Contents lists available at www.innovativejournal.in

INTERNATIONAL JOURNAL OF NURSING DIDACTICS

Homepage: http://innovativejournal.in/index.php/ijnd

ISSN: 2231-5454

Effect of Evidence-Based Enteral NutritionProtocol on Complications Prevention among Trauma Patients

[1] Lobna Mohammed Gamal & [2] Reda Mohamed El-Sayed Ramadan

(1) Assistant Professor of Medical-Surgical Nursing Department, Faculty of Nursing El - Minia University. Egypt
(2) Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Ain Shams University. Egypt

DOI: https://doi.org/10.15520/ijnd.v9i02.2437

Abstract: Trauma injury is the leading cause of mortality and hospitalization worldwide and the leading cause of potential years of productive life lost. Hypercatabolism after trauma may lead to acute protein malnutrition that ultimately results in multiple organ failure. Therefore, nutritional support is an essential component of the care of critical trauma patients for optimizing outcomes. Evidence-based practice improves the quality of care through patient-centered care, the utilization of patient resources, provider resources and experiences, current research and scientific information. **The main objective**; of this study was to assess and evaluate the effect of evidence-based enteral nutrition (EN) protocol on complications prevention among trauma patients. The **research hypothesis**; evidence-based enteral nutrition protocol will prevent complications among trauma patients. **The study subjects** consisted of 50 adult patients diagnosed with trauma and divided equally into two groups; control group who received the routine hospital nutrition and study group who received evidence-based enteral nutrition protocol at the Intensive Care Unit (ICU) El-Minia University Hospital. **The tools of data collection** were; 1) Assessment sheet, it includes two parts, 1st part included socio-demographic data of the patient. 2nd part included five items that cover medical data, 2) Evidence-based enteral nutrition protocol, and 3) Evaluation sheet, it includes two parts, 1st part included the laboratory investigations. 2nd part covers the vital signs. ***Results:*** This study revealed that the majority of the control group less than thirty years old compared to study group equal or more than forty years old. There are statistically significant differences regarding mouth condition, severe infection, and nutritional assessment, among study and control groups. The result also revealed that the highest percent regarding the time of start enteral feeding and body positioning were among the study group. ***Conclusion:*** Evidence-based enteral nutrition protocol had significantly prevention of complications among trauma patients. ***Recommendation:*** Hospital should be following evidence-based enteral nutrition protocol to prevent complications among trauma patients at intensive care unit.

Keyword: Trauma, Enteral Nutrition, Evidence-Based, Complications.

INTRODUCTION

Trauma is the leading cause of death for individuals up to the age of 45 years and is the fourth leading cause of death overall for all ages **(The American Association for the Surgery of Trauma, 2018).** This is one of the highest per capita rates in the world **(Hardcastle et al., 2013)**. (**American Psychological Association, 2018)** defined trauma as an emotional response to a terrible event like an accident, rape or natural disaster. Immediately after the event, shock and denial are typical. Longer term reactions include unpredictable emotions, flashbacks, strained relationships and even physical symptoms like headaches or nausea.

Traumatic injury is caused by various forces from outside of the body, which can either be blunt or penetrating (sharp). Blunt trauma includes falls, road traffic crashes; crush injuries, assaults (punches, kicks) and burns. Penetrating trauma involves shooting, stabbing or falling onto a sharp object (known as impalement) **(Center for Trauma Sciences, 2018)**.

Severe trauma is often accompanied by damage to the intestinal barrier. It has been reported that the administration of enteral nutrition reduces damage to the gut barrier function and maintains associated lymphoid tissue mass and function (**Wernerman et al., 2001 and Anastsilakis et al., 2013)**.

Nutritional support is now considered as a standard of care for intensive care unit patients and has been the first-line choice for more than two decades. The generally accepted goals of nutritional delivery in critically ill patients are to provide nutritional therapy consistent with the patient's condition, prevent nutrient deficiencies, avoid complications related to nutrition delivery, and improve patient outcome **(Quenot et al, 2010)**.

Critically ill patients who cannot consume an oral diet, enteral nutrition is recommended rather than parenteral nutrition because the incidence of infectious complications and length of intensive care unit (ICU) stay are lower with enteral nutrition. **(Elke et al, 2016)**. In case of enteral nutrition, feeding should be started early within the first 24 - 48 hours following admission to facilitate diet tolerance, reduce the risk of intestinal barrier dysfunction and infections, and reduce the length of hospital stay and mechanical ventilation **(Fernandez-Ortega et al., 2011)**

Enteral nutrition (EN) generally refers to any method of feeding that uses the gastrointestinal (GI) tract to deliver part or all of a person's caloric requirements. It can include a normal oral diet, the use of liquid supplements or delivery of part or all of the daily requirements by use of a tube **(American College of Gastroenterology, 2018).** One type of tube can be placed through the nose into the stomach or

small intestine. This tube is called a nasogastric or nasoenteral feeding tube. Sometimes the tube is placed directly through the skin into the stomach or small intestine. This is called a gastrostomy or jejunostomy tube. **(American Society for Parenteral and Enteral Nutrition, 2018)**

When selecting a tube formula, nutrient requirements, the patient's clinical status, the location of enteral access, gastrointestinal function, cost, and duration must all be considered. Numerous tubes feeding solutions are available for enteral nutrition, with many designed to assist in the management of a specific disease process; however, no single formula is ideal for all patients. All contain proteins, carbohydrates, fats, vitamins, minerals, trace elements, and water. The difference lies in how these nutrients are structured and delivered. **(Patricia &Dorrie, 2009)**

Accurate determination of the patients' energy requirements is of great importance, as nutrition support including optimal energy supply, is a key component for a positive clinical outcome **(Weijs&Wischmeyer, 2013)**. Several enteral nutrition practices are directly influenced by nurses, including the timing of prompting physicians to implement feeding, timeliness of increasing the rate of administration of formula to reach the desired nutritional goals, interruptions in feeding, elevation of the head of the bed, and preventing occlusions of feeding tubes. The number of such interventions suggests that nurses' knowledge related to enteral nutrition is essential to achieve optimal outcomes for patients. The number of such interventions suggests that nurses' knowledge related to enteral nutrition is essential to achieve optimal outcomes for patients. **(Wentzel et al., 2006)**

Elevating the head of the bed to a minimum of 30° to 45° to reduce the risk of microaspiration, Elevation to 30° is an accepted standard of care for patients receiving mechanical ventilation to minimize the risk of ventilator-associated pneumonia**. (Critical Care Nutrition, 2007)**. Critical care nurses are also responsible for ascertaining enteral nutrition volume and quality of given formulae **(Swanson & Winkelman, 2002; Smith & Watson, 2005; Higgins et al., 2006)** .Gaps in nursing practice are increased due to the inadequacy of adherence to evidence-based protocol **(Braga et al., 2006; Aari et al., 2008).**

Evidence-based practice (EBP) has been described as doing the right things right and doing things efficiently to the best standard possible, while ensuring that what is done is of known effectiveness **(Craig & Smyth, 2012)**. It is universally defined as: "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient" **(Sackett et al., 1996)**. Continual development of nurses' skills in EBP can help them integrate patient preferences into practice and deliver patient-centered care **(Burman et al., 2013).**

THE AIM OF THE STUDY

To assess and evaluate the effect ofevidence-based enteral nutritionprotocol on complications prevention for patients with trauma.

