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Assessment of Knowledge, Practices and Attitude Regarding
Enteral Nutrition among ICU Nurses in Palestine

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This thesis was submitted in partial fulfilment of the requirements
for the Master's degree in Intensive Care Nursing

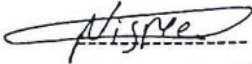
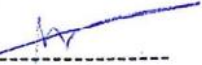

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Declaration

We declare that this thesis entitled “Assessment of knowledge, Practices and Attitude Regarding Enteral Nutrition among ICU Nurses in Palestine” was written by me for the fulfillment of requirements for the Master`s degree in Nursing under the guidance of Dr. Nisreen Salama.

The work provided in this thesis is the researcher`s own work and has not been submitted elsewhere for any other degree or qualification.

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Researcher: Manal Adawi

Abstract

Background: Enteral nutrition plays a crucial role in the care of critically ill patients admitted to Intensive Care Units (ICUs). It is recognized as a medical therapy in law and has an ethical consideration. Proper knowledge, practices, and attitudes among ICU nurses are essential for the effective delivery of enteral nutrition.

Aim: To assess the knowledge, practices and attitudes of enteral nutrition among ICU nurses in Palestine.

Method: A descriptive, cross-sectional design was conducted among 161 ICU nurses working in southern hospitals in Palestine. A structured questionnaire was used to collect data on the nurses' demographic information, knowledge of enteral nutrition guidelines, their practices in administering enteral nutrition, and their attitudes towards enteral nutrition. Data were analyzed using descriptive statistics, independent t-test, one-way ANOVA test, chi-square test and linear regression.

Result: The study reveals that the mean knowledge score among ICU nurses regarding the subject matter was inadequate, with an average score of 10.3 out of 20. Specifically, only 29.2% of the nurses demonstrated a good level of knowledge, while a mere 1.9% exhibited an excellent level of understanding. Nurses have a positive attitude and their practices were consistent somewhat with the guideline. However, attitudinal aspects revealed a generally positive disposition toward enteral nutrition. There were no significant differences between the means of nurse's knowledge level from private and governmental hospitals.

Conclusion: This study highlights both strengths and areas requiring attention in the knowledge, practices, and attitudes of ICU nurses regarding enteral nutrition in southern hospitals in Palestine. The findings underscore the importance of continued education and training for nurses to ensure consistent and evidence-based care for critically ill patients receiving enteral nutrition. Addressing these gaps in knowledge and practice can potentially improve patient outcomes and the quality of care provided in the ICU setting.

Keywords: Knowledge, practice, attitude, enteral Nutrition, ICU nurses

List of Abbreviations

Abbreviation	Full form
ICU	Intensive Care Unit
EN	Enteral Nutrition
PN	Parenteral Nutrition
EF	Enteral Feeding
ICCM	Intensive and Critical Care Medicine
FDA	Food and Drug Administration
GRV	Gastric Residual Volumes

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Chapter One

Introduction

1.1 Background of the Study

Nutrition is a top priority for patients in the hospital, especially those in the Intensive Care Unit (ICU). Lack of care for nutritional needs lead to a breakdown in skeletal muscle and fat metabolism, which in turn causes muscle weakness, particularly in the respiratory muscles, prolonged dependence on a ventilator, breathing and coughing disorders, and ultimately, infections and pneumonia in these patients (Fayazi et al., 2016). Hospitalized patients' morbidity and mortality rates are significantly increased by malnutrition, which affects up to 40% of them. Because of this, malnutrition can persist even after a patient is admitted to a hospital (Pearce, 2014).

Patients admitted to hospitals across the world have a 5% to 50% chance of being malnourished (Persenius et al., 2018). All hospitalized patients are required to have an initial nutrition screen within the first two days of their stay. Nonetheless, ICU patients who are at increased nutritional risk need a comprehensive nutrition examination (Mcclave et al., 2016). In medicine, the term "Enteral Nutrition" (EN) describes the feeding of a patient through a tube placed in his or her stomach, duodenum, or jejunum (Scott, 2015).

EN involves the oral ingestion of food components for certain medical needs, as well as the esophagus-based administration of nutrients via feeding tubes. It can be administered to those whose stomach is at least partially functional and whose nutritional demands and energy requirements cannot be met by a regular diet. To address their nutritional and physiological demands, EN is a vital intervention for critically ill patients. For critically

ill patients who need appropriate nutrition due to elevated metabolic rate and nutritional calories, it is the preferable method of food assistance. It should not be stopped or suspended until ethical considerations have been considered, as it is recognized as a medical therapy under current regulations (Al-Qalah & Alrubaiee, 2020; Gupta et al., 2012).

From pre-Christian times, people have recounted receiving food through a tube and putting it straight into their stomach. Feeds were first introduced into the rectum in ancient Egypt, and in the nineteenth century, crude tubes were used to infuse broths, eggs, milk, and even alcohol into the esophagus and stomach. Treatment with EN has been sluggish to evolve, despite the rising complexity in other areas of medical care during the preceding century. EN treatment, however, has seen a new beginning over the past two decades (El-regal et al., 2018).

In the treatment of critically ill patients, optimal nutrition is crucial. Malnutrition has also been linked to increased ICU stays and risk-adjusted mortality. In the ICU, the conventional idea of nutrition support has developed into a strategy involving more targeted nutrition therapy (Bedier et al., 2016). Optimizing nutritional support for hospitalized, very ill patients has been the subject of several studies. The goal might be to enhance patient outcomes by altering the body's general reaction to illness or injury. This could involve boosting the immune system, speeding up tissue healing, halting the loss of lean muscle mass and bodyweight, or a combination of these and other measures (Sharon et al., 2019).

Parenteral Nutrition (PN) is more-costly and less physiologic than EN for critically ill patients (Shahin & Sayed, 2012). Patients in critical care are at a high risk of malnutrition

due to their illness and their hypermetabolic state. Those with compromised immune systems are more prone to infection and septicemia. Longer ICU stays, greater mortality and morbidity rates, and higher medical costs are all caused by infections and delayed recovery. Hence, regular nutrition must start as soon as admission (Shahin et al., 2012).

For patients who require enteral feeding (EF), nurses are seen as a crucial link in the chain of care. The way nurses give EF, however, has received little attention. Widespread discrepancies exist in the administration of nutritional assistance, which may be attributable to knowledge gaps, the use of different information sources, or a lack of uniformity in the care setting. Inadequate nurse education has been linked to inconsistencies in feeding critically ill patients (Mula, 2014).

The nurse's role in tube feeding typically entails insertion of the feeding tube, maintenance of the tube (if a temporary tube is used), feeding administration, prevention and detection of complications related to this type of therapy, and participation in the evaluation of the patient's response to tube feeding. Nevertheless, registered nurses evaluate the patient's calorie demands and body requirements, analyze daily calorie administration, and advocate for early EF in more contemporary intensive care units (Kalaldehy & Shahin, 2015).

Enteral tube feeding is often a simple technique of nutritional assistance and should be facilitated by a multi-professional team (Scott, 2015). In the critical care unit, providing patients with adequate feeding assistance is crucial (Pichard et al., 2018). Patients with a healthy digestive system but insufficient oral intake may be prescribed EF, which involves a tube being placed directly into the GI tract (Houston et al., 2017). It can be given by mouth or straight into the duodenum, which is the first part of the small intestine

(Scott, 2015). Patients in ICU frequently experience varying degrees of inflammation, which can lead to changes in their energy balance, including decreased protein intake, increased energy expenditure, and protein catabolism. Regardless of pre-existing malnutrition, every critically ill patient has a highly varied metabolic and immunological response to injury or disease that may be mitigated by targeted nutrition therapy. Hence, providing nutritional assistance to critically ill patients is seen as a crucial part of their care (Padilla et al., 2016). Negative clinical outcomes, such as an increase in mechanical ventilation days, duration of stay in the ICU, and infections, have been linked to a patient's cumulative energy debt after the first week of ICU admission (Padilla et al., 2016). According to another study, patients who have their dietary assistance started later may experience energy deficits that they are unable to make up for the rest of their ICU stay (Wei, 2015). Lean tissue waste is also caused by protein catabolism and a cumulative caloric deficit, both of which are linked to unfavorable consequences (Casaer, 2013).

