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Frequency Risk Factors and Clinical Manifestations for Tube Feeding Intolerance among Critically Ill Patients

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Abstract
Background: Enteral feeding intolerance may affect the effectiveness of enteral feeding, thereby prolonging hospital stay, influencing mechanical ventilation and increasing mortality rate. **Aim:** is to investigate the frequency, risk factors, and clinical manifestations for tube feeding intolerance among critically ill patients. **Research design:** A descriptive exploratory survey research design was utilized to conduct this study. **Subjects:** A purposive sample of sixty-five adult male and female critical ill patients that they are receiving enteral feeding in first 24-48 hours of admission. **Setting:** This study was conducted at intensive care units at Assiut University Hospital, Egypt. **Tools: Tool I**: Adult critically ill tube feeding intolerance clinical manifestations assessment questionnaire. **Tool II:** Nutrition status assessment tool by using The Mini Nutritional Assessment Short-Form. **Tool III**: Risk factors of enteral feeding intolerance assessment questionnaire. **Results:** The majority of patients (84.6%) manifested by equal to or more than two symptoms of enteral feeding intolerance, the mean age of patients was (36.57±10.34) and (55.4%) were males. **Conclusion:** Based on the results of this study, many patients suffered from vomiting, constipation, flatulence, abdominal distention or straining. There were several risk factors for enteral feeding intolerance as constipation, stress and bed rest. **Recommendations:** Further research studies and in-service education for critical care nurses regarding to proper nutrition, assessment of enteral feeding intolerance among critically ill patient from time of admission.

Keywords: Clinical manifestations, Critically ill patients, Enteral feeding, Risk factors & Tube feeding intolerance.

Introduction
Enteral feeding refers to the nutritional support mode that provides all kinds of nutrient substances needed by the human metabolism through the gastrointestinal tract, mainly including nasogastric tube **(Cederholm et al, 2017).** The American Society of Parenteral and Enteral Nutrition (ASPEN) recommended that nutrition support therapy from early enteral feeding should start within 24- 48 hours after ICU admission, or when there is stable hemodynamic condition, the functional integrity of the gut may help to maintain the systemic immune functions **(Koontalay, 2020).**
Enteral feeding is the first line of nutrition therapy for critically ill patients but it was not performed in the presence of hemodynamic instability or uncontrolled shock; uncontrolled life-threatening hypoxemia, hypercapnia, or acidosis; active GI bleeding; bowel discontinuity; overt bowel ischemia; abdominal compartment syndrome; high output intestinal fistula; continued obstruction of the GI tract; or gastric risdual volume >500 mL/6h **(Hu et al, 2020).** Enteral nutrition has been the preferred means of nutritional support for feeding critically ill patients because of its favorable morbidity effects**,** lower cost, enhancement of gut immune function and its association with less septic complications compared to parenteral nutrition **(McClave et al, 2016).**
Although enteral feeding is widely accepted and applied in critical care medicine to provide nutrition support to critically ill patients and its positive clinical outcomes, many patients fed by tube show symptoms of feeding tube-associated intolerance. Successful delivery of enteral nutrition is commonly impeded by signs and symptoms of feeding intolerance, including vomiting, abdominal distension, constipation, diarrhea, and increased gastric residual volumes **(Ladopoulos et al, 2018).** Method of enteral feeding has been shown as one of the main factors in the incidence of enteral feeding intolerance in critically ill patients **(Gungabissoon et al, 2015).**
Enteral feeding intolerance (EFI), defined as the failure to provide sufficient EN to critically ill patients due to delay of gastric emptying with the absence of mechanical blocking **(Elmokadem et al, 2021)**. The feeding intolerance usually occurs during

EN, leading to adjustment or discontinuation of the implementation of enteral nutrition **(Chen et al, 2019)**.

Enteral feeding intolerance in critically ill patients is a common problem in intensive care units worldwide. It may occur for any clinical reason, including vomiting, high gastric residual volume, diarrhea, gastrointestinal bleeding and the presence of intestinal fistula **(Hu et al, 2020)**. There is wide spectrum of pathophysiological mechanisms that affect different parts and functions of the gastrointestinal tract, resulting in a variety of clinical symptoms and signs of enteral feeding intolerance **(Reintam Blaser et al, 2021).**

There are influencing factors associated with feeding intolerance in critically ill patients such as diseases; Critically ill patients often experience stress-induced hyperglycemia (blood glucose level ≥10.0mmol/L) due to the severity of the patient's illness that may delay gastric emptying, in patients with traumatic brain injury (TBI), axonal injury in the autonomic nervous system induced by increased intracranial pressure can cause gastrointestinal motility disorders**.** Some drugs such as sedatives and analgesics and vasoactive drugs can potentially affect gastrointestinal motility. Analgesics, such as opioids, can affect the movement of the upper gastrointestinal tract and cause delayed gastric emptying by reducing gastric tension. Sedatives, such as propofol, can delay gastric emptying, increase gastrointestinal transit time and affect the gastrointestinal motility **(Chen, et al, 2019)**.