Research Hypothesis:

Evidence-based enteral nutritionprotocol will be preventing complications among trauma patients.

Research Design:

A quasi-experimental research design was adopted to conduct this study.

Variables:

- Independent variable is the use of evidence-based enteral nutritionprotocol.
- Dependent variable is: complications prevention among trauma patients at intensive care unit.

Setting:

The study was conducted at the Intensive Care Unit of El-MiniaUniversity Hospital. The intensive care unit is located on the second floor; it consists of three rooms with a total bed capacity of 13 beds.

Sample:

A purposive sampleof 50 adult patients (male and female) were randomly selected and divided equally into two groups (control group and study group). The sample size was estimated with STATA 10 program. The estimated required sample size was 25 patients in each group, to achieve the power of study 80%, power = 0-8000 and alpha=0.0500.

Inclusion Criteria:

All adult (18-60 years) trauma patients admitted in ICU and connected with mechanical ventilation for at least 3 days and have no contraindication for enteral feeding.

Exclusion Criteria:

The study excluded all patients who were admitted with gastrointestinal bleeding, ileus, suspected perforation, abdominal surgery, chronic diseases " hypertension, diabetes, COPD" and patients receiving non-invasive mechanical ventilation or parenteral nutrition

Tools for data collection:

Three tools were designed and used by the researcher for collecting data for this study.

1. First Tool:

Is an assessment sheet, it includes two parts, **1st part** included socio-demographic data of the patient as name, age, sex, and level of education, **2nd part**included five items in the form of checklist that covers medical data like type of trauma, reason for admission and use of mechanical ventilation (MV), the risk factors for trauma complications, physical signs of malnutrition, and the nutritional assessment

2. Second Tool:

Evidence-based enteral nutritionprotocol was developed by the researcherafter reviewing the related literature. It included eight-item (in the form of checklist) covers: time to start enteral feeding, formula selection, body positioning, route and rate of administration, avoidance of bacterial contamination, assessing the gastric residual volume before

feeding, the use of the prokinetic agents, prevention of tube occlusions**(American Society for Parenteral and Enteral Nutrition, 2018; Dietitians Association of Australia, 2018 and National Institute for Health and Care Excellence,2018).** The reliability test was done whereas Cronbach's Alpha equal 0.707

3. Third Tool:

Evaluation sheet, it includes two parts, **1st part** included thelaboratory investigations as total leukocytes count (TLC), albumin, Urea, creatinine, electrolyte" sodium (Na), potassium (K), ", liver function Serum glutamic oxaloacetic transaminase (SGOT), Serum glutamic pyruvic transaminase (SGPT), Random blood sugar (RBS), and Hemoglobin (HB). **2nd part** covers the vital signs (Temperature, Pulse, and BP).

Pilot Study:

A pilot study was carried out on (10% of the sample) a number of five patients to test the clarity, validity, and applicability of the tools. Appropriate modifications were done prior to data collection for the actual study. The patients who included in the pilot study were excluded from the study sample.

Fieldwork:

The study was applied after the official approval for data collection was obtained from the head of the intensive care unit, and informed consent was obtained from relatives of the patients for the study (unconscious patient).The data collection period was for 12 months, starting from the beginning of January 2018 to the end of August 2018. The data were collected from the second day of admission after stabilization of the patient's condition and for seven consequent days, three shifts then the data were recorded in the developer tools. The study was conducted through threeconsecutive phases: interviewing and assessment phase, implementation phase, and evaluation phase.

Interviewing and Assessment Phase:

During the first visit in intensive care unit, the researcher explains to relatives of the patients for the study (unconscious patient) importance of evidence-based enteral nutrition protocol as an essential component for complications prevention and for optimizing outcomes for patients.

Implementation Phase:

The Control Group:

The researcher assessed the trauma patients connected with the mechanical ventilation who received the routine hospital nursing care (such as assess the patient nutritional status before feeding; start the feeding within 48hrs, the patients were fed 2 cups of yogurt and 1 cup of juice in the breakfast and dinner but in the lunch the patients were fed a blenderized meal consists of 1 cup of vegetables, quarter chicken, 1 piece of fruit and 1 cup of rice; elevate the head of bed 30 degree, administer feeding by the bolus route 200 ml every 4 hours, not change bedside formula container every 24 hours, assess the gastric residual volume (GRV), not administer the prokinetic agent if the GRV was elevated, flush the feeding tube with 50 ml water after feeding, not to monitor the patient for feeding intolerance) during the different shifts using **tool one: (1st and** 2nd **part).** The researcher assessed the patient's sociodemographic data from his file then the medical data for the type of trauma, the reasonfor admission and intubation, laboratory investigation by using a checklist.

The researcher assessed the patient for the presence of any risk factors that might lead to trauma complication as the presence of infection (pneumonia, line sepsis or wound), the presence of any physical signs of malnutrition (the condition of mouth, skin and capillary refill)

The Study Group:

The researcher assessed the trauma patients connected with the mechanical ventilation from the second day of admission until the seventh day of the study during three shifts using **Tool One (1st and 2nd part).** Which include the assessment of the patient for the presence of any risk factors that might lead to trauma complication as conducted in the control group.

Then the patient exposed to evidence-based enteral nutrition protocol in order to prevent complications of trauma as included in **tool two,** which covers the following measures:

Enteral nutrition was started within 24 hours when the patients were fully resuscitated, using the standard blenderized polymeric formula (100% complete diet) , patients were bolus fed (every 4h, 5 times per day), the head of bed was elevated 45°, the top of formula cans was wiped with alcohol and the bedside formula container was routinely changed every 24 hours, the gastric residual volume was assessed before feeding, the feeding tube was flushed with 30 mL water before and after intermittent feeding.

The researcher provided the nursing protocol in the morning and evening shifts, while the researcher educates the internship critical care nurses those were involved in providing direct patients care in the ICU to implement evidence-based enteral nutritionprotocol at the night shift.

