Effect of Early Abdominal Mobilization Exercise on Gastrointestinal Outcomes among Mechanical Ventilation Patients

Fayza Ahmed Abdou Mohammed Komsan [1], Marwa Mohammad Abd elbaky [2], Warda Ramadan Abou Zied [3], Naglaa Ahmed Ahmed [4]

[1]Assistant professor, Critical Care and Emergency Nursing Department, Faculty of Nursing, Assuit University, Assuit, Egypt
[2] Assistant Professor, Critical Care Nursing and Emergency, Faculty of Nursing. Minia University, Egypt
[3]Assistant professor, Critical Care and Emergency Nursing Department, Faculty of Nursing South Valley University, Qena, Egypt
[4]Assistant professor, Critical Care and Emergency Nursing Department, Faculty of Nursing, Assuit University, Assuit, Egypt

Corresponding author: Warda Ramadan AbouZied
Email: dr.warda.mohamed@nurs.svu.edu.eg , Wardarr1199@gail.com

Abstract

Background: Critically ill intubated and mechanically ventilated patients are usually kept sedated and their mobility is limited, with only passive movement provided through routine nursing care and regular repositioning. Early mobilization of critically ill patients seeks to improve management outcomes and enhance the quality of life for the patients. **Aim of the study**: to assess the effect of early abdominal mobilization exercise on gastrointestinal outcomes among mechanical ventilation patients. **Design:** a quasi-experimental research design**. Setting:** The study was conducted at the Intensive Care Unit in Qena Main University Hospital. **Subjects:** a purposive sample of approximately thirty critically ill patients attached with invasive mechanical ventilation for more than 24 hours. **Tools:** Gastrointestinal outcomes assessment sheet used to assess gastrointestinal outcomes after the abdominal mobilization exercise program. **Results**: 86.7% of the participants experienced reduced distention after abdominal exercises. 83.3% of them had a softer abdomen after the intervention. Concerning abdominal characteristics, 83.3% of the study sample had a soft abdomen after the intervention, and only 16.7% had a tense abdomen after the intervention. Regarding of gastric residual volume, 100.0% of the study sample had less than 50 ml after the early abdominal exercise intervention. **Conclusion**: early abdominal mobilization showed significant improvement in gastrointestinal functions and reduced the signs of enteral feeding intolerance as distension, tense abdomen, vomiting, constipation, and gastric residual volume which means improvement in the digestion process and gastric emptying time. **Recommendations:** early abdominal exercise and massage should be included in the routine patient's care at the ICU and further researches are needed.

Keywords: Abdominal Mobilization; Exercise; Gastrointestinal; Mechanical Ventilation; Patient`s outcomes.

Introduction

The intensive care unite provides complex care for critically ill patients due to the nature of critical illness and the therapies administered at intensive care unite. Critically ill patients who are intubated and mechanically ventilated are generally managed with sedation, and their mobility is restricted receiving only passive movement from routine standard nursing practice and regular repositioning **(Phelan, Lin, Mitchell & Chaboyer, (2018**).

Enteral nutrition (EN) is crucial for meeting the energy and protein needs of critically ill patients, particularly those who have an endotracheal tube and are unable to eat normally. However, EN can lead to various symptoms of feeding intolerance, such as reflux, abdominal distention, diarrhea, large gastric residuals, aspiration of gastric contents into the airway, and pressure injuries **(Deng et al., 2022).** To address these manifestations of enteral feeding intolerance (FI), there have been multiple pharmacological interventions, such as metoclopramide and erythromycin, which promote the movements of the digestive system **(Dehghan, Mehdipoor, & Ahmadinejad 2018).** An early progressive mobilization program may improve the patient's tolerance to EN by enhancing the movements of the digestive system, modifying abdomen pressure, and using a bedside cycle ergometer in addition to physical movement, depending on the patient's health. In critically ill patients who are enterally fed, abdominal massage may enhance gastrointestinal health by lowering gastric residual volumes (GRVs) **(Devlin, et al., 2018).** Bedside cycle ergometer training has been regarded as a relatively recent treatment that trains patients who have been exposed to prolonged immobilization **(Momenfar, et al., 2018 & Yu., et al., 2022).**

Early mobilization (EM) in the ICU is defined as initiating mobilization as soon as hemodynamic and respiratory stabilization is achieved, generally within the first 24 to 48 hours of ICU admission **(Najjar, Dima, & Goldfarb, 2022).** Many studies have shown that early mobilization includes abdominal massage, which is a passive movement performed by medical staff, as well as active movement dependent on a patient's condition, such as sitting at the bedside, standing beside the bed, transferring to a chair, and assisted or independent walking **(Simpson et al., 2022).**