So, critical care nurse should monitor the patients who receive enteral feeding such as obtaining initial weight and weekly weight measurements, vital signs, intake and output measurements and laboratory data for providing enteral tube care throughout the duration of nutrition support therapies. Meticulous feeding tube care is critical to prevent local and systemic forms of infection. Always verify if the naso\orogastric tube placed in the stomach by aspirating a small amount of stomach contents or the gastric residual volume and should be routinely monitored every 4 hours and obtains more objective signs of feeding tolerance. **(Gonce et al, 2017).**

Significance of the study:

It was documented by **Blaser et al, (2017)** In a study done in 167 ICU's on 1888 patients at UK that, enteral feeding intolerance may occur after median 3 days post initiation of enteral feeding with an incidence of 30.5% and documented by **Heyland et al, (2021)** in a study done in 15,918 patients at 785 ICUs from around the world. Of these, 4,036 (24%) had enteral feed intolerance**.** From the researcher's clinical experience during practical training period for two years at intensive care units ,it has been observed that many patients who were admitted to the intensive care units and received enteral feeding suffered from enteral feeding intolerance represent about 28% in 2019-2020 **(Assiut University Hospital Record)** .so, this study will be carried out to help health professionals to investigate the frequency, risk factors and clinical manifestations for tube feeding intolerance among critically ill patients.

Aim of the study:

To investigate the frequency, risk factors and clinical manifestations for tube feeding intolerance among critically ill patients.

Research questions:

1. Hat is the frequency of tube feeding intolerance among critically ill patients at Assiut University Hospital during a data collection period of 6 months?
2. What are the different risk factors for enteral feeding intolerance among critically ill patients during the pre-determined data collection period in Assiut University Hospital?
3. What are the different enteral feeding intolerance manifestations exhibited by critically ill patients during the pre-determined data collection period at Assiut University Hospital?

Operational definitions:

Risk factors: in this study risk factors include age, constipation, medications, stress or bed rest.

Clinical manifestations: in this study clinical manifestations include vomiting, constipation, flatulence, abdominal distention or straining.

Patients and Method:

Research design: A descriptive exploratory research design was utilized to conduct this study.

Setting:

This study was conducted in the intensive care units of Assiut University Hospital, Egypt. These units include; (1) general ICU (16 beds in four separate rooms, 8 head nurses, 40 nurses, 4 assistant nurses and the nurse / patient ratio is 1:3), (2) trauma ICU (16 beds in three separate rooms, 5 head nurses, 28 nurses, 6 assistant nurses and the nurse/ patient ratio is 2:3), (3) coronary ICU (16 beds in three separate rooms ,7 head nurses, 40 nurses, 1 assistant nurses and the nurse/patient ratio is 1:3), (4) anesthesia ICU (12 beds in three separate rooms ,7 head nurses, 35 nurses, 4 assistant nurses and the nurse/patient ratio is 1:2), and (5) Alraghi ICU (11 beds in two separate rooms, 2 head nurses, 20 nurses, 4 assistant nurses and the nurse/ patient ratio is 1:2).

Sample size: Purposive sample of sixty-five adult male and female critical ill patients that they received enteral feeding in first 24-48 hours of admission at intensive care unit and were willing to participate in

this study over a period of six months (from November 2021 – April 2022).

Inclusion criteria: Patient with age ranged between 18-60 years.

Exclusion criteria:

Patients with (hemodynamic instability**, u**ncontrolled shock**,** uncontrolled life-threatening hypoxemia**, h**ypercapnia, or acidosis**, a**ctive GI bleeding**,** bowel discontinuity**, o**vert bowel ischemia**, a**bdominal compartment syndrome**, h**igh output intestinal fistula, continued obstruction of the GI tract**, g**astric residual volume >500 mL/6h**rs, b**rain death**, s**tomach cancer**, a**bdominal trauma**, e**sophageal varices **or d**elayed initiation of EN (>48 hours) in the absence of contraindication to EN)**were excluded from the study.**

Tools of the study: To collect data pertinent to this study; four tools were developed by the researcher after reviewing different related literatures.

Tool I: Adult critically ill tube feeding intolerance manifestations assessment questionnaire.

This tool was developed to assess condition of the patient, measuring and monitoring gastric Residual volume. It covers four main parts including: -

Part 1: Patient characteristics:

It comprises demographic data (age, sex), in addition to clinical data which include anthropometric measurements (weight, height, body mass index, mid arm circumference or calf circumference), patient diagnosis, past medical history, presence of food allergy, tubes that connected with patients, mechanical ventilation data if connected, date of intensive care unit admission and discharge...etc.)

Part 2: Hemodynamic and biomedical data assessment sheet: This part includes assessment of medication type that may cause gastric upset (antibiotics, NSAIDS or analgesics).

Part 3: Feeding intolerance manifestations including Different manifestations of tube feeding intolerance as vomiting, flatulence, diarrhea or abdominal distention etc.

Part 4: Assessment of gastric residual volume including the following: This part involved assessment of gastric residual volume of the patients who included in this study in morning, evening and night shift in 1st, 4th, 7th, and 10th day.

Tool II: Nutritional status assessment tool by using The Mini Nutritional Assessment Short-Form (Yost et al, 2014)

The MNA-SF scores ranged from 0–14, was used to establish the diagnosis of malnourished (0–7 points), at risk of malnourishment (8–11 points) and well nourished (12–14 points).

Tool III: Entral Feeding Intolerance Risk Factors Assessment questionnaire.

This tool composed of two parts to assess frequency and risk factors of enteral feeding intolerance. Including 2 items, from 18 to 19 covering the following:-

Part 1: The frequency of feeding intolerance

This part **including:** Assessment of incidence of enteral feeding intolerance in involved patient in this study.