Evaluation Phase:

Evaluation of Both Groups (Control and Study):

Both groups were evaluated daily during the three shifts using **tool three (1st and 2nd part)**: **1st** vital signs (Temperature, Pulse, and BP) were assessed every 2 hours according to the unit policy and to detect any abnormalities.
2nd Laboratory Investigations such as Total Leukocytes Count, Albumin, Urea, Creatinine, Serum glutamic oxaloacetic transaminase (SGOT), Serum glutamic pyruvic transaminase (SGPT), Sodium (Na), Potassium (K), Random blood sugar (RBS), and Hemoglobin (HB) were done at the second day of admission and repeated at the seventh day of the study to detect the presence of malnutrition and to determine the effect of the implemented nursingenteral feedingprotocol in the reduction of complications.

Strengths and Limitations:

Drop out of ten patients from the sample because of the high mortality rate. The most important was that we didn't enable to weight patients and calculate the body mass index as there was no facility in the hospital to do so. However,

despite these limitations, the present results described the way enteral nutrition should administer in the ICU and may be helpful to other intensive care units as they review their processes and remain aware of the different aspects that contribute to the delivery of enteral nutrition.

Ethical and Administrative Considerations:

Approval from hospital administration was obtained from the intended hospital, relatives of the patients for the study (unconscious patient). Written consent was obtained prior to the administration of the questionnaire, after clarifyingthe purpose of the current study. The researcher emphasized their rights to refuse participation and to withdraw at any time from the study. Confidentiality of data was ensured.

Statistical Analysis:

The collected data were coded, analyzed using statistical package for social sciences (SPSS) software version 16 and tabulated. Descriptive statistics as Numbers, Percent, Mean, Standard Deviation and the T-test were used. Regarding P value, it was considered that: non-significant (NS) if P > 0.05, Significant (S) if P < 0.05.

RESULTS

The finding of the study will be presented in four main parts;

- ***Part One:***This covers the sociodemographic characteristics of the studied groups in the table (1) which shows the sociodemographic characteristics in regarding age, sex, occupation, education,and marital status.
- ***Part Two:***Distribution of both group regarding to their medical data presented in table (2) which distributed to table (2A) that covers the type of trauma and reason for admission, (2B) that covers the risk factors for trauma complications, (2C) which covers the assessment of mouth condition as a sign of malnutrition, (2D) which covers the assessment of skin condition as a sign of malnutrition, (2E) which covers a comparison of both groups in relation to nutritional assessment.
- ***Part Three:*** Comparison the effect of implemented evidence-based enteral nutritionprotocol regarding to time of start enteral feeding, formula selection, body positioning, route and rate of administration, avoidance of bacterial contamination, gastric residual volume, use of the prokinetic agents, and prevention of tube occlusions, which presented in table (3).
- ***Part Four:*** Comparison between both groups regarding laboratory investigations which covers the results of TLC, HB, RBS, Na, K, albumin, urea, creatinine, SGOT, and SGPT that was presented in table (4)
- ***Part Five:***Final part comparison between both groups in relation to vital signs (temperature, pulse, blood pressure) that was presented in table (5)

Part One:

Table (1): Distribution of Both Groups Regarding Their Socio-demographic Characteristics

Socio-demographic Characteristics	Control (n= 25)		Study (n= 25)	
	No.	%	No.	%
Age: (years)				
< 30	14	56.0	8	32.0
30 - < 40	3	12.0	5	20.0
≥ 40	8	32.0	12	48.0
Mean ± SD	35.52 ± 15.51		39.88 ± 16.18	
Sex:				
Male	20	80.0	19	76.0
Female	5	20.0	6	24.0
Occupation:				
Student	9	36.0	6	24.0
Employer	11	44.0	5	20.0
Retired	1	4.0	2	8.0
Farmer	1	4.0	8	32.0
Housewife	3	12.0	4	16.0
Level of Education:				
Illiterate/ read & write	5	20.0	14	56.0
Secondary	9	36.0	4	16.0
University	11	44.0	7	28.0
Marital Status:				
Single	12	48.0	7	28.0
Married	13	52.0	18	72.0

Chi-square test • Independent samples t-test *** Statistically significant difference (P < 0.05)**

Table (1): Shows Distribution of Both Groups regarding Sociodemographic characteristics in relation to age it was found that the Mean ± SD of the study group was (39.88 ± 16.18) compared to control group (35.52 ± 15.51). Regarding sex, it was found that the highest percentages of the control group were male (80.0%), compared to the study group (76.0%). As for occupational data it was observed that the highest percentage of the control group were the employer (44.0%), compared to the study group (20.0%). Regarding the level of education, it was found that the majorities of the study group were Illiterate/ read & write (56.0 %) and the majority of the control group was educated (44.0%). For the marital status, the highest percentage were married it was (72.0%) in the study group and (52.0%) in the control group.

Part Two:

Table 2 (A): Distribution of Both Groups Regarding the Type of Trauma and Reason for Admission

Type of Trauma and Reason for Admission	Control (n= 25)		Study (n= 25)		P-value
	No.	%	No.	%	
Type of Trauma:					1.000
Single	20	80.0	20	80.0	
Multiple	5	20.0	5	20.0	
Reason for Admission and Use of MV:					0.758
Cardiopulmonary Arrest	8	32.0	7	28.0	
Traumatic head Injury	17	68.0	18	72.0	

Chi-square test • Independent samples t-test *** Statistically significant difference (P < 0.05)**

Table 2 (A): Shows distribution of both groups according to types of trauma it was noticed that the majority of both groups (control and study) were having an equal percentage for single trauma (80.0%) and having an equal percentage for multiple trauma (20.0%). Regarding the reason for admission and use of MV the present study represented that highest percentage of the study group (72.0%) had admitted with a traumatic head injury, compared to control group (68.0%).

Table 2 (B): Distribution of Both Groups According to Risk Factors for Trauma Complications

Presence of Infection	Control (n= 25)		Study (n= 25)		P-value
	No.	%	No.	%	
Major Infections:					0.637
Pneumonia	2	8.0	3	12.0	
None	23	92.0	22	88.0	
Minor Infections:					0.055
Line sepsis	2	8.0	7	28.0	
Wound	9	36.0	3	12.0	
Both	14	56.0	15	60.0	

Chi-square test • Independent samples t-test *** Statistically significant difference (P < 0.05)**

Table 2 (B): Shows distribution of both groups according to the risk factors for trauma complications, the results revealed that there were no major infections in both study & control groups. Regarding the minor infections, it was observed that both study & control groups have the highest percentage for both line sepsis and wound 60.0%, 56.0% respectively among study and control group.