In a study conducted by **Umei et al. in 2016,** it was reported that immobilized ICU patients who received doses of corticosteroids and/or neuromuscular blockers tend to experience persistent fatigue, weakness, and poor functional status one year after discharge. Traditionally, it was rare to mobilize ventilated ICU patients, but there is now mounting evidence on the benefits of early mobilization such as increased ventilator free days, decreased delirium; reduced anti-inflammatory effects accompanied by acquired muscle weakness, and enhanced long-term functional outcomes **(Dikkema et al., 2023).**

According to Kim, Kim, Yang, and Choi (2019), early abdominal mobilization (EM) is an evidence-based strategy for critically ill patients that aim to improve

their quality of life following intensive care. Nonetheless, early mobility is still not widely used in intensive care units. According to certain research, between 24 and 45 percent of patients in intensive care units in higher-income nations received out-of-bed activity. In the intensive care unit, just 29% of patients in a middle-income nation received out-of-bed activity **(Taito et al., 2018).**

According to available data, between 38% and 67% of critically ill patients had physically dysfunctions and impairments, and only 37% of patients reported full recovery from their symptoms. Of those who survived, 62% continued to have symptoms up to ten years after being discharged from the intensive care unit. As a result, patients and their families have a lower quality of life and a greater financial load on the healthcare system **(Deng, et al., 2022).**

In developing countries, the use of early abdominal mobilization is still limited due to factors such as the medical instability of critically ill patients, the presence of delirium, sedation, safety concerns, inadequate equipment, and limited staffing. Therefore, this study was conducted to evaluate the effect of early abdominal mobilization exercise on gastrointestinal outcomes among mechanical ventilation patients

Significance of the study:

Critical illness is the reason that patients in intensive care units (ICUs) are often being treated for serious gastrointestinal (GI) dysfunctions or diseases. Different GI problems, including vomiting, high gastric residual volumes, diarrhea, bowel dilatation, and absent bowel sounds, may occur in more than half of the ICU patients receiving mechanical ventilation (MV). Furthermore, feeding intolerance caused by delayed gastric emptying occurs in approximately 50% of critically ill patients. Several studies have confirmed that GI symptoms frequently occur in ICU patients, with up to 62% of patients exhibiting at least one GI symptom for at least 1 day. Intestinal dysfunction is a predominant determining factor that predicts prognosis in critically ill patients, which may lead to impaired outcomes, such as increased length of hospital stay, delayed recovery, increased morbidity or mortality, and could have a negative effect on the patient's quality of life after hospital discharge **(Yu, Cai & Jiang, 2022).**

Aim of the study:

Evaluate the effect of early abdominal mobilization exercise on gastrointestinal outcomes among mechanical ventilation patients.

Research hypothesis:

Critically ill patients participating in an early abdominal mobilization exercise program experienced improvements in their gastrointestinal tract functions, including reduced gastric residual volume and decreased gastric intolerance manifestations.

Operational definition:

Early abdominal mobilization exercise: type of strength exercise that affect the abdominal; muscle that includes abdominal massage, Bedside cycle ergometer and active movement

Patients and methods:

Research design:

Design: a quasi-experimental research (pre-post) design

Setting: The current study was conducted in the Qena Main University Hospital ICU. The period of data collection starts

from the first of February 2023 to the first of June 2023.

Subjects: a purposive sample of approximately thirty critically ill patients attached with invasive mechanical ventilation who meet the following inclusion criteria: age between 18 and 60 years, ICU patients with Mechanical ventilation duration greater than 48 hours, early enteral nutrition support, and patients with a stable respiratory and circulatory system.

Patients who met any of the following criteria were excluded from the study: a Glasgow Coma Scale score of less than 8 (indicating inability to communicate with researchers and nurses during the intervention), an

Intracranial pressure (ICP) equal to 29 mm Hg, Acute coronary syndrome, unstable spinal injury, unstable fracture, presence of gastrointestinal disease, and use of gastric motility drugs.

Tool of the study:

Measurement and data collection

Gastrointestinal outcomes Assessment tool after abdominal mobilization exercise tool:

This tool was developed by the researchers after reviewing the related literature **(Goelen, et al., 2022)** and was used to assess gastrointestinal outcomes after an abdominal mobilization exercise program. It consisted of three parts:

Part one: critically ill patients' **s**ocio-demographic data, such as age, sex, weight, and body mass index (BMI). Patient clinical data such as the reason for ICU admission, medical diagnosis, past medical history of hypertension or diabetes mellitus, in addition to length of ICU stay.