Part 2: Enteral feeding intolerance risk factors assessment sheet

This part **including:** Assessment of risk factors of feeding intolerance among critically ill patient as hyperglycemia, hypoproteinemia, hypokalemia, stress or pain.

Method: This study was carried out in two phases:

Preparatory phase:

- **Tools development:** Data collection tools were developed based on reviewing the current, past, local and international related literature in the various aspects using books, articles, periodicals, magazines, and references were done.
- **Content validity and reliability:** Content validity was done by (5) specialists in the field of critical care nursing from Assiut University, who examined the tools for clarity, relevance, comprehensiveness and understanding.
- **Reliability of the tools** was measured by using correlation coefficient and it estimated by Cronbach's alpha coefficient (r-0.72).
- **Pilot study:** A pilot study was conducted on 10 % of the study subjects (7 patients) over one mmonth in the selected setting to test the tools' applicability and clarity. The data from the pilot study were analyzed; no changes were made to the tools used, so the 10% of subjects chosen for the pilot study were included in the study.
- **Ethical approval:** An official permission to conduct the study was obtained from the Assiut university hospital responsible authorities in anesthesia, trauma, general, coronary and Alraghi intensive care units after explaining the nature and purpose of the study.

Ethical considerations:

- Research proposal was approved from Ethical Committee in the Faculty of Nursing, Assiut University.
- There was no risk for study subject during application of the research.
- The study followed common ethical principles in clinical research.
- Oral consent was obtained from patients or guidance who participated in the study after explaining the nature and purpose of the study.
- Confidentiality and anonymity were assured.
- Study subjects had the right to refuse to participate and or withdraw from the study without any rational any time.
- Study subject privacy was considered during collection of data.

Assessment phase:

- This phase of data collection was started once official permission was granted to proceed with the proposed study; the researcher approached the head nurses of the different ICUs to obtain lists of patients, and reviewed those patients as considering the inclusion and the exclusion criteria to select eligible patients. Patients whom agreed to participate in the proposed study were interviewed individually to explain the purpose, benefits and the nature of the study and to establish rapport and cooperation. Then oral consent was obtained from each of the subjects. Each selected patient was monitored every day during the day shifts for about 60 minutes until removal of nasogastric tube, discharge, transferred to another unit or died. During which, all study tools were filled out.
- Demographic data (age and sex) and clinical data which included patient diagnosis, past medical history, presence of food allergy and the length of hospital stay were collected and documented by the researcher (tool I part 1).
- The type of given medications for each patient involved in the study was assessed (tool I part 2).
- Each patient involved in the study; was monitored for manifestations of feeding intolerance as vomiting, abdominal distension, constipation, diarrhea during monitoring period and data were documented (tool I part 3) .
- Each patient involved in the study; was assessed for gastric residual volume through the day and data were documented (tool I part 4).
- The researcher assessed patient nutrition status twice times by using (The Mini Nutritional Assessment Short-Form); once at time of initiation of enteral nutrition as baseline data and another last time when patient death, discharge, transferal to another department or discontinuation of enteral feeding and transformation to receive oral feeding (tool II).
- The researcher investigated the frequency of enteral feeding intolerance among adult critically ill patients (tool III part 1).
- Each patient involved in the study was assessed for risk factors of feeding intolerance occurrence (tool III part 2).
- The researcher collected data over a period of six months (from November 2021 – April 2022).

Statistical analysis:

The researcher entered the data by using a personal computer. All data were entered into statistical packages for the social sciences (SPSS) version 23.0 software for analysis and figures were created in Excel. The researcher analyzed, categorized, and then coded the content of each tool. Categorical variables were described by number and percent, whereas continuous variables were described by the mean and standard deviation (Mean, SD). Chi-square test and Fisher exact test were used to compare between categorical variables, where compare between continuous variables by t-test. $p < 0.05$ was considered statistically significant.

Results:

Table (1): Percentage distribution of age, sex, diagnosis, past history of diseases and presence of food allergy among the studied sample (n=65):

	No	%
Age group		
18 - < 30 yrs.	20	30.8
30 - < 40 yrs.	20	30.8
40 - < 50 yrs.	22	**33.8**
50 - <60 yrs.	3	4.6
Mean ± SD	**36.57±10.34**	
Sex		
Male	36	**55.4**
Female	29	44.6
Diagnosis		
Respiratory	30	46.2
Trauma	39	**60**
GIT	2	3.1
Renal	6	9.2
Neurological	2	3.1
Cardiovascular	2	3.1
Past history of diseases		
Cardiovascular	28	43.1
Neurological	2	3.1
Endocrine	33	**50.7**
Food allergy		
Yes	12	18.5
No	53	**81.5**

≠ The patient may have more than one diagnosis.