Table 2 (C): Comparison Between the Study and Control Groups Regarding Mouth Condition as a Sign of Malnutrition on the Second Day

The condition of The Mouth	Control (n= 25)		Study (n= 25)		P-value
	No.	%	No.	%	
The 2nd day:					0.546
Healthy	21	84.0	19	76.0	
Coated mouth, no infection	4	16.0	5	20.0	
Poor fitting	0	0.0	1	4.0	
Severe infection	0	0.0	0	0.0	

Chi-square test • Independent samples t-test *** Statistically significant difference (P < 0.05)**

Table 2 (C): Displayed that 76.0%, 84.0% respectively among study and control groups were healthy mouth atthe second day. The table also showed severe infection, it was found that both study and control groups have the same percentage regarding severe infection 0%.

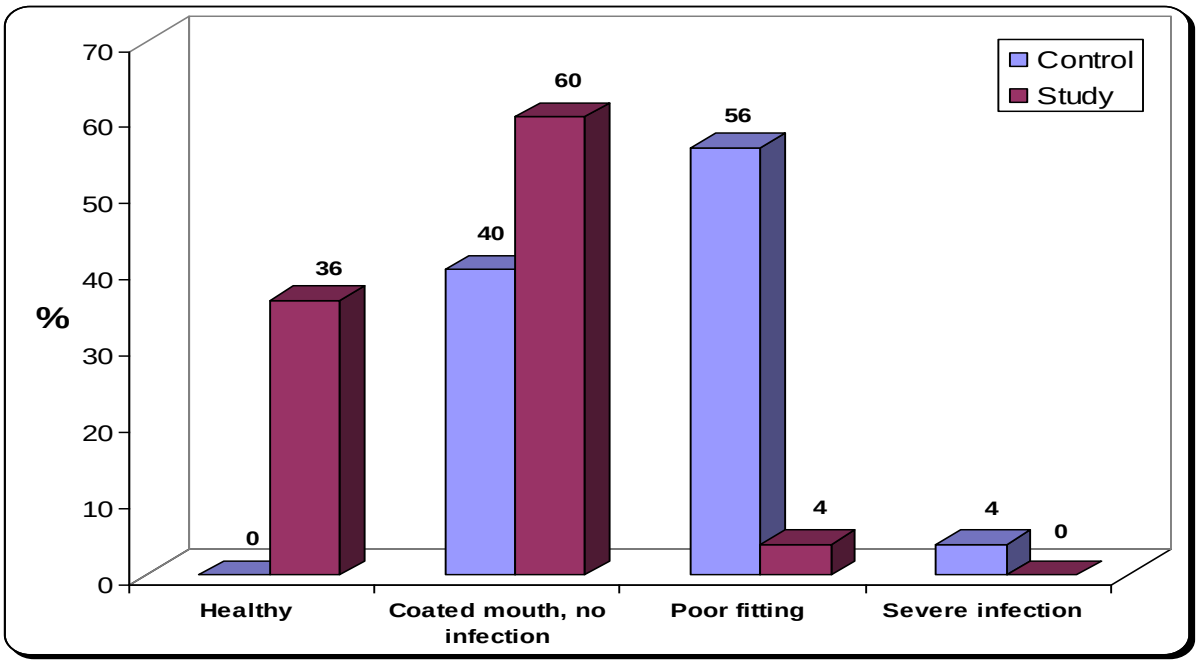

Figure (1): Distribution Percent of Both Groups Regarding Assessment of Mouth Condition as a Sign of Malnutrition on the Seventh Day

Figure (1) clarifies that; 36. 0%, 0.0 % respectively among the study group and control were a healthy mouth on the seventh day. Concerning severe infection, it was found that 0.0%, 4.0%, respectively among study and control group. Finally, the **figure** showed statistically significant differences between both groups regarding mouth condition.

Table 2 (D): Comparison Between the Study and Control Groups Regarding their Skin Condition as a Sign of Malnutrition on the Second Day

The condition of the Skin	Control (n= 25)		Study (n= 25)		P-value
	No.	%	No.	%	
The 2nd day:					0.415
Red and intact	23	92.0	20	80.0	
Superficial breakdown	2	8.0	5	20.0	
Breakdown, infection	0	0.0	0	0.0	

Chi-square test • Independent samples t-test *** Statistically significant difference (P < 0.05)**

Table 2 (D): Showed that there was no statistically significant difference between both study and control groups regarding condition of the skin on the second day.

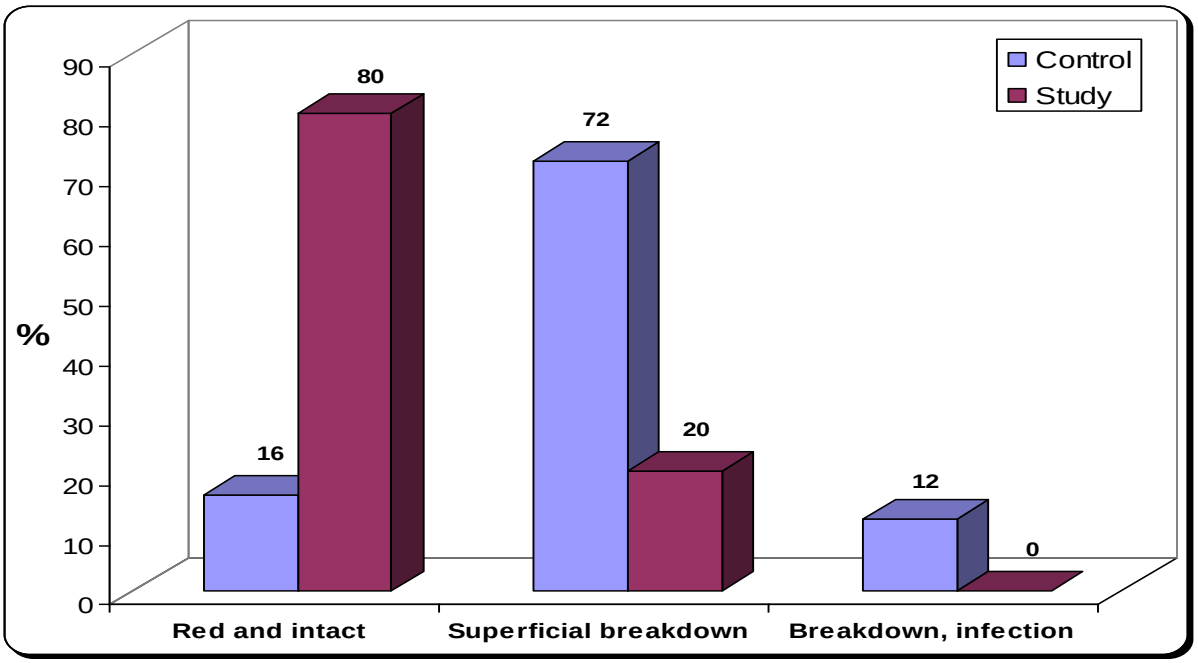

Figure (2): Distribution of Both Groups Regarding Assessment of Skin Condition on the Seventh Day