1.2 Statement of the Problem

The cause that encouraged me to study the EF problem started during my master's degree studies when a doctor discussed this crucial topic and its importance in preventing deaths. In my real life, I encountered two stories of deaths occurring due to EF.

Searching for the information was conducted on EF problems on Google Scholar, PubMed, and other sources. This sparked my enthusiasm to study this topic because the literature focuses on various problems related to EF. According to several related literature reviews, malnutrition is a common issue among hospitalized patients, impacting around 30%-50% of critically ill individuals. Unfortunately, delaying the initiation of nutrition support can result in patients experiencing energy deficits that may be difficult to compensate for during their remaining time in the ICU.

This delay often occurs due to a lack of nursing responsibility for nutritional therapy, ultimately leading to inadequate nutritional outcomes. Despite established nutritional guidelines, there exists a gap between recommended practices and their actual implementation.

1.3 Aim of the Study

The main aim of the current study is to assess the knowledge, practices and attitudes of EN among ICU nurses in Palestine.

1.4 Objectives of the Study

The current study mainly aims to:

- Assess the level of knowledge among ICU nurses on EF in term of placement of tube, indication, methods, administration of medication, Initiation and complication of EN feeding.
- Evaluate the practices of ICU nurses on EF in terms of EN formula administration, patient positioning, flushes, medication administration, gastric and residual volume.
- Assess the ICU nurses' attitude toward EN.
- Assess the association between nurses' knowledge based on practice and attitudes.
- Assess association between knowledge and socio-demographic variables.

1.5 Research Questions

The current study aims at answering the following questions:

- What is the level of knowledge of ICU nurses in Palestine regarding enteral nutrition?

- What are the practices of ICU nurses in Palestine related to EN for critically ill patients?
- What are attitudes of ICU nurses in Palestine related to EN for critically ill patients?
- Are there any significant differences in the level of knowledge based on practices and attitudes of ICU nurses in Palestine towards EN?
- Are there any significant differences in the level of knowledge of ICU nurses in Palestine regarding EN based on demographic characteristics?

1.6 Research Hypotheses

- There are no significant differences in the level of knowledge of ICU nurses in Palestine regarding EN based on their practices at a significance level of 0.05.
- There are no significant differences in the level of knowledge of ICU nurses in Palestine regarding EN based on their attitudes at a significance level of 0.05.
- There is no significant relationship between the practices of ICU nurses in Palestine related to EN for critically ill patients and their gender at a significance level of 0.05.
- There is no significant relationship between the attitudes of ICU nurses in Palestine related to EN for critically ill patients and their gender at a significance level of 0.05.
- There are no significant differences in the level of knowledge of ICU nurses in Palestine regarding EN for critically ill patients based on their demographic variables (gender, educational level, residency..., etc.) at a significance level of 0.05.

1.7 Significance of the Study

Nurses play a vital role in delivering best health care quality. Their clinical expertise is therefore essential. Thus, quality of treatment and nurses' clinical level of competency in EN are closely related. Accordingly, making nursing competency as a top priority for professionals would increase the quality of care provided.

The significance of the study will be on three levels: education, administration, and policy. The findings of the study could also be used to update nursing school curricula so that future nurses are better equipped to care for seriously ill patients. It is also believed that this study would help nurses better educate, assess, and start EF for critically ill patients. This study may also help improve the quality of the care given to critically ill patients in ICU by informing strategies to improve the nutritional status of ICU patients while they are in the hospital, such as the creation of guidelines and protocols, provision of resources to help with EF.

Regarding policy and the administration, this research might be used by policymakers to track the progress of EF practices, ensure that protocols and recommendations are being followed, and resolve the problems occur. Furthermore, the findings may assist decision-makers in developing appropriate guidelines and will provide crucial data for implementing cost-effective measures and infection-prevention measures. It will also aid in the preparation of appropriate policy to lessen the burden of this serious infection.

It also benefits to the researcher, university and community by obtaining new data in the field of the study that will help to develop new recommendations and guidelines. Moreover, Results of this study may also help fill the gap in knowledge regarding EF procedures and patient health.

1.8 Definition of Variables:

1.8.1 Conceptual definitions

Critical care: According to the World Federation of Societies of Intensive and Critical Care Medicine (ICCM) it is a multidisciplinary and interprofessional specialty dedicated to the comprehensive management of patients having, or at risk of developing, acute, life-threatening organ dysfunction (Kayambankadzanja et al., 2022).

Enteral feeding: Feeding provided through the gastrointestinal tract via a tube, catheter, or stoma that delivers nutrients distal to the oral cavity (Cober et al., 2015).

Nursing knowledge: the knowledge that is useful to nurses, whether it is derived from the discipline of nursing or other disciplines (Reay & Rankin: 2013).

Nursing practice: A practice is an exercise or daily task that is done with an intention (Twichell S. 2016). In healthcare settings, it is crucial to identify and assess the barriers that impact the acquisition of successful or unsuccessful knowledge, in order to implement effective strategies for change (Dogherty et. al, 2013).

Nursing attitude: An attitude is a mental state that reflects how one thinks about an object, fact, or situation, and it is evident through their behavior (DK, 2017). It is crucial for nurses to feel responsible for providing adequate nutritional support to their patients while they are in the hospital, as poor nutrition can affect mortality and morbidity. However, due to the busy routine at the ward level, nutrition care may be given lower priority (Bjerram et al., 2012).

1.8.2 Operational definitions

Operationally, it will be measured by using “Self-Reported Questionnaire” “Assessment of knowledge, attitude and practice of nurses regarding Enteral Nutrition at West Bank hospitals”

This Questionnaire used after obtaining permission from Dr. May Hamdan from Polytechnic University Palestine.

Nursing knowledge: It is the mean score of the sample's response total degree towards the twenty-six items targeting the nursing knowledge in the instrument of the study (cf. items 8 to 26).

Nursing attitude: It is the mean score of the sample's response total degree towards the ten items targeting the nursing attitude appearing in the instrument of the study (cf. item 28 to 37).

Nursing practice: It is the mean score of the sample's response total degree towards the ten items targeting the nursing practice in the instrument of the study (cf. items 38 to 47).

Conclusion

Nutrition is crucial for hospitalized patients, particularly those in the ICU, as neglecting their nutritional needs can lead to muscle and fat breakdown, resulting in muscle weakness, respiratory issues, prolonged ventilator dependence, and infections like pneumonia. Malnutrition affects up to 40% of hospitalized patients worldwide and increases morbidity and mortality rates. All hospitalized patients should undergo an initial nutrition screen within the first two days, with ICU patients at higher nutritional risk requiring a more comprehensive evaluation.

EN is considered a medical therapy that should not be discontinued without ethical considerations.

Nurses play a vital role in tube feeding by inserting and maintaining feeding tubes, administering feedings, detecting and preventing complications, and evaluating patient responses. They assess calorie needs, monitor daily intake, and advocate for early EF in modern intensive care units.

Providing effective nutrition assistance is a fundamental element in reducing the risk of malnutrition and improving outcomes for critically ill patients, making it an integral part of their overall care.

Researches indicates that nurses' practices related to EN do not consistently align with international guidelines, which could put patients at risk. Studies have also shown that intensive care registered nurses may have insufficient knowledge and responsibility for nutritional therapy, resulting in suboptimal nutritional outcomes.

Chapter Two

Literature Review

Overview

The literature review was done to identify related research, validate the research problem, and to identify gaps in knowledge among ICU nurses toward EF. This chapter includes introduction, indication of EF, nutritional assessment, preparation, storage and administration of EN, hang time of EN, selection, verification of location and maintenance of enteral access devices, initiation and advancement of EN feeding, patient position while on EF, flushes, enteral tube misconnection, medication administration, head off refeeding syndrome, gastric residual volume of EN, practices of nurses on EN, nursing attitude knowledge of nursing personnel, nursing practice and summary.