Part two: physiological parameters were **used** to assess critically ill patients' heart rate (bradycardia, normal, tachycardia), respiratory rate (bradypnea, normal, tachypnea), blood pressure (hypotension, normal, hypertension), and oxygen saturation (normal, hypoxia), methods of patient intubation, the amount of Positive End Expiratory Pressure (PEEP/ CPAP) in cmH2O**,** and duration of mechanical ventilation (MV).

Part three: Gastrointestinal outcomes assessment tool: was used to assess the motility of the gastrointestinal system as the presence of abdominal distention, abdominal circumference, and the presence of vomiting. The bowel movement was also assessed as the presence of constipation, diarrhea, and finally the bowel sound (normal, hypoactive, or hyperactive in one minute using the stethoscope), and the amount of gastric residual volume (in Milliliter).

The scoring system:

Body Mass Index (BMI)

18.5 to 24.9 = Normal. (Score = 1)
25 to 29.9 = Over weight (Score = 2)
30 to 34.9 = Obesity class 1. (Score = 3)
35 to 39.9 = Obesity class 2. (Score = 4)
More than 40 = extreme obesity.
(Score = 5)

Methods:

Permission to conduct the study was obtained from the hospital director, the head of the ICUs, and the head nurse after an explanation of the aim of the study.

- Content **validity** of the study was done by jury of (7) experts who are specialists in the field of critical care nursing from Assiut University, and necessary modifications will be done.

- **Reliability** of the study tool: The reliability of the test was be calculated by using correlation coefficient and it was be estimated by Alpha Cronbach′s test for this study.

Ethical consideration: -

- In this study, the researcher was following the ethical principles in the Declaration of Helsinki and its updates.
- Research proposal was approved from the Ethical Committee in the Faculty of Nursing, monthly meeting (code number 15) at 2-1-2023, the ethical committee of the Faculty of Nursing at South Valley University was granted official ethical permission to conduct the study (SVU-NUR-CRE-3-2-2-2023).
- There is no risk for study subject during application of the research.
- A written informed consent was obtained from patients participating in this study, after explaining the nature and purpose of the study.
- Confidentiality and anonymity will be assured.
- Study subjects were having the right to participate, refuse and or withdraw from the study without any rational at any time.
- Study subject's privacy was considered during collection of data.

A pilot study was conducted on 10% (three) intubated mechanically ventilated patients who met the inclusion criteria to test the tool for clarity, objectivity, and feasibility. Then, necessary modifications were made and the sample was excluded from the study.

Data collection: The current study was carried out after 48 hours of admission of critically ill patients intubated with invasive mechanical ventilation and early enteral nutrition when their condition became stable. The current study included **four phases**: assessment, preparation, implementation, and evaluation.

Assessment phase: All patients of the study were examined after stabilization of their condition at the ICU using the tool of the study before application of early abdominal mobilization exercise to provide baseline data of patient gastric motility, residual volume, and presence of abdominal distention, vomiting, diarrhea, and constipation.

Preparation phase: the researcher completed a two weeks (5 days per week) training program with assistance of specialized physiotherapist for abdominal massage and using the bedside cycle machine.

Implementation phase: According to ICU protocol, the critically ill patient received intermittent enteral feeding, which takes 200 ml every 2 hours. The researcher aspirated the gastric residual volume before abdominal mobilization exercise and after 2 hours of abdominal mobilization exercise.

Application of abdominal massage:

The researcher begins the abdominal massage before the patient's feeding time to prevent aspiration. The patient is positioned in a supine position with legs straightened, and the researcher stands on the right side.

The massage is initiated in a left-to-right direction over the intestines on the abdominal wall. The main steps of the massage include pressing, tapping, kneading, and shaking the abdomen twice a day for 20 minutes, for seven days.

Application physical therapy (bed-side bicycle) exercise:

The researcher assessed the patient's conscious level, vital signs, and ability to exercise. The exercise was started with the patient in the high Fowler's position, with the head of the bed elevated 35 to 45 degrees. The researcher and physical therapist assisted the patient in starting the exercise on a bedside cycle twice a day for 10-15 minutes, for seven days.

Evaluation phase:

Critically ill patients underwent abdominal mobilization exercises and massage for seven days. Gastrointestinal outcomes were assessed using the second and third part of the study tool after 2 hours of application.

Gastric residual volume: the patient was placed in the semi-fowler position and a 50-ml syringe was used to aspirate the stomach contents from the nasogastric tube prior to feeding.

Abdominal distension was assessed by measuring the circumference of the abdomen with a 150-cm flexible measure; the beginning point for the measurement was the patient's umbilicus and percussion technique.

