological parameters of critically ill patients.

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