2.1 Search Strategy

The search was performed depending on different international databases including Google Scholar, PubMed, Medline. The following keywords was used: “Enteral feeding”, “knowledge of ICU nurses of EN”, “clinical practice guideline”, “nutritional support”, “refeeding syndrome. These words were searched in combination with each other and in separated form. For example, during the initial search, the keyword “EN” was combined with “refeeding syndrome”. Later, during each new search a new keyword added until including all keywords in the last search. However, the searching process was limited to the following inclusion criteria: full text, written in English, published between 2005 and 2023. Studies were specifically related to knowledge, practice, attitude of ICU nurses toward EN.

Enteral nutritional support refers to the prerequisite of calories, protein, electrolytes, vitamins, minerals, trace elements, and fluids via the gastrointestinal route. EF is indicated for patients with a functional gastrointestinal tract whose oral nutritional intake is not enough to meet estimated needs (Loss, 2018).

Patients who are unable to ingest a sufficient amount of food and unsure maintenance of adequate nutrition, may require methods for feeding. Those methods include both parenteral intravenous methods and enteral through gastrointestinal system. EF is the preferred route of nutrient administration in the critically ill. It maintains the integrity of the gut mucosa and has immunologic advantages over parenteral feeding. Compared with total parenteral feeding; the enteral route is safer more physiologic and less expensive (ASPEN, 2009).

Few studies attempted to analyze nurses' factors influencing utilization of EN. In well resource countries like Belgium and China, these factors include demographic factors, years of experience, nurse's knowledge on EN, training on EN and nurse's attitude on EN (Huang et al., 2019). Training on EN has been shown to improve delivery of EN (Joos et al., 2015). A multicenter study that was conducted in China by Huang et al. (2019) showed that nurses who had relatively high frequency of EN- related training had higher odds for delivering EN per guidelines than those with low frequency of EN-related training (Huang et al., 2019). The results of this study results were consistent with those by Joes et. al. (2015), which showed that nurse's lack of knowledge is a vital disruptive factor for delivering EN as per guidelines. Consequently, improving nurse's knowledge can improve clinical practice of the guidelines (Huang et al., 2019). Years of experience has also been documented to influence delivery of EN per guidelines (Huang et al., 2019).

Nutritional status affects organ function, mobility, and mortality as well as wound healing and ventilator weaning (Cederholm et al., 2017). Also, Tian et. al. (2018) indicated that patients unable to eat better are fed within 24 to 48 hours after ICU admission.

EN is a valuable clinical intervention for patients of all ages, according to ASPEN safe practices for EN. EN has many outcome benefits and potential side effects that can happen at any step, including patient assessment, prescribing, and order review, product selection, labeling, and administration (ASPEN,2016).

In ICU, one of the nurse's responsibilities is to ensure that patients receive the right diet to sustain their organ systems. In identifying patients who are at risk of inadequate feeding, malnutrition, and preventing EN issues in critically sick patients, nurses play a crucial role (Dhaliwal et al., 2014). Therefore, it is crucial for nurses to comprehend nutrition assessment and application, monitor, and manage the nutrition of seriously ill patients.

Aziz & Ali (2020) conducted Quasi-experimental study in the critical care units in AL – Hilla Teaching Hospitals (Iraq) aimed to evaluate the effectiveness of enteral tube feeding protocol sessions upon nurses' knowledge, A customized, three-part questionnaire was designed to collect information from the 60 nurses who were randomly assigned to the control and trial groups. Trial group members who attended EF education sessions scored highly on knowledge assessments, indicating that the instruction provided was beneficial to the nurses' understanding of the topic.

Sancar et al., (2023) conducted descriptive study in Turkey aimed to examine nurses' knowledge and behaviors about nasogastric tube placement according to current standards. A total of 184 registered nurses took part, and their responses were compiled

from a two-part questionnaire known as the "Personal Information Form" and the "NGT Placement Information Form." Half of the nurses (45.6%) didn't keep up with the latest research on nasogastric tubes, yet over half (48.9%) utilized auscultation to confirm nasogastric tube installation. They found that none of the nurses in the research used capnography, x-rays, or a pH test to verify nasogastric tube insertion. Thus, nurses should adhere to the latest data about nasogastric tube placement and keep up with or advance their education in this area.

Ahmed & Hasan (2021) conducted a descriptive study in Iraq targeted the critical care units at Al-Ramadi Teaching Hospital and Al-Fallujah Teaching Hospital of Al-Anbar Governorate during the period 6th of December 2020 to 5th of January 2021. 32 nurses were chosen based on a non-probability (purposive) sample. The findings showed that most nurses had a decent understanding of EF. Researchers found that most RNs working in intensive care units knew little about EF, which might cause patients to get an inadequate amount of nutrition. The study suggests that nurses receive more information and training on the proper way to provide EF as part of an educational program and a training course program.

Moustafa et al., (2016) conducted descriptive study in Egypt aimed to assess nurses' performance through assess nurses' knowledge, practice and attitude regarding nasogastric tube feeding among critically ill patient. Sample of the study consisted of 40 nurses from both genders, with different ages, educational levels and years of experience was selected for this study. Data were obtained through three main tools; Self-administered questionnaire sheet, observational checklist and Nurses attitude questionnaire sheet. The results showed that Nurses had satisfactory level of knowledge,

unsatisfactory level of practice, and positive attitude regarding nasogastric tube feeding among critically ill patient. There was statistically significance relation between level of knowledge, practice and attitude. Knowledge, practice and attitude level was found to differ significantly in relation to years of experience. Recommendation: Designing nurses' educational program to improve their knowledge for nasogastric tube. Procedure book should be available in ICU as a reference for all nurses. Recommendation for future: Setup a project that aims to improve nurses' performance by implementing evidence-based practice. Ongoing monitoring of staff nurses' practice by head and charge nurses when caring for patients who receiving nasogastric tube feeding and provision of guidance to correct poor practices.

Ramuada (2017) conducted a descriptive cross-sectional design with analytical components to assess the knowledge, attitudes and behaviors of nurses in relation to Enteral Nutrition (EN) at 1 Military Hospital in Thaba Tshwane, Pretoria. The study targeted 240 participants directly involved in patient care for both pediatric and adult cases. Specific criteria were established to define the indications for EN, which include situations where patients face difficulties in eating, have an elevated risk of malnutrition, or experience compromised nutrient and fluid intake. EN administration can be either gastric or intestinal. The primary indications for EN usage are when patients struggle with oral intake or when oral feeding presents safety concerns, such as dysphagia or altered consciousness levels. Contraindications for EN, such as bowel obstruction, perforation, uncontrolled life-threatening hypoxia, hypercapnia, and active upper gastrointestinal bleeding, were also identified. Proper tube maintenance, including regular flushing with tap water or sterile water for critically ill patients, is emphasized to prevent blockages. Flushing before and after medication administration is recommended, with each

medication administered separately to avoid potential tube blockages. It's discouraged to mix medication directly with the feeding formula to prevent chemical reactions. Additionally, the study highlighted discrepancies in nurses' attitudes and practices, particularly in critical care settings, regarding the implementation of recommended nutritional care protocols.

2.2 Nutritional assessment

Nurses lacked adequate knowledge on assessment of patients' nutritional status. Similar findings were reported by Persenius et. al. (2018) conducted a descriptive study contained 15 chief nurses in municipal care and 27 chief nurses in county council care were interviewed by telephone via a semi-structured interview guide. One hundred and thirty-one registered nurses (response rate 72%) from 14 municipalities and 28 hospital wards responded to the questionnaire, all in one county. that nurses acknowledged that not all patients are nutritionally assessed, and nurses lacked skill in performing nutritional assessment.