Abdominal palpation was applied with sufficient pressure from one to two cm of depression for light palpation and from 2.5 to 7.5 cm of depression for deep palpation. The abdominal wall was inspected and palpated for any bulging or tenderness.

Constipation and diarrhea were assessed by observing the frequency and consistency of the patient's stool, abdominal auscultation for detection of bowel sounds and movements. Vomiting occurrence was assessed by asking the patient and/or reading the vomit document of the patient.

Data analysis

The statistical package software SPSS version 23 was used for data analysis in the study. Mean, standard deviation, and descriptive statistics, including frequency and distribution, was used to describe different characteristics of the quantitative data. The mean percent score was also calculated.

Results

The current study results are presented in the following tables:

Table 1: represents the socio-demographic data for studied critically ill patients. Concerning age, 50 % of samples were age between 40-50 years old. Concerning gender 63.3% of the sample was male. Regarding weight, the mean and SD are 94.37±22.6. As regards height, the mean and SD are 169.83±7.87. About BMI, 10% of the study sample had normal weight (18.5-24.9), while 26.7% had overweight, obesity class 1, and obesity class 2, respectively. In addition, 10.0% of the study sample had extreme obesity. Regarding Medical diagnosis, 23.3% of them had acute respiratory failure and acute stroke, respectively. While 3.3% had pulmonary edema, Concerning Length of ICU stay, 50.0% of the study sample stayed in the ICU between 8 and 15 days, 46.7% stayed in the ICU between 1 and 7 days, and only 3.3% stayed more than 15 days.

Table 2: Shows the distribution of clinical data for studied critically ill patients. It reveals that 80.0% of the sample had a normal heart rate, while 20.0% had tachycardia. Regarding blood pressure, 50% of the study sample had normal blood pressure, and the remaining 50% had hypertension. Concerning

respiratory rate, 70.0% of the study sample had a normal respiratory rate, while 30.0% had tachypnea. Also, the same table shows that 70% had abnormal mean arterial pressure. Also, 73.3% of the sample had normal oxygen saturation. Regarding methods of intubation, 86.7% of the study samples used ETT, and only 13.3% used a tracheostomy tube.

Table 3: Describes the distribution of abdomen characteristics before and after intervention for the studied critically ill patients**,** regarding abdominal distention, 70.0% of the sample had distention before the intervention, and only 13.3% of the sample had distention after the intervention. In terms of abdominal characteristics, 83.3% of the study sample had a soft abdomen after the intervention, and only 16.7% had a tense abdomen after the intervention. While none of the patients had a hard abdomen after the intervention.

In terms of constipation, 20.0% of the study sample had no constipation before the intervention, while 76.7% had no constipation after the intervention. Regarding diarrhea, 80.0% of the sample had no diarrhea before the intervention, and 100.0% had no diarrhea after the intervention. For Vomiting, 46.7% had vomiting before intervention, while only 3.3% had vomiting after intervention, and 96.7% had no vomiting after intervention. Regarding Bowel movement, 16.7% had a hyperactive bowel movement before the intervention, and the same percentage had it after the intervention. 83.3% had hypoactive bowel movements before the intervention, and 6.7% had hypoactive bowel movements after the intervention. However, 76.7% had normal bowel movements after the intervention. In terms of the amount of gastric residual, 100.0% of patients had less than 50 ml of gastric residual volume after the intervention. Before the intervention, 6.7% had more than 50 ml, 36.7% had less than 100 ml, and 56.7% had more than 100 ml of gastric residual volume. Also, there were statistically significant differences among the study sample and the mentioned items. With p= 0.000**

Table 4: represents distribution of the studied critically ill patient related amount of gastric residual during 7 days. On the first day, the average amount of gastric residual was 134.33 ± 40.57 mL, ranging from 80 to 200 ml. By the 6th and 7th days, the average amounts were 43.33 ± 19.18 mL (20 to 90 mL range) and 21.67 ± 13.35 mL (0 to 50 mL range) respectively. There were statistically significant differences among the study groups with a P 0.001**.

Table 5: shows the correlation between the amount of gastric residual and demographic and medical data for the studied critically ill patients. There were statistically significant differences between the first and seventh days only regarding BMI, with r values of -0.029 and 0.385*, respectively.

Table 6: represents the correlation between the amounts of gastric residual with complications before and after intervention for the studied critically ill patients. There were statistically significant correlation between gastric residual volume and abdominal distention before and after intervention on the 1st, 2nd, 3rd, 4th, and 5th days. Additionally, there were statistically significant correlation related abdominal circumferences before and after intervention on the 1st, 2nd, 3rd,

4th, 5th, 6th, and 7th days. However, there were no statistically significant differences before and after intervention across all 7 days related to constipation, diarrhea, vomiting, or bowel movements.