Table (2): Percentage distribution of nutrition status assessment of studied sample by using The Mini Nutritional Assessment Short-Form (n=65):

Nutrition status assessment tool	Baseline nutritional assessment		The last nutrition assessment		P. value
	No	%	No	%	
Normal nutritional status	37	56.9	35	53.8	0.860
At risk of malnutrition	28	43.1	30	46.2	
Malnourished	0	0	0	0	
Mean ± SD	11.49±1.23		11.43±1.26		0.159

- Chi square test for qualitative data between the two groups

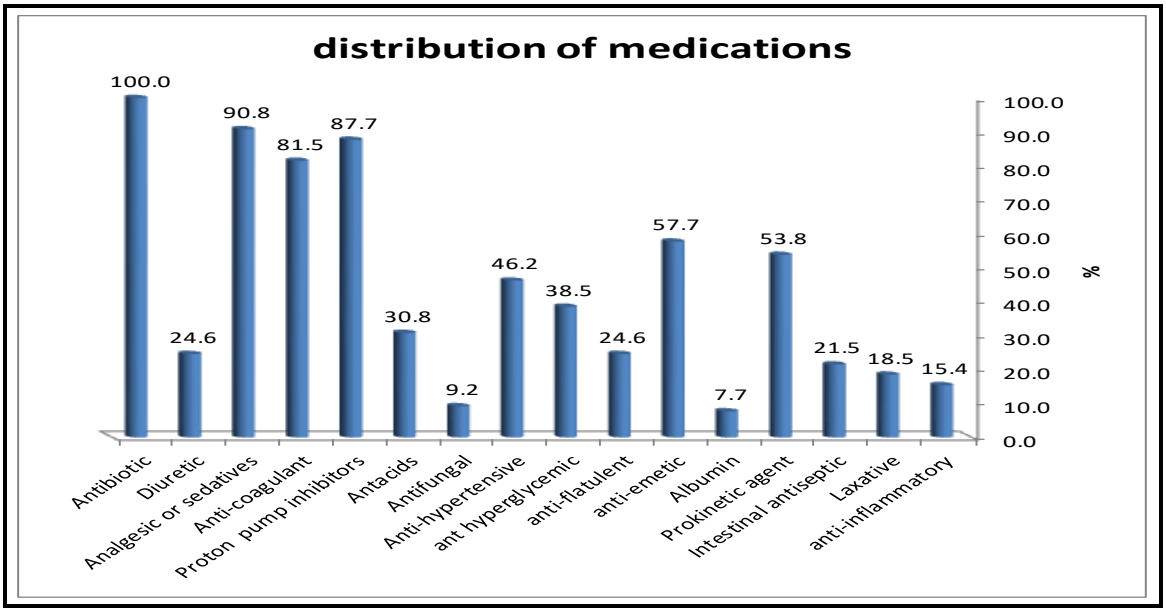

Figure (1): Percentages distribution of given medications through assessment days for studied sample (n=65).

Table (3): Percentage distribution of gastric residual volume for the studied sample through all three shifts of assessment days:

Gastric residual volume	No	Yes	0-50cm		50-100cm		100-200cm		>200cm	
1st day (n=65)										
Morning	47	18	16	88.9	0	0	2	11.1	0	0
Evening	47	18	12	66.7	4	22.2	2	11.1	0	0
Night	47	18	12	66.7	4	22.2	2	11.1	0	0
4th day (n=65)										
Morning	47	18	14	77.8	2	11.1	0	0	2	11.1
Evening	47	18	12	66.7	2	11.1	2	11.1	2	11.1
Night	47	18	14	77.8	0	0	2	11.1	2	11.1
7th day (n=53)										
Morning	41	12	12	100	0	0	0	0	0	0
Evening	41	12	8	66.6	2	16.7	0	0	2	16.7
Night	41	12	8	66.6	2	16.7	0	0	2	16.7
10th day (n=14)										
Morning	10	4	4	100	0	0	0	0	0	0
Evening	10	4	2	50	2	50	0	0	0	0
Night	10	4	4	100	0	0	0	0	0	0

≠ There was no gastric residual volume in measurement in other days of assessment.

Number of patient was different because their death, transferal or establishing oral feeding.

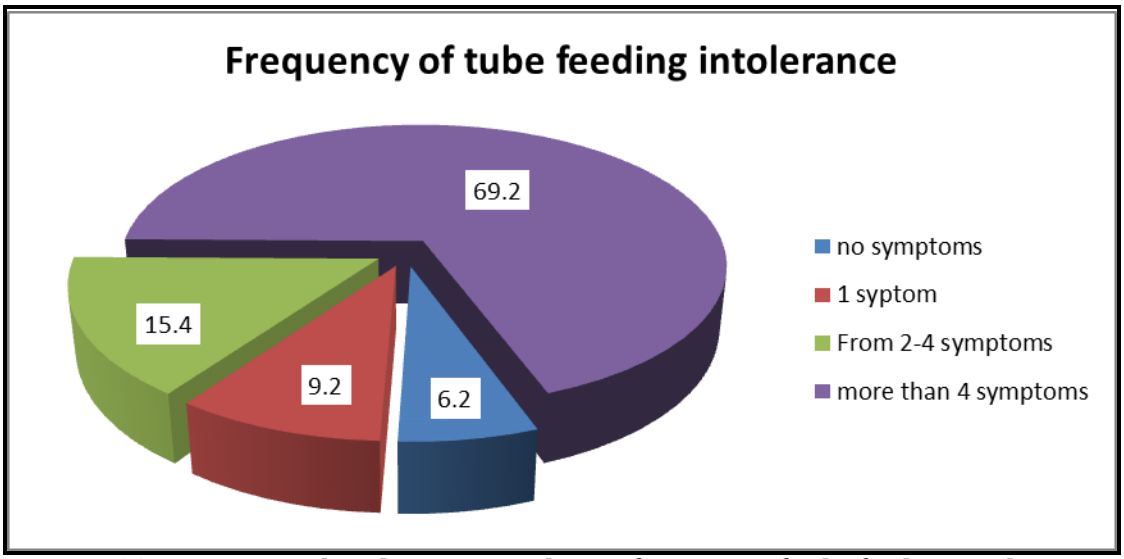

Figure (2): Percentage distribution regarding to frequency of tube feeding intolerance manifestations among studied sample (n=65