2.3 Preparation, Storage and Administration of EN

In a study carried out by Krey et al. (2021) at Saint Vincent Charity Hospital and Health Center in Cleveland, they examined how to enhance the processing, preparation, and delivery of high-quality enteral hyperalimentation to patients as a case study for cost-saving strategies in nutrition services. This assessment led to the establishment of a specialized enteral preparation facility within the hospital's foodservice department. This facility was purposefully designed to streamline the cost-effective preparation and distribution of enteral formulas. Achieving this required reallocating physical space and

retraining staff. The implementation of this enteral preparation facility has not only led to improved quality in EN services but has also been instrumental in supporting nutritional needs while effectively managing costs at the hospital.

2.4 Hang Time of EN

A study conducted by Lakananurak et al, (2020) sought to determine the best hang times for both kinds of formulations at normal room temperature and high temperature. Aseptic procedures were used to create ten samples of blenderized formula and ten samples of reconstituted powdered formula. A reconstituted powdered formula may hang up to 6 hours at both temperatures, it was discovered that the ideal hang time to prevent significant bacterial contamination of the blenderized formula should be limited to 2 hours at standard room temperature and be administered by bolus method at high temperature.

2.5 Selection and Verification of Location of Enteral Access Devices

Ccritically ill patients who cannot be fed orally for a period of more than three days must receive specialized nutritional support (Seron- Arbeloa, 2013). A study conducted by Best (2019) showed that feeding tube is typically inserted into the stomach through the nose (nasogastric tube) if enteral tube feeding is likely to be required only for a brief period (less than four weeks); for longer periods, gastrostomy feeding should be taken into consideration (National Institute for Health and Care Excellence, 2006).

2.6 Enteral Tube Misconnections

Inadvertent connections between enteral feeding systems and non-enteral systems, such as intravascular lines, peritoneal dialysis catheters, tracheostomy tube cuffs, medical gas tubing, and so on, are known as enteral misconnections. Several ways to stop such medical errors are discussed together with sentinel event data and causal elements. Three categories of solutions can be made: (1) education, awareness, and human aspects; (2) buying tactics; and (3) design modifications. There are updates on safety innovations and programs (Guenter et al., 2009).

A study conducted by Kelly (2018) shows the following issues about feeding tube misconnection: The FDA has warned feeding tube manufacturers and medical professionals in a letter about the risk of serious injury from incorrect connections between enteral devices and other medical items including tracheostomy tubes. With relation to feeding tube misconnections, the agency reported receiving reports of two fatalities, 24 major injuries, and 32 device malfunctions since 2011. The agency expressed fear that many more similar instances may go unreported or be mistaken for medication errors. The FDA advises hospitals and medical professionals to utilize connections on devices that comply with ISO 80369-1 or 80369-3 standards or are specifically made to lessen the danger of misconnection.

The following were noted by (Hahn, 2018) in his paper "Feeding Tube Misconnections- A Safety Issue". The patient could suffer injury if a nurse unintentionally attaches an enteral device to an intravenous line or tracheal tube. Connectors with specialized functions can stop this from happening. The EF tube is not always necessary for cancer patients, but for those who do, it is an essential component of their care.

Tubing misconnections have long been a source of concern in the nursing literature. The patient could die if a nurse unintentionally attaches an enteral device to an intravenous line or tracheal tube.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) published a sentinel event alert in 2006 to notify healthcare providers of a potentially harmful unexpected incident that was unrelated to a patient's sickness. The JCAHO advised the healthcare sector to be extremely cautious while connecting catheters and tubing to patients. JCAHO reports of frequent misconnections that had actually resulted in patient deaths, the Food and Drug Administration (FDA), United States Pharmacopeia, the Institute for Safe Medication Practices, and European Commission against Racism and Intolerance (ECRI).

Tube misconnections posed such a major concern to patients in California that the state issued legislation requiring all enteral items to be built with enteral use in mind. It took a while for manufacturers to accept this regulation. The goal was to prevent a feeding tube connection from being made using a lure lock connector. In 2007, manufacturers from all over the world banded together to create a connector that would lessen the possibility of joining two unrelated systems incorrectly.

2.7 Medication administration

Abdullah et. al. (2014) conducted among critical care nurses in Egypt revealed that there was a limited understanding and suboptimal application of medication administration via the nasogastric tube. The research findings pointed out a disparity between nurses' knowledge and their actual practices in contrast to the established guidelines regarding

medication administration through a nasogastric tube. The study recommended that enrichment of the critical care nurses at El-Manial Specialty Hospital knowledge and practices related to administration of 12 medications via nasogastric tube according to the standard guidelines will be helpful to ensure patient safety and provide cost effective care. The study indicated that the location at which a medicine is administered, such as orally or intravenously, is frequently used to categorize a pharmaceutical administration method. The selection of administration routes is influenced by the characteristics and pharmacokinetics of the medicine as well as convenience.

2.8 Refeeding syndrome

Can be fatal but can be avoided. To improve management, at-risk patients must be recognized and identified. Rapid refeeding after a period of undernourishment can result in refeeding syndrome, which is characterized by hypophosphatemia, electrolyte changes, and metabolic and clinical consequences. Those who are chronically malnourished and those who haven't eaten in more than 10 days have high risk. Dysphagia patients are particularly vulnerable. In patients who are at danger, refeeding should start at 10 kcal/kg per day and be gradually increased. Beginning with refeeding is the best time to take thiamine, vitamin B complex, and multivitamin supplements. According to new National Institute for Health and Care Excellence (NICE) guidelines, correcting electrolyte and fluid deficits prior to feeding is not necessary, but it should be done at the same time as refeeding (Mehanna et al, 2009).

Unfortunately, the refeeding syndrome occurs in contemporary clinical practice and is only marginally recognized or comprehended. Disorders of glucose and fluid balance, as well as electrolyte imbalances that primarily affect the intracellular ions phosphate,

potassium, and magnesium, are examples of pathophysiologic processes. It is linked to high morbidity and death despite the possibility of prevention. Teams of nutritionists can offer guidance and instruction on its detection, prevention, and treatment. To make these easier, regional treatment standards ought to be created (Crook et al, 2001).

2.9 Gastric Residual Volume of EN

The results of a research by Nickson (2020) titled "Gastric Residual Volume" are as follows: the volume of the stomach that is aspirated after an enteral feed has been administered is known as the gastric residual volume. While most patients will tolerate EN via a gastric tube, some patients will experience delayed gastric emptying and raised GRVs due to sedation, pain medications, hypothermia, decreased movement, and the effect of being critically ill intolerance of EF is defined here as more than one GRV > 500mls. Although GRV measurement is one of the most frequently used techniques in ICU nutrition management, there is little proof that it is effective (Nickson, 2020).

In patients with elevated GRVs, administering more EN may result in aspiration and a rise in intra-abdominal pressure, which raises the risk of respiratory and circulatory failure as well as intestinal necrosis. Due to this, it is crucial to monitor GRV in the initial stages of EN administration, especially in critically ill patients. The needs of the inpatient population and institution-specific protocols are typically taken into consideration when determining the frequency of GRV measurement (for example, every six hours) and the intervention strategy for large GRVs, for example, if GRV is above 500 ml, hold feeding for two hours and recheck GRV (Bounoure, 2016).

Conclusion

Several studies demonstrate how important specialist training in enteral nutrition (EN) is for maintaining adherence to accepted clinical guidelines. Higher levels of knowledge among nurses are associated with improved adherence, but inadequate comprehension prevents appropriate application. Furthermore, it seems that nursing experience has a beneficial effect on EN protocol adherence.

Although its clinical importance is still up for debate, many nurses regularly check stomach residual volume as part of their monitoring routines. When it comes to inserting tubes, a significant number of nurse's lack experience with sophisticated methods and instead rely solely on auscultation. Thus, it is essential to stress ongoing education and current information in order to guarantee patient safety.

Although the majority of nurses have a reasonable understanding of enteral feeding (EF), there are some knowledge gaps that may lead to patients receiving insufficient nutrition.

Chapter Three

Research Methodology

Overview

This proposal part describes the research methodology that is used to evaluate the level of knowledge, practices and attitude on EN among ICU nurses in Palestine.

It displays the study design, population and sampling, study tool, data collection procedures, the statistical analysis, outcome, measuring outcome and ethical considerations are discussed thoroughly.