Table 7: represents the duration of MV for the studied critically ill patients, 46.7% of the study sample stayed in mechanical ventilation from 1 to 7 days, 50.0% from 8 to 15 days, and only 3.3% stayed more than 15 days.

Table (1): Distribution of Socio-demographic Data for the critically ill patients (n = 30)

Item	No	%
Age		
18 to 28 Years	4	13.3
29 to 39 Years	11	36.7
40 to 50 Years	15	50.0
Sex		
Male	11	36.7
Female	19	63.3
	Mean ± S.D	**Range**
Weight.	94.37±22.6	60-140
Height.	169.83±7.87	148-179
Body Mass Index (BMI)		
18.5 to 24.9 Normal	3	10.0
25 to 29.9 Overweight	8	26.7
30 to 34.9 Obesity class 1	8	26.7
35 to 39.9 Obesity class 2	8	26.7
More than 40 extreme obesity	3	10.0
Reason for ICU Admission		
Medical cases.	26	86.7
Surgical cases.	4	13.3
Medical Diagnosis		
Acute respiratory failure	7	23.3
Chronic Obstructive Pulmonary Disease **(COPD)**	3	10.0
Acute Respiratory Disease Syndrome **(ARDS)**	3	10.0
Bronchial Asthma	2	6.7
Acute stroke	7	23.3
Pulmonary edema	1	3.3
Thyroid crisis	5	16.7
Diabetic Ketoacidosis **(DKA)**	2	6.7
Past Medical History		
Diabetes Mellitus **(DM)**	6	20.0
Hypertension	10	33.3
No history	7	23.3
DM & Hypertension	7	23.3
Length of ICU Stay		
1to7 days	14	46.7
8 to15 days	15	50.0
More than15 days	1	3.3

Table (2): Distribution of Clinical Data for studied critically ill patients (n = 30)

	No	%
Heart Rate		
Normal	24	80.0
Tachycardia	6	20.0
Blood Pressure		
Normal	15	50.0
Hypertension	15	50.0
Respiratory Rate		
Normal	21	70.0
Tachypnea	9	30.0
Mean Arterial Pressure		
Normal	9	30.0
Abnormal	21	70.0
Oxygen Saturation		
Normal	22	73.3
Hypoxia	8	26.7
Methods of Intubation		
Endotracheal tube **(ETT)**	26	86.7
Tracheostomy tube	4	13.3
Positive End Expiratory Pressure (PEEP/ CPAP)		
5 to 10 cmH2O	27	90.0
More than 10 cmH2O	3	10.0

Table (3): Distribution of abdomen characteristics before and after intervention for the studied critically ill patients (n = 30)

	Before		After		X2	P. value
	No	%	No	%		
Abdominal Distention						
Presence	21	70.0	4	13.3	19.82	0.000**
Absent	9	30.0	26	86.7		
Abdominal Characteristics						
Abdomen soft	0	0.0	25	83.3	45.26	0.000**
Tense	14	46.7	5	16.7		
Hard	16	53.3	0	0.0		
Constipation						
Presence	24	80.0	7	23.3	19.29	0.000**
Absent	6	20.0	23	76.7		
Diarrhea						
Presence	6	20.0	0	0.0	6.67	0.024*
Absent	24	80.0	30	100.0		
Vomiting						
Presence	14	46.7	1	3.3	15.02	0.000**
Absent	16	53.3	29	96.7		
Bowel Sound						
Hypoactive (less than 5\ minutes)	25	83.3	2	6.7	42.59	0.000**
Normal (5-30\ minute)	0	0.0	23	76.7		
Hyperactive (more than 30\ minutes)	5	16.7	5	16.7		
Amount of Gastric Residual Volume in Milliliter (ml)						
Less than 50 ml	0	0.0	30	100.0	60.00	0.000**
More than 50 ml	2	6.7	0	0.0		
Less than 100 ml	11	36.7	0	0.0		
More than 100 ml	17	56.7	0	0.0		

- **Chi square test for qualitative data between the two groups**
- **Fisher's exact test was used to assess the similarity between the two groups**

***Significant level at P value < 0.05, **Significant level at P value < 0.01.**

Table (4): represents distribution of the studied critically ill patient related amount of gastric residual during 7 days