Table (4): Percentage distribution of different risk factors for enteral feeding intolerance manifestation among studied sample (n=65):

Risk factors	N	%	Asymptomatic		Symptomatic	
			N	%	N	%
Risk factors related to medication						
Antibiotics • Absent • Present	**65**	100	0 4	0.0 100.0	0 61	0.0 100.0
Sedative & analgesics • Absent • Present	**59**	90.8	4 0	100.0 0.0	30 31	49.2 50.8
Antacid agents • Absent • Present	**20**	30.8	4 0	100.0 0.0	41 20	67.2 32.8
Risk factors related to investigation						
Hypoproteinemia • Absent • Present	**59**	90.8	0 4	0.0 100.0	12 49	19.6 80.4
Hyperglycemia • Absent • Present	**48**	73.8	2 2	50.0 50.0	15 46	24.6 75.4
Hypokalemia • Absent • Present	**33**	50.8	2 2	50.0 50.0	11 50	18.03 81.97
Acidosis • Absent • Present	**22**	33.8	2 2	50.0 50.0	41 20	67.2 32.8
Hypoxemia • Absent • Present	**4**	6.2	2 2	50.0 50.0	59 2	96.7 3.3
Other risk factors						
Bed rest • Absent • Present	**65**	100	0 4	0.0 100.0	0 61	0.0 100.0
Stress • Absent • Present	**65**	100	0 4	0.0 100.0	0 61	0.0 100.0
Pain • Absent • Present	**65**	100	0 4	0.0 100.0	0 61	0.0 100.0

Risk factors	N	%	Asymptomatic		Symptomatic	
			N	%	N	%
Mechanical ventilation						
• Absent	**54**	83.1	2	50.0	6	9.8
• Present			2	50.0	55	90.2
Weakened /absent bowel sounds						
• Absent	**44**	67.7	4	100.0	17	27.9
• Present			0	0.0	44	72.1
Constipation						
• Absent	**42**	64.6	4	100.0	19	31.1
• Present			0	0.0	42	68.9
Long-term fasting						
• Absent	**2**	3.1	4	100.0	59	96.7
• Present			0	0.0	2	3.3
Postoperative 3 days						
• Absent	**2**	3.1	4	100.0	59	96.7
• Present			0	0.0	2	3.3
Age >=60						
• Absent	**0**	0	4	100.0	61	100.0
• Present			0	0.0	0	0.0
Abdominal surgery						
• Absent	**0**	0	4	100.0	61	100.0
• Present			0	0.0	0	0.0
Acute pancreatitis						
• Absent	**0**	0	4	100.0	61	100.0
• Present			0	0.0	0	0.0

Table (5): Percentage distribution of different enteral feeding intolerance manifestations exhibited by studied sample:

Number of patients manifestation	1st day		4th day		7th day		10th day		13th day		16th day		19th day		21th day		TOTAL	
	65		65		53		14		10		2		2		1			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Vomiting	31	47.7	17	26.2	8	15.1					2	100			1	100		
Frequency																		
1-2 times	18	58.1	15	88.2	8	100					2	100			1	100	43	66.2
3-4 times	13	42	2	11.8	0	0					0	0			0	0		
Amount	108.39±74.44		74.12±49.12		50±23.9						40				50			
Constipation	41	63.1	30	46.2	28	52.8	6	42.9	6	60	0	0	0	0	0	0	45	69.2
Diarrhea	10	15.4	15	23.1	2	3.8	0	0	0	0	2	100	0	0	0	0		
Frequency																	21	32.3
1-3 times	0	0	4	26.7	2	100	0	0	0	0	0	0	0	0	0	0		
3-6 times	10	100	11	73.3	0	0	0	0	0	0	2	100	0	0	0	0		
Flatulence	18	27.7	24	36.9	10	18.9	8	57.1	0	0	0	0	0	0	0	0	45	69.2
Abdominal distension	28	43.1	26	40	10	18.9	6	42.9	2	20	0	0	0	0	0	0	42	64.6
Straining	20	30.8	26	40	8	15.1	6	42.9	2	20	0	0	0	0	0	0	42	64.6

 # number of patient was different because their death, transferal or establishing oral feeding.

Table (6): Correlation Co-efficient between patient's demographic data with manifestations of tube feeding intolerance among studied sample (n=65):

	Age		Sex	
	r	P	r	P
Constipation	-.248-	0.047*	-0.072	0.568
Diarrhea	.310	0.012*	0.042	0.741
Flatulence	-.248-	0.047*	0.062	0.624
Distension	-.292-	0.018*	0.017	0.894
Straining	-.292-	0.018*	0.017	0.894

- Chi square test for qualitative data between the two groups
**Statistically Significant Correlations at P. value <0.05 **Statistically Significant Correlations at P. value <0.01*

Table (7): Correlation Co-efficient between patient's medical data with manifestations of tube feeding intolerance for studied sample (n=65):