3.1 Study Design

This study is operated within the descriptive, cross-sectional studies to accomplish the aim and the objectives of the study.

3.2 Population and Sampling

The target population was all ICUs' nurses working in the selected hospitals during the data collection period. The sample size consisted of 171 registered nurses distributed to the ICUs at 7 hospitals located in the region of Southern West Bank. 161 questionnaires were distributed purposively, and were answered and collected. This current study was conducted in 7 governmental and private hospitals providing critical care services in south West Bank. The hospitals include:

Al-Ahli Hospital/ Hebron: it is also named as Patients Friends Society (P.F.S). It was founded in Hebron in 1976 as a non-governmental, non-profit and non-political Society. It is interested in upgrading health services in Southern part of the West Bank. The

hospital has a nursing college offering education in three distinct specializations: nursing, midwifery and anesthesia technology. With a clinical capacity of 250 beds, it boasts a workforce of 1,000 employees, including a dedicated team of 450 nurses. It also comprises 18 departments.

Al-Mizan Hospital/ Hebron: it is a private hospital established in 1999 as profitable institution. Its clinical capacity ups to 145 beds and employs 420 employees including 190 nurses and consists of 13 departments.

Beit Jala Governmental Hospital/ Bethlehem: is a government hospital in Beit Jala city in the West Bank administrated by the Palestinian Ministry of Health. It was built in 1955. The overall staff number is 363; about 170 of which are nurses. It has 131 beds and 21 departments.

Bethlehem Arab Society for Rehabilitation/ Bethlehem: this non-governmental society was founded in 1960 as a non-profit organization. It employs over 350 individual and has 77 beds.

Martyr Abu Al-Hasan Qassem Hospital/ Yatta: this governmental hospital is located in Yatta in Hebron District and was established in 2004. It has 178 employees; including 110 nurses, and its clinical capacity is 75 beds and 7 departments.

President Mahmoud Abbas Governmental Hospital/ Halhul: this hospital was established in 2021. It contains 85 beds and 3 department. The number of its staff reaches 115 individuals.

Queen -Alia Hospital/ Hebron: it was established in 1957. Its clinical capacity is 237 beds and employs about 596 employees including 276 nurses. It also includes 20 departments.

The total number of nurses is 170 distributed as shown in table (1) below:

Table (1): Distributing the sample to the hospitals

Name of hospital	Government private	District	Number of nurses
Al Ahli hospital	Government	Hebron	58
Al Mizan hospital	Private	Hebron	20
Beit Jala government hospital \Bethlehem	Government	Bethlehem	24
Bethlehem Arab society for Rehabilitation	Private	Bethlehem	15
Martyr Abu Al-Hasan Qassem Hospital/ Yatta	Government	Hebron	7
President Mahmoud Abbas Governmental Hospital/ Halhol	Government	Hebron	12
Queen -Alia hospital	Government	Hebron	34

Total: 170 nurses

Inclusion criteria

The current study includes all the nurses working in the ICUs and have been working for at least 6 months or more.

Exclusion criteria

- All nurses working in Pediatric ICU, Neonatal ICU, CCU.
- All ICU nurses who were on leave/ annual vacation during data collection were excluded.
- Head Nurses, Managers, and Supervisors in other wards.
- Student Nurses/ Intern Nurses.
- Nurses who refuse to participate in this study.
- Nurses with less than 6 months of work experience.

3.3 Instrument of the Study

In this study, the researcher used a questionnaire that was obtained from the Polytechnic University, with approval from the research team. The research team also conducted validity and reliability testing by doing interview based pre-tested structured questionnaire containing a Likert-scale questions, multiple choice questions, and open-ended questions. Validity was done by sending the questionnaire to an expert reference group consisting of medical staff (n = 3), and assessment experts (n = 2), and nutritionist (n = 3). The questionnaire was then pilot tested by twenty nurse who did not take apart in the current study.

The questionnaire consisted of five parts. The first part consisted the demographic characteristics of the study population, including gender, age, education, marital status, area of living, name of hospital, department of work (surgery, ICU, etc.), and years of experience.

The second part was related to source EN information and consisted of seven items. The third part was for knowledge assessment and consisted of 20 items. The fourth part was for attitude assessment and consisted of 10 items. Finally, the fifth part was for practice assessment and consisted of 10 items.

3.4 Data Collection Procedure

Data were collected from 1 April 2023 to 31 May 2023. After obtaining approval from the University's research ethical committees, the researcher visited ICU department in each selected hospital to meet the head nurse. Then the head nurse was informed about the study's objectives, data collection procedures, and the roles and responsibilities of the

researcher. Data were collected by the primary researcher only.

Eligible nurses were approached and notified about the objectives of the study, data collection procedures, and the right to voluntary participation and self-determination.

Those who agreed to engage in the study were asked to sign the informed consent to assure that they were able to participate in the study.

The researcher distributed the questionnaire among general ICU nurses at government and private hospitals in south Palestine. The study objectives and instructions were clearly explained to the participants and the researcher informed that participation is valuable as it will provide insights on how can improve patient care in hospitals in the future. Also, participation is completely voluntary and the participant have the right to withdraw at any time without any consequences.

All the information provided was treated with confidentiality. The data collected was used for research purposes only and any published results will be anonymous and will not contain any identifying information.

3.5 Analyzing Data of the Study

The data was analyzed by using the statistical package for the social sciences (SPSS) and entering the data in the program. The description and correlation statistics were used to analyze the collected data. Also, the frequencies and percentages, mean and standard deviation, chi square, the independent t-test and one-way ANOVA test and Tukey HSD test were all used and calculated.

3.6 Outcomes

Dependent variables: Include knowledge, practice and attitude.

Independent variables: Demographic Variables-These represented in the variable of gender, age educational level, marital status, area of living, name of hospital, department and years of experience.

3.7 Measuring outcomes:

Study outcomes measured through meeting the aim of the study and test of study hypothesis.

3.8 Ethical consideration:

The study received ethical approval from the Ethics and Research Committee/ Institutional Review Boards (IRBs) at the School of Nursing, Arab American University of Palestine, followed by approvals from the Palestinian Ministry of Health (MOH) and private hospitals in the ICU department of the South West Bank, allowing nurses to complete the questionnaire through the ICU department head.

The study's nature, objectives, data collection procedures, the right of participants to voluntary participation and self-determination, the right to withdraw without facing any threats or penalties, and the roles and responsibilities of the researcher were all clearly explained to the participants. In addition, participants were fully informed about the data collection method and the study tools, which are detailed in a research package (See: Appendix 1).

The confidentiality of the data was rigorously upheld and preserved. Instead of using names, each participant was assigned a unique identification (ID) number, which was affixed to the collected data. Participants were assured that any specific data would not be publicly disclosed in a manner that could identify them or shared with others. Identifying information was securely managed and stored with a security code on locked computer files. The research purposes were thoroughly communicated to the participants, and they were given the opportunity to ask any questions they had about the study. The contact information of the investigator was provided to respondents in case they had any inquiries regarding the study or the research instruments.

Prior to commencing data collection, formal approval for the study was secured from the institutional review board (IRB). It is important to note that no risks associated with participation in this study were identified. Measures were put in place to ensure confidentiality, anonymity, and voluntary participation of the respondents.

Conclusion

A descriptive, cross-sectional design was employed in this study, involving a total of 170 registered nurses working in intensive care units across seven hospitals located in the Southern West Bank region. Of the 170 nurses, 161 successfully completed the questionnaire. Ethical considerations were rigorously adhered to throughout the data collection process.

The questionnaire used for data collection consisted of two parts; part one presents the socio-demographic information of the sample of the study, and part two contains the four main domains respectively; nutrition information, knowledge, attitude and practice. To analyze the data, various statistical methods were applied, including calculations of mean,

standard deviation, frequency, and percentage. Additionally, the study utilized the Independent Sample t-test, one-way ANOVA test, Chi-square analysis, aligning with the research questions posed in the study.

Chapter Four

The Results

Overview

This chapter provides an overview of the results of this study by answering the main research questions during the study. This chapter is organized according to research questions.