Amount of gastric residual in Milliliter (ml)	Mean ± S.D	Range	RM-ANOVA Between Groups
1st day	134.33 ± 40.57	80-200 ml	F=201.806 P<0.001** Partial η2=0.874
2nd day	129.33 ± 35.91	80-200 ml	
3rd day	107.33 ± 33.21	50-150 ml	
4th day	87.33 ± 24.77	40-130 ml	
5th day	68 ± 24.27	30-100 ml	
6th day	43.33 ± 19.18	20-90 ml	
7th day	21.67 ± 13.35	0-50 ml	

- **Repeated measures of analysis of variance (RM-ANOVA) test**
- ***Significant level at P value < 0.05, **Significant level at P value < 0.01**

Table (5): Correlation coefficient between the amount of gastric residual and demographic and medical data for the studied critically ill patients (n = 30)

		Gastric Residual Volume						
		Day1	Day2	Day3	Day4	Day5	Day6	Day7
Age	r	0.133	0.077	0.100	0.076	0.162	0.309	0.330
	P	0.484	0.687	0.598	0.689	0.392	0.097	0.075
Sex	r	-0.204	-0.182	-0.192	-0.116	-0.139	-0.061	0.114
	P	0.279	0.337	0.309	0.543	0.463	0.748	0.548
BMI	r	-0.029	0.008	-0.115	-0.047	0.109	0.199	.385*
	P	0.879	0.966	0.545	0.803	0.567	0.292	0.036
Reason for ICU admission	r	0.007	-0.020	0.092	0.043	0.074	0.035	0.100
	P	0.973	0.915	0.628	0.822	0.698	0.856	0.600
Medical diagnosis	r	0.340	0.233	0.303	0.202	0.210	0.081	0.073
	P	0.066	0.216	0.103	0.284	0.266	0.670	0.702
Past medical history	r	-0.225	-0.250	-0.222	-0.194	-0.079	-0.217	-0.108
	P	0.231	0.182	0.238	0.303	0.677	0.248	0.569
Length of ICU stay	r	0.309	0.357	0.229	0.185	0.135	0.200	0.030
	P	0.097	0.053	0.224	0.329	0.477	0.288	0.874
Heart rate	r	0.301	0.316	0.219	0.294	0.112	-0.044	-0.127
	P	0.106	0.089	0.244	0.114	0.557	0.817	0.504
Blood pressure	r	-0.058	0.019	-0.102	0.055	-0.056	0.141	0.102
	P	0.759	0.921	0.591	0.774	0.769	0.456	0.593
respiratory rate	r	-0.016	0.074	0.009	-0.018	0.116	0.077	0.360
	P	0.931	0.697	0.963	0.925	0.542	0.685	0.050
Mean arterial pressure	r	-0.129	-0.095	-0.143	0.048	-0.146	-0.039	-0.166
	P	0.495	0.618	0.452	0.802	0.440	0.840	0.380
Oxygen saturation	r	-0.236	-0.181	-0.089	-0.089	-0.265	-0.107	-0.077
	P	0.210	0.339	0.639	0.641	0.156	0.575	0.688
Methods of intubation	r	0.007	-0.020	0.092	0.043	0.074	0.035	0.100
	P	0.973	0.915	0.628	0.822	0.698	0.856	0.600
PEEP/CPAP	r	0.131	0.195	0.163	-0.055	-0.112	-0.059	0.000
	P	0.490	0.301	0.388	0.774	0.557	0.757	1.000
Duration of MV	r	0.309	0.357	0.229	0.185	0.135	0.200	0.030
	P	0.097	0.053	0.224	0.329	0.477	0.288	0.874

****. Correlation is significant at the 0.01 level (2-tailed).**
***. Correlation is significant at the 0.05 level (2-tailed).**

Table (6) Correlation coefficient between the amount of gastric residual and abdominal complications before and after intervention for the studied critically ill patients (n = 30)

Amount of gastric residual first day		Abdominal distention		Abdominal circumference		Constipation		Diarrhea		Vomiting		Bowel movement	
		Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Day1	R	-.436-*	-0.145	.504**	0.142	0.050	0.058	-0.050	-	0.018	-0.210	-0.064	0.052
	P	0.016	0.454	0.005	0.462	0.792	0.767	0.792	-	0.925	0.274	0.739	0.789
Day2	R	-.420-*	-0.165	.456*	0.098	0.033	0.074	-0.033	-	0.058	-0.105	-0.084	0.018
	P	0.021	0.392	0.011	0.611	0.862	0.704	0.862	-	0.761	0.589	0.657	0.926
Day3	R	-.481-**	-0.233	.660**	0.104	-0.010	0.001	0.010	-	0.046	-0.241	-0.119	0.060
	P	0.007	0.224	0.000	0.592	0.957	0.996	0.957	-	0.808	0.208	0.532	0.756
Day4	R	-.496-**	-0.237	.721**	0.187	0.123	0.018	-0.123	-	0.007	-0.247	-0.159	0.138
	P	0.005	0.215	0.000	0.331	0.517	0.926	0.517	-	0.969	0.197	0.401	0.476