Figure (2): reveals statistically significant differences between both study and control groups regarding tocondition of the skin on the seventh day, evidenced by p-value = 0.000*

Table 2 (E): Comparison Between the Study and Control Groups Regarding their Nutritional Assessment

Nutritional Assessment	Control (n= 25)	Study (n= 25)	P-value[1]
	Mean ± SD	Mean ± SD	
Triceps Skin Fold Thickness:			
In the 2nd day	0.84 ± 0.30	0.92 ± 0.29	0.343
In the 7th day	0.76 ± 0.27	1.00 ± 0.28	0.002*
P-value[2]	0.008*	0.004*	
Upper Mid Arm Circumference:			
In the 2nd day	30.21 ± 3.48	31.93 ± 2.94	0.066
In the 7th day	29.76 ± 3.51	32.03 ± 2.90	0.017*
P-value[2]	0.000*	0.099	

1: Independent sample t-test 2: Paired samples t-test *Statistically significant difference (P < 0.05)

Table 2 (E): Revealed that, there was some increase in the mean values of the nutritional assessment among the study group. Regarding to the triceps skinfold thickness it was found that the mean ± SD of the control group on the second day was (0.84 ± 0.30) and (0.76 ± 0.27) in the seventh day while found that the mean ± SD of the study group the second day was (0.92 ± 0.29) and (1.00 ± 0.28) on the seventh day. Regarding to the upper mid-arm circumference it was found that the mean ± SD of the control group in the second day was (30.21 ± 3.48) and (29.76 ± 3.51) in the seventh day while the mean ± SD of the study group was in the second day was (31.93 ± 2.94) and (32.03 ± 2.90) in the seventh day. The result revealed that a statistically significant difference found between both groups.

Part Three:

Table 3: Comparison Between the Study and Control Groups Regarding toevidence-based enteral nutritionprotocol

Evidence-based enteral nutritionprotocol	Control (n= 25)		Study (n= 25)		P-value
	No.	%	No.	%	
Time of Start Enteral Feeding:					
Start feeding within the 1st 24 hours of admission	13	52.0	25	100.0	0.000*
Start feeding when patient if fully resuscitated and in stable hemodynamic condition					
Formula Selection:					
Standard polymeric formula → 100% complete diet	0	0.0	25	100.0	0.000*
Body Positioning:					
Elevate the head of the bed 30 – 45°	20	80.0	25	100.0	0.018*
Route and Rate of Administration:					
Intermittent bolus; start with 50 ml/ bolus every 3 hours	0	0.0	25	100.0	0.000*
Advance by 100 ml every feed every 24 hours	0	0.0	25	100.0	0.000*
The suggested maximum volume/ day → 200-250 ml/ 3 hours	0	0.0	25	100.0	0.000*
Avoidance of Bacterial Contamination:					
Wipe top of formula cans with alcohol	0	0.0	25	100.0	0.000*
Routinely change beside formula container every 24 hours	6	24.0	25	100.0	0.000*
Gastric Residual Volume:					
Gastric residual volume ≤ 200 mL	7	28.0	20	80.0	0.014*
Gastric residual volume > 200 mL	18	72.0	5	20.0	0.000*
Prokinetic Agents:					
Give metoclopramide 10 mg intravenously every 6 hours if gastric residual volume remains high	0	0.0	5	20.0	0.059
Prevention of Tube Occlusions:					
Flush tube with 30 mL water before and after intermittent feeding	17	68.0	25	100.0	0.002*

Chi-square test • Independent samples t-test * Statistically significant difference (P < 0.05)

Table 3: Revealed that statisticallysignificant difference was found among both groups regarding the time of start enteral feeding, formula selection, body positioning, route and rate of administration, avoidance of bacterial contamination, gastric residual volume, and prevention of tube occlusions**.**

Part Four:

Table 4: Comparison Between the Study and Control Groups Regarding to Laboratory Investigations

Laboratory Investigations		Control (n= 25)	Study (n= 25)	P-value[1]
		Mean ± SD	Mean ± SD	
TLC	2nd day	10882.4 ± 2623.4	11660.0 ± 4114.1	0.429
	7th day	14110.0 ± 6117.3	8520.0 ± 2160.4	0.167
	P-value[2]	0.014*	0.000*	
HB	2nd day	11.47 ± 1.68	10.87 ± 1.33	0.002*
	7th day	10.58 ± 1.28	11.64 ± 0.84	0.573
	P-value[2]	0.001*	0.000*	
RBS	2nd day	133.64 ± 42.42	133.72 ± 34.63	0.009*
	7th day	148.76 ± 45.08	130.68 ± 34.65	0.219
	P-value[2]	0.112	0.675	
Na	2nd day	145.12 ± 5.62	144.48 ± 4.87	0.136
	7th day	144.04 ± 4.99	145.68 ± 4.97	0.118
	P-value[2]	0.279	0.244	
K	2nd day	3.91 ± 0.81	3.82 ± 0.50	0.250
	7th day	3.88 ± 0.48	4.09 ± 0.43	0.113
	P-value[2]	0.846	0.010*	
Albumin	2nd day	3.80 ± 0.50	3.35 ± 0.48	0.277
	7th day	2.97 ± 0.45	3.90 ± 0.45	0.150
	P-value[2]	0.000*	0.000*	
Urea	2nd day	45.56 ± 24.75	50.08 ± 31.18	0.917
	7th day	47.64 ± 12.85	42.48 ± 18.74	0.994
	P-value[2]	0.673	0.035*	
Creatinine	2nd day	1.08 ± 0.39	1.24 ± 0.62	0.669
	7th day	1.26 ± 0.34	1.02 ± 0.28	0.633
	P-value[2]	0.044*	0.023*	
SGOT	2nd day	54.36 ± 25.96	70.56 ± 48.94	0.000*
	7th day	66.92 ± 39.81	54.20 ± 31.95	0.001*
	P-value[2]	0.187	0.138	
SGPT	2nd day	74.36 ± 41.94	75.68 ± 46.96	0.000*
	7th day	73.28 ± 44.37	56.60 ± 32.60	0.262
	P-value[2]	0.874	0.015*	

1: Independent sample t-test 2: Paired samples t-test * Statistically significant difference (P < 0.05)

Table4: Represented that, a statisticalsignificant difference was found among both study and control groups regarding laboratory investigations as HB, RBCs, Albumin, Urea, Creatinine, SGOT, and SGPT during the 2nd & 7th day.