4.1 Frequencies of the Study

Of the 170 registered nurses that are distributed in intensive care units at 7 hospitals located in the region of Southern West-bank/Palestine, 161 completed the questionnaire (i.e., the response rate was 94.7%). Table 2 summarizes nurses' response rate according to hospital (see also Fig.2).

Hospital		Sector	ICU Team	Response n (%)
1	Al-Ahli Hospital/ Hebron	Private	58	53 (91.4)
2	Al-Mizan Hospital/ Hebron	Private	20	20 (100)
3	Beit Jala Governmental Hospital/ Bethlehem	Governmental	24	24 (100)
4	Bethlehem Arab Society for Rehabilitation/ Bethlehem	Private	15	14 (93.3)
5	Martyr Abu Al-Hasan Qassem Hopspital/ Yatta	Governmental	7	7 (100)
6	President Mahmoud Abbas Governmental Hospital/ Holhul	Governmental	12	12 (100)
7	Queen Alia Hospital/ Hebron	Governmental	34	31 (91.2)
Total cohort			170	161 (94.7)

4.1.1 Nurses' sociodemographic information

The general characteristics of the sample are presented in Table 3. 60% of the respondents are males. The mean age of participated nurses was 29.7 ± 7.5 years, ranged from 20 to 56 years old. The majority of the nurses have bachelor degree (68.9%). Nearly half of the nurses were married (53.4%). The majority of the nurses (58.4%) were living in the villages. The analysis also reveals that most of the respondents had 5 years or less of ICU experience (57.2%). Whereas only (9.3%) of them had experience that is greater than 15 years.

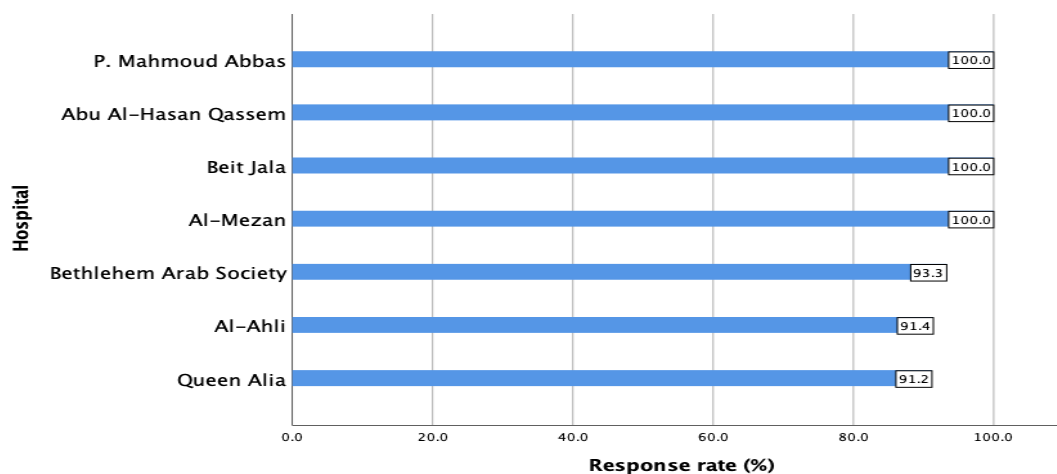


Fig. 1. Nurses' response rate according to hospital (n = 161)

Table 3: Nurses' general characteristics according to gender.

Variables		Males (n = 96, 60%)	Females (n = 65, 40%)	Total
		n (%)	n (%)	n (%)
Marital status	Single	37 (38.5)	35 (53.8)	72 (44.7)
	Married	57 (59.4)	29 (44.6)	86 (53.4)
	Widowed	1 (1)	0 (0)	1 (0.6)
	Divorced	1 (1)	1 (1.5)	2 (1.2)
Qualification	Diploma	18 (18.8)	14 (21.5)	32 (19.9)
	Bachelor	67 (69.8)	44 (67.7)	111 (68.9)
	Master	11 (11.5)	7 (10.8)	18 (11.2)

Residence	Camp	17 (17.7)	9 (13.8)	26 (16.1)
	Village	58 (60.4)	36 (55.4)	94 (58.4)
	City	21 (21.9)	20 (30.8)	41 (25.5)
Years of experience	< 1	12 (12.5)	19 (29.2)	31 (19.3)
	1 – 5	35 (36.5)	26 (40.0)	61 (37.9)
	6 – 10	20 (20.8)	10 (15.4)	30 (18.6)
	11 – 15	18 (18.8)	6 (9.2)	24 (14.9)
	> 15	11 (11.5)	4 (6.2)	15 (9.3)

4.1.2 Nurses' general EN practices

The statistical analysis revealed that 70.8% of enrolled nurses have experience in EN, 48.1% of them deal with tube feeding patients on a regular day and 32.5% of them deal with tube feeding once weekly, see Fig. 2. Fig. 3 illustrates the most commonly administered EN was intermittent feeding by 30.5%, followed by bolus feeding (27.9%), then continuous feeding (22.7%). Furthermore, Table 4 illustrates nurses' information regarding EN.

- Nurses reported that they primarily relied on the internet (59.6%) as their primary source for obtaining information related to EN, with only 9.3% obtaining such information from dietitians.
- The majority of nurses (52.2%) cited university courses as their primary source of nutritional knowledge, followed by experiential learning (49.7%), and then the internet (39.1%). Workshops were identified as a source by 11.2%, while seminars were the least commonly mentioned source (5.0%).
- Approximately half of the nurses (54.0%) had received education related to EN during their academic studies, but only 40.4% had received it as part of in-service training after completing their formal education.

Variables		Males (n = 96, 60%)	Females (n = 65, 40%)	Total
		n (%)	n (%)	n (%)
Information sources of EN^a	Books	40 (41.7)	22 (33.8)	62 (38.5)
	Internet	58 (60.4)	38 (58.5)	96 (59.6)
	Doctor	25 (26.0)	29 (44.6)	54 (33.5)
	Dietitian	8 (8.3)	7 (10.8)	15 (9.3)
	Colleagues	17 (17.7)	11 (10.3)	28 (17.4)
Main sources of nutritional information^b	University course	46 (47.9)	38 (58.5)	84 (52.2)
	Experience	54 (56.3)	26 (40.0)	80 (49.7)
	Seminars	5 (5.2)	3 (4.6)	8 (5.0)
	Workshops	13 (13.5)	5 (7.7)	18 (11.2)
	Internet	37 (38.5)	26 (40.0)	63 (39.1)
EN-related education in nursing program	Yes	54 (56.3)	33 (50.8)	87 (54.0)
	No	42 (43.8)	32 (49.2)	74 (46.0)
EN-related in-service training program	Yes	43 (44.8)	22 (33.8)	65 (40.4)
	No	53 (55.2)	43 (66.2)	96 (59.6)

EN: enteral nutrition.
^{a,b} Responses with more than one selection.