Day5	R	-.463-**	-0.148	.566**	0.064	-0.063	-0.066	0.063	-	0.034	-0.247	0.187	-0.143
	P	0.010	0.444	0.001	0.741	0.741	0.734	0.741	-	0.860	0.197	0.321	0.458
Day6	R	-0.270	-0.025	.591**	-0.043	-0.177	0.155	0.177	-	0.059	-0.062	0.126	0.155
	P	0.149	0.896	0.001	0.825	0.350	0.422	0.350	-	0.757	0.751	0.505	0.422
Day7	R	-0.166	-0.023	.475**	-0.093	-0.349	-0.018	0.349	-	0.017	-0.117	0.227	-0.065
	P	0.380	0.905	0.008	0.631	0.059	0.927	0.059	-	0.929	0.545	0.227	0.737

****. Correlation is significant at the 0.01 level (2-tailed).**
***. Correlation is significant at the 0.05 level (2-tailed)**

Table (7): represents duration of mechanical Ventilation for the studied critically ill patients

Duration of mechanical Ventilation	No	%
1 to 7 days	14	46.7
8 to15 days	15	50.0
More than 15 days	1	3.3

Discussion

Abdominal massage is an ancient remedy used in treating issues pertaining to the abdominal areas. Massage is extremely beneficial to the body and therapeutic to the mind. Making Massaging for the legs after a run helps lactic acid move to reduce soreness, and massaging a stiff neck and shoulder helps to reduce tension. Also massaging the abdomen improves digestion and relieves stress, which improves gastrointestinal function. **(Ogunyewo et al., 2020)**

Massage therapy can stimulate parasympathetic activity and induce a more effective gastrointestinal function by increasing peristalsis, decreasing abdominal distension, increasing bowel transit time, reducing gastric gas volume, increasing the frequency of defecation, and decreasing the frequency of vomiting **(Higgins JPT et al., 2021).**

The findings of the current study show the distribution of sociodemographic data for the study sample based on age group (40 to 50 years), which made up half of the studied sample. The majority of the sample was female. These findings contradict those of **(Wang et al. 2022)**, who reported that the majority of patients aged 65 years and older admitted to the ICU and had only just been placed on mechanical ventilation and had started nasogastric tube feeding.

In the present study, the majority of participants were overweight, with a mean and standard deviation (S.D.) of 94.37 ± 22.6. However, (**Singer et al. 2019)** reported that the majority of the study sample was underweight, with a mean and S.D. of 65.25 ± 11.8, attributing these results to the small sample size. The mean and S.D. for height were 169.83 ± 7.87, consistent with the findings of (**Dehghan et al. 2021)**, who observed that thirty percent had a mean and S.D. of 172.34 ± 5.3. In terms of BMI, only a small percentage of the study sample had normal weight, while less than thirty percent were overweight, in obesity classes 1 and 2 respectively. Moreover, less than a quarter of the study sample had extreme obesity. This study aligns with (**Çetinkaya et al. 2020)**, who noted that both groups were primarily overweight and obese.

The study finding in terms of reasons for ICU admission, most of the patients in the study were admitted for medical reasons, while only a small percentage had surgical reasons. This finding aligns with (**Higgins et al. 2021)**, who found that fifty percent of the patients had medical conditions and the majority had chronic medical diseases. As for medical diagnoses, less than a quarter of the patients in the study had acute respiratory failure and acute stroke, respectively. These findings were similar to those of (**Goelen et al. 2021**), who noted that about a quarter of the patients had respiratory failure and cardiovascular diseases.

In terms of the length of ICU stay, our study found that half of the participants stayed in the ICU for 7 to 15 days, while less than half stayed for 1 to 7 days. This contrasts with the findings of (**Martinez et al. 2020)**, who reported that the majority of participants stayed in the ICU for 15 to 30 days. Regarding the clinical data for the study participants, our findings indicate that the majority had a normal heart rate, while twenty percent

experienced tachycardia. In terms of blood pressure, half of the participants had normal blood pressure and hypertension. This aligns with the findings of (**Klawitter et al. 2021)**, who reported that the majority of participants had normal hemodynamic parameters such as blood pressure and heart rate.