Table (5): Comparison Between the Study and Control Groups Regarding to Vital Signs

Vital Signs		Control (n= 25)	Study (n= 25)	P-value[1]
		Mean ± SD	Mean ± SD	
Temperature	2nd day	37.45 ± 0.69	37.38 ± 0.50	0.674
	7th day	37.44 ± 0.89	37.12 ± 0.40	0.112
	P-value[2]	0.934	0.062	
Pulse	2nd day	93.40 ± 19.32	96.16 ± 17.76	0.601
	7th day	94.48 ± 11.46	93.20 ± 8.06	0.65
	P-value[2]	0.810	0.472	
Systolic BP	2nd day	118.80 ± 18.78	122.80 ± 14.00	0.397
	7th day	115.20 ± 15.31	115.60 ± 11.21	0.916
	P-value[2]	0.395	0.021*	
Diastolic BP	2nd day	76.00 ± 12.58	80.40 ± 12.07	0.213
	7th day	73.20 ± 9.88	75.20 ± 7.14	0.416
	P-value[2]	0.337	0.034*	

1: Independent sample t-test 2: Paired samples t-test* Statistically significant difference (P< 0.05)

Table (5): Revealed that there were not statistically significant differences among both study and control groups regarding temperature and pulse. While the finding showed that statistically significant differences were found among both study and control groups regarding the systolic and diastolic BP.

DISCUSSION

Early nutritional supports have the potential to reduce disease severity, diminish complications, and decrease the length of stay in the intensive care unit (ICU) and to favorably affect the patient outcome **(Martindale, 2009)**. Early enteral nutrition in trauma patients requiring intensive care decreases mortality rate **(Doig et al., 2011)**. EBP is now considered a standard of care and essential to nursing practitioner practice. The primary advantages of EBP

include improved quality of care through patient-centered care, the utilization of patient resources, provider resources and experiences, current research and scientific information **(Greiner and Knebel, 2003)**

From this concept of the importance of enteral nutrition in critically ill patients, this study was aiming to apply enteral nutritionprotocolin ICU, and make a comparison between using enteral nutritional protocol in one group (study group) and another group (control group) who receive the routine nutrition of the ICU in El-Minia University hospital.

In the current study used many parameters for the assessment and follow up of the patients like physical examination; in this aspect we assess the condition of the skin and the mouth which revealed a statistically significant difference between the two groups as showed in an improvement in the condition of the mouth and skin in the patients of the study group rather than in the control group. These were supported by (**Beckerson, et al, 2018**) who evaluate the impact of enteral nutrition on the mucosal integrity and the study demonstrates that enteral nutrition has the ability to maintain mucosal integrity and support the gastrointestinal tract environment, including gut microflora.

As regards to the triceps skinfold thickness and the upper mid-arm circumference. The comparison between the two groups as regards the above-mentioned parameters showed a significant difference between the two groups as shown in the increased measurement of the skinfold thickness and upper mid-arm circumference (UMAC) in the study group rather than in the control group. These were supported by (**FO Akinbami, et al, 2010)**, who examined the impact of nutritional status, by measured anthropometric indices and derived body composition, the study showed that survivors, on admissions, had significantly higher UMAC, abdominal skinfold thickness as well as a proportionately bigger upper arm cross-sectional area compared with those patients who died.

After that assessed and followed up the patients by biochemical studies which included (hemoglobin, total leukocyte count, electrolytes, blood glucose level, urea, creatinine, AST, ALT, and albumin). Statistical analysis of the results showed no significant difference between the two groups. These were supported by (**Albugami et al., 2015)**, who reported that there is no difference regarding albumin, urea, sodium, potassium, hemoglobin over 6, 12, 24 months for patients on long-term tube feeding.
The present study protocol recommends early enteral nutrition (started within 24-48 hours after admission in resuscitated patients and patients in stable condition). These recommendations are based on a trend toward a reduction in infectious complications, improvement in nutritional endpoints. This was supported by (**Elke et al, 2016**) who confirm that the use of enteral nutrition as compared to parenteral nutrition for critically ill patients has no effect on overall mortality but decreases infectious complications and length of stay. In the same context **(Yang et al., 2018)** mentioned that early enteral nutrition can improve nutritional status and promote intestinal function recovery for patients undergoing colorectal cancer surgery.

The present study revealed that the use of standard enteral formula have shown the appositive effect on maintaining skin integrity and prevent infections which were supported by **(Blanc et al, 2015)** who found that the use of early enteral feeding with standard or supplemented diets have a statisticalsignificant in the improvement of open acute wound healing. Also, supported by **(Cox & Rasmussen, 2014),** who reported that use of enteral feeding protocols may provide vital elements to augment nutrition and ultimately result in improved clinical outcomes.

The present study protocol recommended the use of the intermittent bolus method for feeding which was supported by (**Mohamed et al., 2013**) who confirms that intermittent 4-hour interval enteral feeding schedule inhibit the development of gastric colonization. In this respect, **(El-Hafez et al., 2013)** reported thatintermittent 4-hour enteral feeding schedule had lowered the incidence of gastrointestinal complication and length of the hospital stay.

The present study protocol revealed that the elevation of the patient head of bed about 30 – 45° prevent risk of aspiration and decrease infection which was supported by (**Schallom et al, 2015**) who mentioned that elevation head of bed greater than 30º is feasible and preferred to 30º for reducing oral secretion volume, reflux, and aspiration without pressure ulcer development in gastric-fed patients receiving mechanical ventilation while (**Linn et al, 2015**) added that enteral nutrition administered to patients in the supine has increased the rate of complications.

The current study confirmed that the EN formula containers should be wiped with alcohol and changed every 24 hrs this was supported by **(Boullata et al, 2017)** who found that wiping down can/bottle with alcohol and any remainingformula discarded within 24 hours of preparation demonstrated a reduction in microbial contamination of EN formula.

The current study revealed that the user of the standard protocol prevent the risk of aspiration as most patients have an acceptable level of gastric residual volume (GRV) (≤ 200 mL). This finding is not corresponding with (**Ozen et al., 2016)** who stated that, the use of gastric residual volume measurements may, therefore, be discontinued as part of the standard care protocol in medical intensive care units and **(Bartlett Ellis &Fuehne, 2015)** added that gastric residual volume assessment does not accurately reflect the total volume of the contents available.