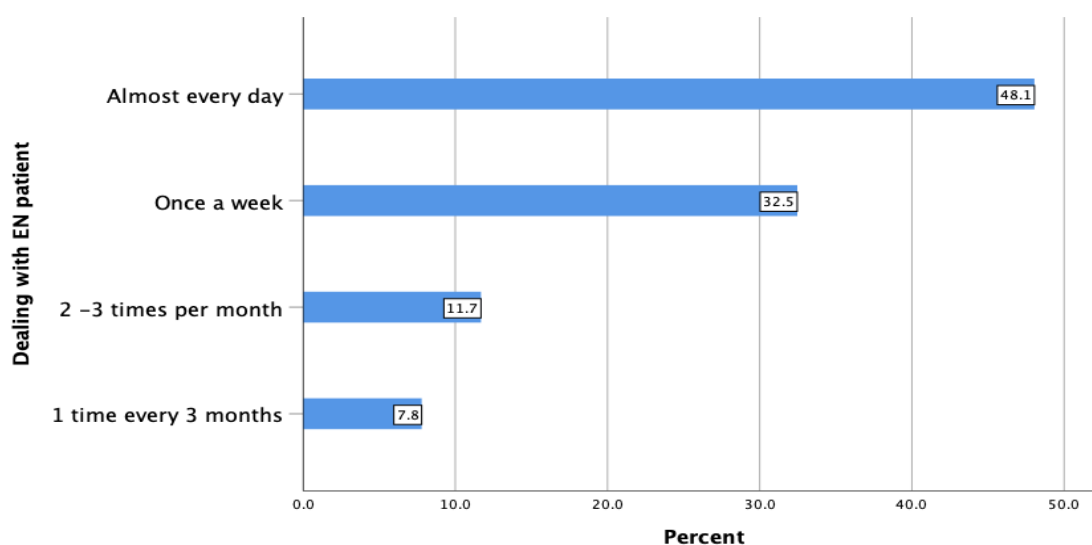


Fig. 2. Dealing with EN patient

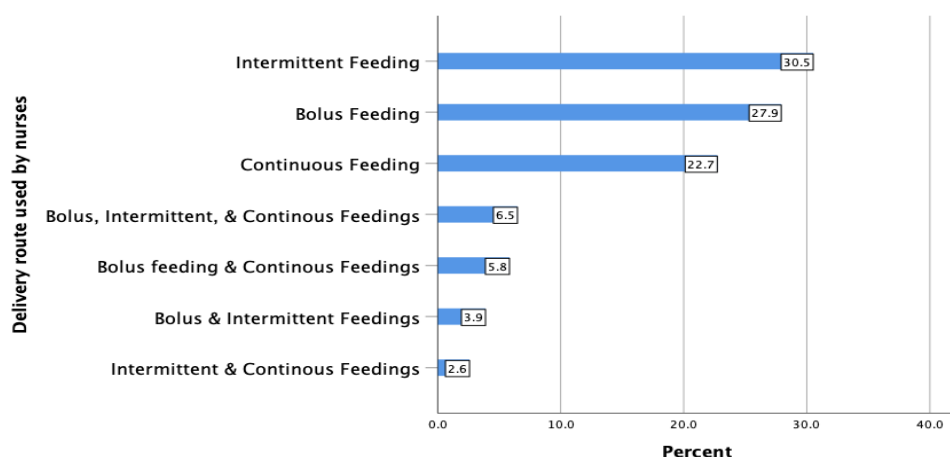


Fig. 3. Delivery route used by nurses

4.2 Nurses' knowledge regarding Enteral Nutrition

The analysis reveals the mean of the knowledge score is (10.3 ± 2.8) out of 20, and ranged from 3 to 17. The majority of nurses (50.9%) had an average knowledge level regarding enteral nutrition (i.e., the score from 40 to less than 60), whereas only 1.9% of them had an excellent knowledge level (i.e., the score is 80 or higher), see Table 5 and Fig. 4.

Table 5: Nurses' knowledge regarding EN

Knowledge score	Excellent	Good	Average	Poor
n (%)	3 (1.9)	47 (29.2)	82 (50.9)	29 (18.0)

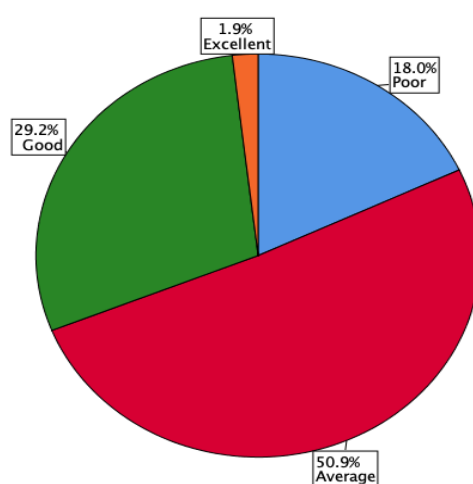


Fig. 4. Nurses' knowledge level regarding EN

Furthermore, the percentages of participants who responded correctly to each question (i.e., knowledge item) are illustrated in Table 6 (see also Fig. 5).

- The most correctly answered question (75.2%) was the twelfth question “Enteral tubes should be flushed with 5–20 ml of water”, followed by (73.3%) to both the fourth and fourteenth questions “Intermittent drip-feeding regimen can be given by pump or gravity drip” and “Nasogastric route is part of short-term enteral feeding support for less than 4 weeks”, respectively.
- The least correctly answered question was the fifteenth statement “The ongoing assessment of nasogastric tube placement every ____”, where only 21.7% of nurses have responded correctly to the statement.

Table 6: Percentages of nurses responded to 20 nutritional knowledge questions.

Knowledge items		CA	WA/DK
		n (%)	n (%)
1.	Pancreatitis is an indication to start enteral feeding (T)	61 (37.9)	100 (62.1)
2.	Nasogastric can be administered by bolus injection or by intermittent or continuous infusions (T)	111 (68.9)	50 (31.1)
3.	Continuous drip method doesn't require a pump (F)	86 (53.4)	75 (46.6)
4.	Intermittent drip-feeding regimen can be given by pump or gravity drip. (T)	118 (73.3)	43 (26.7)
5.	Continuous drip method is the most problematic for drug-nutrient interaction. (F)	52 (32.3)	109 (67.7)
6.	The closed tube system is better as compared to the opened tube system due to? (Less contamination)	81 (50.3)	80 (49.7)
7.	Tube dislodgement is considered one of the complications of EN. (T)	90 (55.9)	71 (44.1)
8.	Blenderized tube feedings are contraindicated for patients who are immune-compromised. (T)	52 (32.3)	109 (67.7)

9.	The difference between ensure and ensure plus is: (Ensure provides 250 cal and 9 g protein and ensure plus provides 350 cal and 13 g protein per serving)	84 (52.2)	77 (47.8)
10.	The purpose of flushing is to check for preventing clogging of enteral tubes (T)	114 (70.8)	47 (29.2)
11.	Enteral feeding tubes should be flushed with water just prior to feeding. (F)	56 (34.8)	105 (65.2)
12.	Enteral tubes should be flushed with 5–20 ml of water. (T)	121 (75.2)	40 (24.8)
13.	Medications can be administered with feeding. (F)	63 (39.1)	98 (60.9)
14.	Nasogastric route is part of short-term enteral feeding support for less than 4 weeks. (T)	118 (73.3)	43 (26.7)
15.	The ongoing assessment of nasogastric tube placement every: (24 h)	35 (21.7)	126 (78.3)
16.	Feeds are usually commenced at (ml/h): (Low rate about 25–50 ml/h)	97 (60.2)	64 (39.8)
17.	The bed position of conscious patient can be changed after: (60 min after feeding)	38 (23.6)	123 (76.4)
18.	Post-pyloric feeding is associated with fewer interruptions once EN has been started. (T)	102 (63.4)	59 (36.6)
19.	Post-pyloric feeding may reduce the risk of gastroesophageal reflux. (T)	111 (68.9)	50 (31.1)
20.	Which of the following provides greater physiologic benefits? (Intragastric feeding)	67 (41.6)	94 (58.4)
CA: correct answer; DK: don't know; F: false; T: true.			