		Constipation	Diarrhea	Flatulence	Distension	Straining
Diagnosis						
Respiratory	r	-.319-	0.152	-0.185	-0.218	-0.218
	P	0.010*	0.226	0.140	0.080	0.080
Trauma	r	.272	0.027	.272	0.184	0.184
	P	0.028*	0.832	0.028*	0.143	0.143
GIT	r	-.267-	.258	-.267-	-0.241	-0.241
	P	0.031*	0.038*	0.031*	0.053	0.053
Renal	r	0.213	-0.220	0.213	0.236	0.236
	P	0.089	0.078	0.089	0.058	0.058
Neurological	r	-.267-	-0.123	-.267-	-0.241	-0.241
	P	0.031*	0.329	0.031*	0.053	0.053
Cardiovascular	r	-.267-	.258	-.267-	-0.241	-0.241
	P	0.031*	0.038*	0.031*	0.053	0.053
Increased length of stay in ICU	r	.320*	-0.065	.320*	.359*	.359*
	P	0.009**	0.610	0.009**	0.003**	0.003**
Past history of diseases						
Cardiovascular	r	-.362-	.329	-.362-	-.266-	-.266-
	P	**0.003***	**0.007***	**0.003***	**0.032***	**0.032***
Neurological	r	-.267-	.258	-.267-	-0.241	-0.241
	P	**0.031***	**0.038***	**0.031***	0.053	0.053
Endocrine	r	-0.123	.285	-0.123	-0.214	-0.214
	P	0.329	0.021*	0.329	0.087	0.087
Food allergy	r	0.198	-0.180	0.026	0.145	0.145
	P	0.113	0.151	0.834	0.248	0.248

- Chi square test for qualitative data between the two groups
**Statistically Significant Correlations at P. value <0.05 **Statistically Significant Correlations at P. value <0.01*

Table (8): The relationship between use of medications with occurrence of tube feeding intolerance manifestations for studied sample (n=65):

		Vomiting	Constipation	Diarrhea	Flatulence	Distension	Straining
Diuretics	r	-0.100	0.071	0.063	0.226	0.124	0.124
	P	0.429	0.572	0.616	0.070	0.325	0.325
Sedative and analgesic	r	.258	0.025	-0.042	0.025	0.075	0.075
	P	0.038*	0.844	0.741	0.844	0.555	0.555
Anticoagulant	r	.330	0.026	0.159	-0.145	-0.020	-0.020
	P	0.007**	0.834	0.205	0.248	0.872	0.872
proton pump inhibitors	r	.326	0.156	-0.142	-0.047	0.115	0.115
	P	0.008**	0.214	0.260	0.711	0.364	0.364
Antacid	r	0.195	0.156	-0.033	0.156	0.214	0.214
	P	0.119	0.216	0.795	0.216	0.086	0.086
Antifungal	r	-0.221	-.248-	0.234	-0.018	-0.209	-0.209
	P	0.077	0.046*	0.060	0.889	0.095	0.095
Antihypertensive	r	0.010	-0.185	0.152	0.082	-0.089	-0.089
	P	0.937	0.140	0.226	0.515	0.479	0.479
Ant hyperglycemic	r	-0.103	-0.021	0.198	0.116	-0.142	-0.142
	P	0.415	0.868	0.115	0.358	0.258	0.258
Ant flatulent	r	-0.044	0.226	-0.242	0.226	.273	.273
	P	0.727	0.070	0.052	0.070	0.028*	0.028*
Antiemetic	r	.553	.370	-0.067	0.103	.256	.256
	P	0.000**	0.002**	0.597	0.416	0.040*	0.040*
Albumin	r	0.206	-0.058	.418	-0.058	-.390-	-.390-
	P	0.099	0.648	0.001**	0.648	0.001**	0.001**
Prokinetic	r	0.120	0.185	0.112	0.185	0.089	0.089
	P	0.339	0.140	0.376	0.140	0.479	0.479
Intestinal antiseptic	r	-0.100	-.624-	.758	-.299-	-.551-	-.551-
	P	0.429	0.000**	0.000**	0.015*	0.000**	0.000**
Laxatives	r	0.005	.317	-0.159	.317	.352	.352
	P	0.967	0.010*	0.205	0.010*	0.004**	0.004**
Anti- inflammatory	r	-0.055	0.099	-0.112	-0.085	0.137	0.137
	P	0.661	0.430	0.373	0.499	0.276	0.276

- Chi square test for qualitative data between the two groups
- Antibiotics is (NA) Not applicable because it was given to all patients
**statistically Significant Correlations at P. value <0.05*
***statistically Significant Correlations at P. value <0.01*

Table (1): Illustrates that majority of studied sample (81.5%) of patients were not having food allergy, about (60%) were having trauma, (55.4%) of them were males, (50.7%) suffered from endocrine disease and the mean age of studied sample was (36.57±10.34); about (33.8%) of patients their age ranged from 40 - < 50 yrs.

Table (2): This table illustrates that there was no a statistical significant differences between the baseline nutritional assessment and the last nutrition assessment (P value 0.860).

Figure (1): Shows that all patients received antibiotics in all days (100%). The majority of patients {(90.8%) (81.5%) (87.7%)} received analgesic or sedative, anti-coagulant and proton pump inhibitors respectively, more than half of patients {(57.7%) (53.8%)} received anti-emetic and prokinetic agent respectively, (30.8%) received antacids, (24.6%) received anti-flatulent, (21.5%) received intestinal antiseptic, (18.5%) received Laxative and only (9.2%) received antifungal.

Table (3): This table shows This table shows that the highest percentage of gastric residual volume was 0-50 cm through all shifts in 1st, 4th, 7th and 10th day of patient's assessment however (11.1%, 14.2%) of patients within high gastric residual volume >200 cm in 4th and 7th days of assessment respectively.