The present study revealed the importance of using enteral feeding in maintaining mucosal integrity, prevent severe infections and prevent skin break down, that was supported by **(Wan et al., 2015)** who reported that supplementation of parenteral nutrition with 20% enteral nutrition preserves gut barrier function, by way of maintaining innate immunity, and intestinal microbiota. Also supported by (**Ralls et al., 2015**), who mentioned that epithelial barrier function declined in unfed segments of human small bowel and there is increased in the incidence of infectious complications in patients not receiving enteral feeds.

The present study used the GRV to assess the gastrointestinal tolerance to enteral feeding and the study revealed a statistical significance between the two groups (control & study) as the study group showed less high episodes of GRVs (5 patient only) but the control group have a higher incidence (12 patient) that was supported by (**Chapman et al., 2011**) they reported that elevated gastric residual volume is indicative of delayed gastric emptying that can be associated with increased risk of aspiration.

The present study revealed the importance of using enteral nutrition on the trauma patients connected to mechanical ventilation that was supported by (**Lofgren et al., 2015**) he revealed that patients with trauma in ICU benefit from early enteral nutrition.

The previously mentioned data reflects the quality of evidence-based enteral nutritionprotocol that delivered to the trauma patient connected to mechanical ventilation in the ICU, which needs much observation and evaluation for its accuracy. As nursing management of patients with enteral nutrition has a key role in ensuring the success of enteral nutrition.

CONCLUSION

Regarding the age, it was found that the fort eight percent of the study group had equal or more than forty years compared to control group fifty six percent less than thirty years. As regards sex current studyfound that the highest percentages of the control group were male eighty percent compared to the study group wasseventy-six percent. Regarding the level of education, it was found that the majorities of the study group were Illiterate/ read & write fifty-six percent and the majority of the control group was university education forty-four percent.

Based on the results of the present study it can be concluded thatthe applying of evidence-based enteral nutritionprotocolin trauma patient connected with mechanical ventilation was successful in reducing complications. The results revealed that the presence of a significant difference found between the control and study group in relation to the assessment of mouth condition, and in the condition of skin as red and intact and to breakdown and infection skin and in relation to nutritional assessment as triceps skinfold thickness and upper mid-arm circumference and in relation to following the enteral nutrition protocol. Regarding the laboratory investigations, the study revealed that statistical significance difference found between both groups regarding HB in second and seven dayand RBS in second day.

RECOMMENDATIONS

- Hospitals should define an ongoing quality control process of enteral nutrition formula preparation, distribution, storage, handling, and administration.
- The hospital should review their process of enteral feeding and implement a nutritional protocol to prevent complications among trauma patients connected to mechanical ventilation
- All health care professionals who directly involved in patient care should receive education and training on the importance of providing adequate nutrition.
- The hospital should increase its supplies and facilities to help the staff in providing a high quality of care
- Replication of the current study on a larger probability sample is recommended to achieve generalizability and wider utilization of evidence-based enteral nutritionprotocol.

REFERENCES

[1]. Aari R, Tarja S & Helena L (2008) Competence in intensive and critical care nursing: a literature review. Intensive & Critical Care Nursing 24, 78-89.

[2]. Albugami, M., Al Twaijri, Y., Ibrahim, A., Bassil, H., Laudon, U., El Karouri, M., ... &Motieb, A. (2015). Comparison between Four Types of Long-Term Tube Feeding Regarding Nutritional Effects, Complications,and Outcomes. Science, 4(3), 60-66.

[3]. American College of Gastroenterology. Enteral and Parenteral Nutrition. (2018). Available at: http://patients.gi.org/topics/enteral-and-parenteral-nutrition/

[4]. American Psychological Association. Trauma. (2018). Available at: https://www.apa.org/topics/trauma/

[5]. American Society for Parenteral and Enteral Nutrition. (2018). What Is Enteral Nutrition? Available at: https://www.nutritioncare.org/About_Clinical_Nutrition/What_is_Enteral_Nutrition/

[6]. Anastsilakis, C.D, Ionnidis, O. Gkiomisi, A.I, Botsiois, D. (2013). Artificial nutrition and intestinal mucosal barrier functionality. Digestion. 88(3):193-208.

[7]. Bartlett Ellis, R. J., &Fuehne, J. (2015). Examination of accuracy in the assessment of gastric residual volume: a simulated, controlled study. Journal of Parenteral and Enteral Nutrition, 39(4), 434-440.

[8]. Beckerson, J., Szydlo, R. M., Hickson, M., Mactier, C. E., Innes, A. J., Gabriel, I. H., ... &Rahemtulla, A. (2018). Impact of route and adequacy of nutritional intake on outcomes of allogeneic haematopoietic cell transplantation for haematologic malignancies. Clinical Nutrition.

[9]. Blanc, G., Meier, M. J., DorociakiStocco, J. H.,Crozeta, K., Barbosa, D. A. (2015). The effectiveness of Enteral Nutritional Therapy in the Healing Process of Pressure Ulcers: A Systematic Review. USP, 49(1).

[10]. Boullata, J. I., Carrera, A. L., Harvey, L., Escuro, A. A., Hudson, L., Mays, A., ... &Kinn, T. J. (2017). ASPEN safe practices for enteral nutrition therapy. *Journal of Parenteral and Enteral Nutrition*, *41*(1), 15-103.

[11]. Braga, J.M, Hunt, A., Pope, J., Molaison, E., Braga, J.M., Hunt, A., Pope, J. &Molaison, E. (2006) Implementation of dietitian recommendations for enteral nutrition results in improved outcomes. Journal of the American Dietetic Association 106, 281-284.

[12]. Burman, M.E., Robinson, B., Hart, A.M. (2013). Linking evidence-based nursing practice and patient-centered care through patient preferences. Nurs Adm Q. 37(3):231–41.

[13]. Center for Trauma Sciences. What is Trauma? (2018). Available at: http://www.aftertrauma.org/what-is-trauma/what-is-trauma

[14]. Chapman MJ, Besanko LK, Burgstad CM, et al. (2011). Gastric emptying of a liquid nutrient meal in the critically ill: the relationship between scintigraphic and carbon breath test measurement. Gut 60:1336-1343.

[15]. Cox, J., & Rasmussen, L. (2014). Enteral nutrition in the prevention and treatment of pressure ulcers in adult critical care patients. Critical care nurse, 34(6), 15-27.

[16]. Craig, J.V., Smyth, R.L. (2012). The evidence-based practice manual for nurses, 3rd edition. Edinburgh: Churchill Livingstone; 2012.

[17]. **Critical Care Nutrition, (2007):** Early vs. delayed nutrient intake. http://ccn.cissec.com/cpg /2.0_early_07.pdf. Published January 8, 2007..