The result of the study revealed that more than half of the study participants had a normal respiratory rate, while over a quarter had tachypnea. Moreover, approximately a quarter of the participants had a normal mean arterial pressure, while the majority had abnormal mean arterial pressure. Most participants also had normal oxygen saturation, while about a quarter experienced hypoxia. These results agree with (**Stoppe et al., 2020),** who documented that a low percentage had tachypnea and the majority had normal blood pressure, with no statistically significant differences between the two groups. Regarding intubation, the majority of the study samples were in an endotracheal tube, and only a small percentage had a tracheostomy tube. A high percentage of the sample was on PEEP or CPAP.

In terms of gastric residual volume, the current study revealed that on the first day, the mean standard deviation (SD) of the gastric residual was higher than on the 6th and 7th days. There was a statistically significant difference between the samples on different days of the study, demonstrating the impact of early abdominal mobilization, exercise, and massage on reducing gastric residual volume. Conversely, (**Wang et al. 2022)** observed that the effect of abdominal massage on gastric residual volume was significantly lower in the abdominal massage group compared to the control group, with a p-value of 0.004. However, (**Bruen et al. 2020)** reported that varying incidence rates of gastric residual volume in ICU patients, with less than half and about a quarter experiencing gastrointestinal motility disorders are common in ICU patients.

The results of the current study showed that only a small percentage of the sample experienced abdominal distention after the intervention. In contrast, the majority of the sample had no distention after the intervention, and there were statistically significant differences between the groups. These findings align with (**Khorjahani et al. 2020)**, who demonstrated the impact of abdominal massage on the incidence of abdominal distension. There was no variation among the studies, so a fixed-effect model was used for the meta-analysis. The incidence of abdominal distension in the intervention group was significantly lower than that in the control group. Regarding abdominal characteristics, the current study revealed that most of the participants had a soft abdomen after the intervention, while a smaller percentage had a tense abdomen. This supports the positive effect of early abdominal mobilization exercises on digestion and gastrointestinal tract function. (**Menges et al. 2021)** corroborated the present study, noting that after the abdominal massage, the patient's abdominal circumference increased, and the abdomen became hard compared to before the massage.

The study found that about half of the participants experienced vomiting before the intervention, but this significantly

decreased after the intervention, indicating improved digestion. These results align with a study by **(Wang J et al. 2023)**, which showed that the incidence of vomiting in the abdominal massage group was significantly lower than in the control group. Regarding constipation, the study revealed that the majority of participants experienced constipation before the intervention, but this significantly decreased after the intervention. Additionally, most of them did not experience diarrhea after the intervention, suggesting that early abdominal exercise can improve digestive system function. Similarly, (**Wang et al. 2022)** reported that abdominal massage is commonly used by patients to enhance digestive system movement, thus reducing constipation. Abdominal massage can also speed up food passage through the digestive system, enhance intestinal movement, improve blood circulation, and reduce intra-abdominal pressure. This can lead to faster food emptying, reducing gastric residue and the likelihood of gastric retention.

The study found statistically significant differences between the first and seventh days in terms of BMI, with correlation coefficients of -0.029 and 0.385*, respectively. The study also examined the correlation between gastric residual and complications before and after intervention. There were statistically significant differences before and after intervention on the 1st, 2nd, 3rd, 4th, and 5th days regarding abdominal distention. However, there were no statistically significant differences before and after intervention over the course of all 7 days with regard to constipation, diarrhea, vomiting, or bowel movements. These results were in agreement with (**Dehghan et al. 2021),** who reported a correlation between abdominal exercise and socio-demographic data such as age and the positive impact of early bedside cycle exercise on gastrointestinal system dysfunctions such as vomiting, diarrhea, decreased bowel sounds, and gastric retention. There were no statistically significant differences before and after the intervention.

Regarding the duration of mechanical ventilation (MV), this study found that less than half of the participants were on MV for 1–7 days, while the remaining half required MV for 7–15 days. This contrasts with the findings of **(Menges et al. (2021)**, who stated that the majority of critically ill patients undergo mechanical ventilation for 5 days.

Conclusion and Recommendation

Recommendation

- Early abdominal mobilization with abdominal massage should be included in the routine care of intubated patients.
- Nurses should be educated about the ideal technique of abdominal mobilization and messages to prevent patient harm
- The ICU head nurse and nurses should be aware of the value of early abdominal mobilization and message and its effect on patient outcomes.
- The ICU nurses should inform the patients and their relatives about the value of early patient mobilization and its effect on reducing ICU stay.
- Further research will be needed using a large probability sample to provide a generalization of the data obtained, and to include the study results in the guidelines for routine ICU patient care.

Conclusion

-In conclusion of the study, early abdominal mobilization showed improvement in gastrointestinal functions. Early exercise reduces gastric residual volume and vomiting and improves gastric motility which in turn prevents diarrhea and reduces constipation.

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