Figure (2): This figure shows that majority of patients (84.6%) manifested by equal to or more than two symptoms of enteral feeding intolerance.

Table (4): Illustrates that pain, stress, bed rest, use of broad-spectrum antibiotics were common risks for enteral feeding intolerance for all patient (100%). The majority of patients (90.8%) took sedative or analgesic agents and had hypoproteinemia, (83.1%) were connected with mechanical ventilator, but age >60 yrs., abdominal surgery and acute/severe pancreatitis weren't matched in studied sample (0%).

Table (5): This table clarifies that that more than two thirds of patients suffered from vomiting, constipation, flatulence, abdominal distention and straining {(69.2) (69.2) (66.2) (64.6) (64.6)} respectively while more than one third of patients (32.3%) suffered from diarrhea.

Table (6): This table shows that there was positive correlation between patient's age and occurrence of all manifestations of enteral feeding intolerance as diarrhea, distension, straining , constipation and flatulence with statistical significance difference as r and p values {(0.310*, 0.012)(0.292*, 0.018)(0.292*, 0.018)(0.248*, 0.047) (0.248*, 0.047)} respectively.

Table (7): This table shows that there was positive relationship between respiratory disorder and constipation, (trauma, neurological) and (constipation, flatulence), GIT disorder and neurological disorders with (constipation, diarrhea, flatulence), endocrine disease and diarrhea, cardiovascular disorders and all manifestations with a statistical significant differences (P value < 0.05).

Table (8): This table shows that there was positive relationship between use of (sedative, analgesics, anticoagulant, proton pump inhibitors or antiemetic) and occurrence of vomiting, use of (antifungal, antiemetic, intestinal antiseptic or laxatives) and constipation, use of (albumin, intestinal antiseptic) and diarrhea, use of laxatives and flatulence, use of (ant flatulent, albumin, intestinal antiseptic or laxatives) and distension, use of (ant flatulent, antiemetic, albumin, intestinal antiseptic or laxatives) with a statistical significant differences (P value < 0.05).

Discussion:

In light of the patient's demographic data, the finding of the current study revealed that the highest percentage of patients with age ranged from forty to less than or equal to fifty years. These findings were supported by **(Vinaik & Mehndiratta, 2021)** who studied "An Open Label Clinical Study to Evaluate the Safety and Gastrointestinal Tolerance of ONS in Hospitalized Patients Requiring Enteral Tube Feeding" and showed that mean age of the study participants were forty years. **Regarding to sex**, more than one half of patients were males included in this study. These findings are in line with **(Gungabissoon et al, 2015)** who studied "prevalence, risk Factors, clinical consequences, and treatment of enteral feed intolerance during critical illness" and showed that sixty percent of patients were males. The current study revealed that **the most common diagnosis was trauma** in about sixty percent of patients. These findings agreed with **(Ukleja, 2010)** who studied "Altered GI Motility in Critically Ill Patients: Current Understanding of Pathophysiology, Clinical Impact and Diagnostic Approach" and showed that the majority of patients with increased cranial pressure after head injury. **From the researcher's opinion,** this result may be due to the most of patients were males and had head injury or spinal cord injury due to accidents and exposure to hard work. **Concerning the past medical history,** results revealed that more than one half of patients suffered from endocrine disease mainly diabetes mellitus and hypertension. These findings agreed with **(Dehghani et al, 2022)** who investigated "the effect of oral synbiotic on enteral feeding tolerance in critically ill patients" and showed that the most common underlying diseases were diabetes mellitus and hypertension. **From the researcher's opinion,** this result may be due to these diseases are more common as regarding to their age group and stress. The current study reported that less than one fourth of patients suffered from **food**