[18]. Dietitians Association of Australia. Enteral nutrition manual for adults in health care facilities. (2018). Available at: https://daa.asn.au/wp-content/uploads/2018/06/Enteral-nutrition-manual-june-2018-website.pdf

[19]. Doig, G.S, Heighes, P.T, Simpson, F, Sweetman, E.A. (2011). Early enteral nutrition reduces mortality in trauma patients requiring intensive care: a meta-analysis of randomized controlled trials. Injury.42(1):50-56.

[20]. El-Hafez, A. I. A., Mohamed, W. Y., AbdelMageed, E., Mehany, M. M., & Mohammed, M. A. (2013). Effect of intermittent enteral feeding schedule on the occurrence of gastrointestinal complications and hospital stay among critically ill patients. Assiut Scientific Nursing Journal, 1(1).

[21]. Elke, G., van Zanten, A. R., Lemieux, M., McCall, M., Jeejeebhoy, K. N., Kott, M., ... &Heyland, D. K. (2016). Enteral versus parenteral nutrition in critically ill patients: an updated systematic review and meta-analysis of randomized controlled trials. Critical Care, 20(1), 117.

[22]. Fernandez-Ortega, J.F, Herrero Meseguer, J.I, Martinez, Garcia, P. (2011). Guidelines for specialized nutritional and metabolic support in the criticallyill patient. Update. The consensus of the Spanish Society of Intensive Care Medicine and Coronary Units-Spanish Society of Parenteral and Enteral Nutrition (SEMICYUC-SENPE): indications, timing,and routes of nutrient delivery] Med Intensiva. 31(1):7–11.

[23]. **FO Akinbami, et al, (2010):** Body mass composition: a predictor of admission outcomes, Asia Pac J Clin Nutr; Vol 19 (3), P 295-300.

[24]. Greiner, A.C. &Knebel, E. (2003). Institutes of Medicine. Health professions education: A bridge to quality. National Academy Press, Washington, D.C.

[25]. Hardcastle, T.C, Samuels, C., Muckart, D.J. (2013). An assessment of the hospital disease burden and the facilities for the in-hospital care of trauma in KwaZulu-Natal, South Africa. World J Surg. 37(7):1550-1561.

[26]. Higgins, P.A, Daly, B.J, Lipson, A.R. & Guo, S. (2006) Assessing nutritional status in chronically critically ill adult patients. *American Journal of Critical Care* 15, 166-177.

[27]. Linn, D. D., Beckett, R. D., &Foellinger, K. (2015). Administration of enteral nutrition to adult patients in the prone position. Intensive and Critical Care Nursing, 31(1), 38-43.

[28]. Lofgren, E., Mabesa, T., Hammarqvist, F., & Hardcastle, T. C. (2015). Early enteral nutrition compared to outcome in critically ill trauma patients at a level one trauma center. South African Journal of Clinical Nutrition, 28(2), 70-76.

[29]. Martindale RG., et al, (2009): Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition: Executive Summary. Crit Care Med, Vol 37, P1757–1761.

[30]. Mohamed, W. Y., AbdelMageed, E., Mehany, M. M., Mohammed, M. A., &El-Hafez, A. I. A. (2013). The Effect of two Schedules of Intermittent Enteral Feeding on the Development of Gastric Colonization. Journal of Education and practice, 4.

[31]. National Institute for Health and Care Excellence. Enteral tube feeding. (2018) Available at: https://pathways.nice.org.uk/pathways/nutrition-support-in…/enteral-tube-feeding.pdf

[32]. Ozen, N., Tosun, N., Yamanel, L., Altintas, N. D., Kilciler, G., &Ozen, V. (2016). Evaluation of the effect on patient parameters of not monitoring gastric residual volume in intensive care patients on a mechanical ventilator receiving enteral feeding: a randomized clinical trial. Journal of critical care, 33, 137-144.

[33]. Patricia, G. &Dorrie, K. (2009): Critical Care Nursing, A Holistic Approach, 9th Ed, Chapter 40, P 1017:1023.

[34]. Quenot et al, (2010): Bedside adherence to clinical practice guidelines for enteral nutrition in critically ill patients receiving mechanical ventilation, critical care nursing journal, Vol 14 (2), P1-7.

[35]. Ralls, M. W., Demehri, F. R., Feng, Y., Ignatoski, K. M. W., & Teitelbaum, D. H. (2015). Enteral nutrient deprivation in patients leads to a loss of intestinal epithelial barrier function. Surgery, 157(4), 732-742.

[36]. Sackett, D.L., Rosenburg, W.C., Muir, Gray, J.A., Haynes, R.B., Richardson, W.S.(1996). Evidence-based medicine, what it is and what it isn't. Br Med J. 312:71–2.

[37]. Schallom, M., Dykeman, B., Metheny, N., Kirby, J., & Pierce, J. (2015). Head-of-bed elevation and early outcomes of gastric reflux, aspiration and pressure ulcers: a feasibility study. American Journal of Critical Care, 24(1), 57-66.

[38]. Smith, G. & Watson, R. (2005). Gastrointestinal Nursing. Oxford: Blackwell Publishing.

[39]. Swanson, R.W. & Winkelman, C. (2002) Special Feature: Exploring the Benefits and Myths of Enteral Feeding in the Critically Ill. Critical Care Nursing Quarterly 24, 67-74.

[40]. The American Association for the Surgery of Trauma. Trauma Facts. (2018). Available at: http://www.aast.org/trauma-facts

[41]. Wan, X., Bi, J., Gao, X., Tian, F., Wang, X., Li, N., & Li, J. (2015). Partial enteral nutrition preserves elements of gut barrier function, including innate immunity, intestinal

alkaline phosphatase (IAP) level, and intestinal microbiota in mice. Nutrients, 7(8), 6294-6312.

[42]. Weijs, P. J., &Wischmeyer, P. E. (2013). Optimizing energy and protein balance in the ICU. Current Opinion in Clinical Nutrition & Metabolic Care, 16(2), 194-201.

[43]. Wentzel, M., Larsson, B.W., Lord, M.L., (2006): Enteral nutrition in intensive care: nurses' perceptions and bedside observations. Intensive Crit Care Nurs. Vol 22(2), P82-94.

[44]. Wernerman, J., Payne-James, J., Grimble, G. (2001). Nutrition support for the intensive care unit. Artificial nutrition support in clinical practice. 2nd ed. London: Greenwich Medical Media. p. 591-603.

[45]. Yang, F., Wei, L., Huo, X., Ding, Y., Zhou, X., & Liu, D. (2018). Effects of early postoperative enteral nutrition versus usual care on serum albumin, prealbumin, transferrin, time to first flatus and postoperative hospital stay for patients with colorectal cancer: A systematic review and meta-analysis. Contemporary nurse, 1-17.