allergy. These findings were supported by **(Gupta et al 2019)** who studied "Prevalence and Severity of Food Allergies among US Adults" and showed that estimated convincing food allergy prevalence among adults was less than one fourth too. Also **assessment of nutritional status** in relative to previous measurements and nutrition status assessment by using The Mini Nutritional Assessment Short- Form, it was founded that there was no a statistical significant differences between the baseline nutritional assessment and the last nutrition assessment. **From the researcher's opinion,** this result may be due to the hypermetabolic and hyper catabolic state associated with critical illness and length of stay may be short to show to cause significant nutritional alterations. The current study revealed that all patients were received **antibiotic** in all days. The findings arematching with **(Vieira et al, 2018)** who studied "Incidence of diarrhea and associated risk factors in patients with traumatic brain injury and enteral nutrition" and showed that majority of individuals used antibiotic therapy. **From the researcher's opinion,** this result may be due hospitalization and increased risk for infection. It was observed that the vast majority of patients took **sedative or analgesic agents**. The findings are matching with **(Pinto et al, 2012)** who studied "Tolerance to enteral nutrition therapy in traumatic brain injury patients" and showed that the use of sedatives is common after trauma. **From the researcher's opinion,** this result may be due severe pain after trauma and surgical operations. The highest percentage of **gastric residual volume** was zero to fifty cm through all shifts in the first, fourth, seventh and tenth day of patient's assessment however less than one fifth of patients within high gastric residual volume more than two hundred cm in the fourth and seventh days of assessment respectively. **From the researcher's opinion,** this result may be due to provision of prokinetic agents and proton pump inhibitors effectively. Results show that majority of patient manifested by equal to or more than two symptoms of enteral feeding intolerance. These findings are in line with **(Yahyapoor et al, 2021)** who studied "The prevalence and possible causes of enteral tube feeding intolerance in critically ill patients" and showed that the highest prevalence of enteral tube feeding intolerance was observed among the vast majority of patients on the second day which decreased in the following days and the lowest prevalence of ETFI was observed among more than one third of patients on seventh day. Only less than one fifth of them did not present with ETFI during the whole study period. **It was noticed that constipation, stress and bed rest**; there were common risks for enteral feeding intolerance. These findings are matching with **(Xu et al, 2017)** who studied "Identification of risk factors for enteral feeding intolerance screening in critically ill patients" and showed that near to three quarters of patients had constipation and more than one third of them had stress and prolonged bedrest. The present study reported that there was positive relationship and statistical significant differences between use of (sedative and analgesics, anticoagulant, proton pump inhibitors or antiemetic) and occurrence of vomiting, use of (antifungal, antiemetic, intestinal antiseptic or laxatives) and constipation, use of (albumin, intestinal antiseptic) and diarrhea, use of laxatives and flatulence, use of (ant flatulent, albumin, intestinal antiseptic or laxatives) and distension, use of (ant flatulent, antiemetic, albumin, intestinal antiseptic or laxatives). The findings are matching with **(Vieira, et al, 2018)** who studied "Incidence of diarrhea and associated risk factors in patients with traumatic brain injury and enteral nutrition" and showed that most of individuals used antibiotic therapy, of these near to three quarter percent had diarrhea. **This may be due to** broad- spectrum antibiotics induce an imbalance in gastrointestinal flora and cause gastrointestinal dysfunction which manifested by feeding intolerance. These findings are also in line with **(Pinto et al, 2012)** who studied "Tolerance to enteral nutrition therapy in traumatic brain injury patients" and showed that the use of sedatives is common after trauma and Unfortunately, sedatives slow gastric emptying and increase the likelihood of feeding intolerance. **This result may be due to** analgesics, such as opioids can affect the movement of the upper gastrointestinal tract and may cause delayed gastric emptying. Sedatives such as propofol, may delay gastric emptying, increase gastrointestinal transit time and affect the gastrointestinal motility. As regarding to **enteral feeding intolerance manifestations**; results shows that more than two thirds of patients suffered from **vomiting and abdominal distension.** These findings were supported by **(Liu et al, 2021)** who studied "Feeding intolerance in critically ill patients with COVID-19" and showed that Feeding intolerance developed in patients and more than sixty percent were commonly manifested by abdominal distension and vomiting. Also, more than one third of patients suffered from **diarrhea**. These findings are matching with **(Kadamani et al, 2014)** who studied "Incidence of aspiration and gastrointestinal complications in critically ill patients using continuous versus bolus infusion of enteral nutrition" and showed that incidence of diarrhea was more than thirty percent and greater in the bolus enteral nutrition method than in the continuous enteral nutrition method. Results delineated that more than two thirds of patients

experienced **constipation**. These findings were supported by **(Vincent et al, 2015)** who studied "Getting Critical about Constipation" and showed that Constipation has been reported to occur in 5 – 90.5% of patients depending on the specific population studied and the definition used. **Results reported that** more than two thirds of patients experienced **straining and flatulence**. These findings were supported by **(Jalanka et al, 2018)** who studied "The long-term effects of fecal microbiota transplantation for gastrointestinal symptoms and general health in patients with recurrent Clostridium difficile infection" and showed that the most commonly experienced symptom was flatulence in more than half of patients in a group and more than two thirds in another group. **This may be due to** presence of constipation and gastrointestinal disturbance. **From the researcher's opinion,** this result may be due to bed rest, lack of activity, diet habits changes and gastrointestinal motility is a complex process, which is often altered during critical illness that may lead to these manifestations. The study results clarified that there was positive correlation and statistical significance difference between patient's age and all manifestations of enteral feeding intolerance as constipation, flatulence, diarrhea, distension and straining. These findings in line with **(Forootan et al, 2018)** who studied that "Chronic constipation" and documented that physiological conditions (e.g., age) have been revealed to increase the risk of constipation and weak or absent bowel sounds. Moreover, a number of diseases are also associated with reduced movement, such as spinal cord injury or musculoskeletal disorders are also common causes of this condition. The study results delineated that there was positive relationship and statistical significant difference between respiratory disorder and constipation, (trauma, neurological) and (constipation, flatulence), GIT disorder and neurological disorders with (constipation, diarrhea, flatulence), endocrine disease and diarrhea, cardiovascular disorders and all manifestations. These findings in line with **(Forootan et al, 2018)** who studied that "Chronic constipation" and reported that neurological disorders: multiple sclerosis, stroke, spinal cord injury and autonomic neuropathy, endocrine and metabolic conditions: diabetes mellitus, hypercalcemia, hypothyroidism, hyperthyroidism are causes of constipation.

Conclusion:

Based on the results of this study, it was concluded that the majority of patients manifested by equal to or more than two symptoms of enteral feeding intolerance. Of them, more than two thirds of patients suffered from vomiting, constipation, flatulence, abdominal distention and straining while more than one third of patients suffered from diarrhea and there were several risk factors for feeding intolerance as constipation, stress, bed rest and use of medications as antibiotics and analgesics.

Recommendations:

Based on the study findings, further research studies and in-service education for critical care nurses regarding to proper nutrition, assessment of enteral feeding intolerance among critically ill patient from time of admission.

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