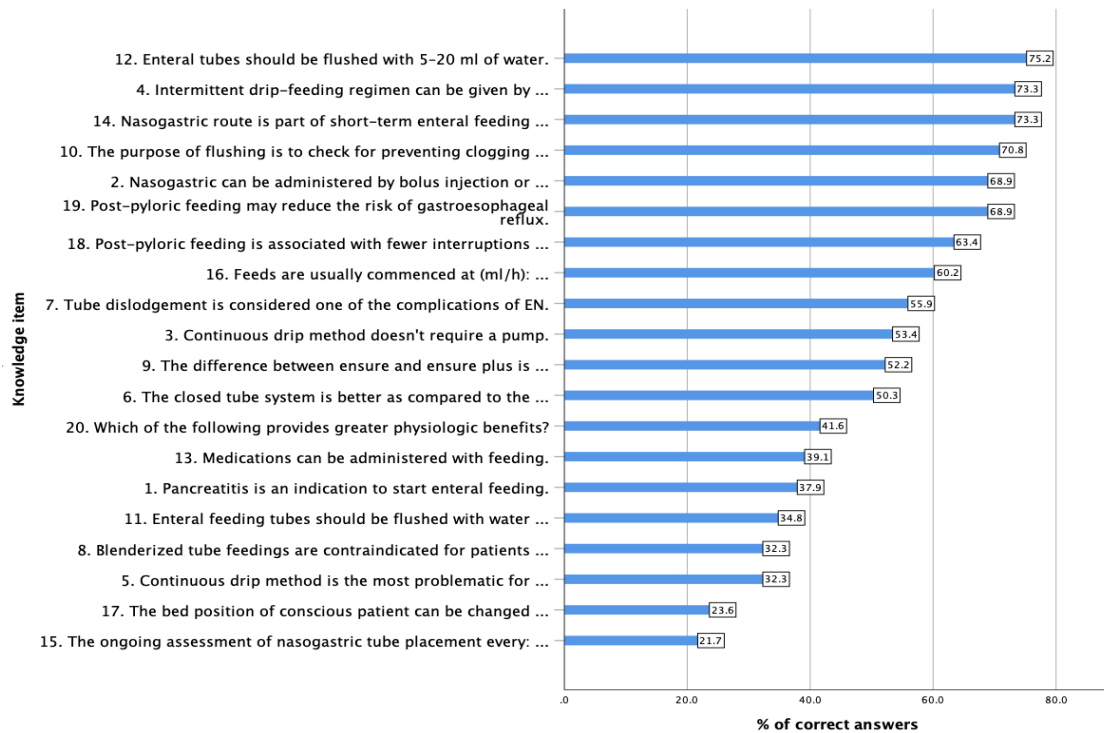


Fig. 5 Nurses' knowledge level regarding EN (% of correct answers)

Independent-samples T-test/one-way ANOVA were employed to explore if nurses' sociodemographic characteristics and knowledge score are significantly associated. Our findings are summarized in Table 7.

- Only the years of experience was significantly associated with knowledge score, i.e., p -value < 0.05 . Multiple comparisons using Tukey HSD test (Table 9) revealed that there was a significant difference between the means of nurses' knowledge score from the pairs with years of experience (6 – 10 years) and (1 – 5 years). We also conclude that nurses with (6 – 10) years of experience are associated with higher mean knowledge levels than nurses with low experience in the categories 1 – 5 years. The nurses with less than 1 year of experience are associated with the lowest mean knowledge level.
- There was not a significant difference between the means of nurses' knowledge levels from private and governmental hospitals.

Table 7: The differences in nurses' knowledge score and nurses' general characteristics.			
Variables		Mean ± SD	p-value
Gender	Male	10.4 ± 2.8	0.493
	Female	10.1 ± 2.8	
Marital status	Single	10.7 ± 2.8	0.157
	Married	10.1 ± 2.7	
Qualification	Diploma	9.6 ± 2.7	0.181
	Bachelor	10.4 ± 2.8	
	Master	11.1 ± 2.6	
Residence	Camp	10.3 ± 3.3	0.814
	Village	10.4 ± 2.8	
	City	10.0 ± 2.6	
Hospital	Private	10.2 ± 2.8	0.804
	Governmental	10.4 ± 2.8	
Years of experience	< 1	9.6 ± 3.1	0.027*
	1 – 5	10.0 ± 2.7	
	6 – 10	11.7 ± 2.4	
	11 – 15	9.8 ± 3.1	
	> 15	10.5 ± 2.3	
SD: Standard deviation.			
* The differences are significant using independent-samples T test / one-way ANOVA (i.e., p-value < 0.05)			

Table 8: Significant multiple comparisons of knowledge score according to nurses' years of experiences (only significant pairs are reported).			
Significant differences		95% confidence interval	p-value
6 – 10	1 – 5	0.001 – 3.367	0.050*
	< 1	0.155 – 4.021	0.027*
* The differences are significant using Tukey HSD test (i.e., p-value < 0.05)			

Finally, we applied a one-way ANOVA analysis to explore if nurses' knowledge score was associated with their attitudes as illustrated in Table 9 and with their practices as illustrated in Table 10. The analysis shows that nurses' knowledge score was related to certain nurses' attitudes and practices.

Table 9: The differences in nurses' knowledge score and nurses' attitudes.			
Variables		Mean \pm SD	p-value
The complications of enteral feeding is less than parenteral feeding.	Agree	10.7 \pm 2.9	0.037*
	Disagree	9.5 \pm 2.6	
	No opinion	9.3 \pm 2.2	
Enteral feeding is a safe way to feed in cases where oral feeding is contraindicated.	Agree	11.0 \pm 2.5	<0.001*
	Disagree	9.2 \pm 2.7	
	No opinion	8.6 \pm 3.3	
Enteral feeding increases the burden on nursing personnel.	Agree	10.3 \pm 2.8	0.001*
	Disagree	11.0 \pm 2.6	
	No opinion	8.5 \pm 2.4	
It is better to avoid enteral feeding because it leads to complications such as aspiration.	Agree	10.6 \pm 2.7	0.274
	Disagree	9.7 \pm 2.8	
	No opinion	10.0 \pm 3.0	
Nurses have a role in providing adequate nutrition.	Agree	10.8 \pm 2.6	0.008*
	Disagree	9.4 \pm 3.0	
	No opinion	9.3 \pm 2.7	
It is important to understand how to administer the tube feeding.	Agree	10.7 \pm 2.7	0.027*
	Disagree	9.5 \pm 2.5	
	No opinion	9.2 \pm 3.3	
Tube feeding is an expensive treatment and it does not have any impacts and benefits for critically ill patients.	Agree	10.3 \pm 2.4	0.010*
	Disagree	10.7 \pm 2.8	
	No opinion	8.6 \pm 3.2	
I am generally satisfied with the quality of enteral feeding given for hospitalized patients.	Agree	10.8 \pm 2.6	0.034*
	Disagree	9.8 \pm 2.8	
	No opinion	9.4 \pm 3.5	
It is difficult to administer tube	Agree	10.3 \pm 3.0	0.242

feeding because limited instruction is provided by the Dietitian.	Disagree	10.5 ± 2.6	
	No opinion	9.3 ± 2.5	
Complications of enteral feeding can be controlled by different practices or different regimens.	Agree	10.5 ± 2.8	0.315
	Disagree	10.2 ± 2.9	
	No opinion	9.5 ± 2.4	
SD: Standard deviation.			
* The differences are significant using one-way ANOVA (i.e., p-value < 0.05)			

Variables		Mean ± SD	p-value
Dealt with EN patient	Yes	10.7 ± 2.8	0.022*
	Sometimes	9.6 ± 2.9	
	No	9.2 ± 2.5	
Flush the tube with 5 cm³ water after feeding	Yes	10.7 ± 2.8	0.011*
	Sometimes	8.4 ± 1.7	
	No	10.1 ± 2.9	
Give medication for the patient	Yes	10.4 ± 2.7	0.626
	Sometimes	9.8 ± 3.1	
	No	10.0 ± 3.1	
Check residual Volume	Yes	10.8 ± 2.7	0.001*
	Sometimes	8.7 ± 2.6	
	No	9.0 ± 2.7	
Most feed formula in EN	Standard	10.2 ± 2.7	0.209
	Specialized	10.2 ± 2.8	
	Blenderized	11.7 ± 3.1	
Elevate the patient head position to 45° after feeding	Yes	10.6 ± 2.8	0.046*
	Sometimes	8.6 ± 2.6	
	No	9.5 ± 2.6	
return the patient to his original position after feeding	Yes	10.9 ± 2.5	0.031*
	Sometimes	9.7 ± 3.2	
	No	9.8 ± 2.9	
Last step in nasogastric tube feeding	Assess for bowel sounds	10.5 ± 2.7	0.445
	Auscultate tube placement & check pH	10.2 ± 3.2	
	Flush the tube with water	10.4 ± 2.6	
	Re-flush the tube with water	9.2 ± 2.4	
SD: Standard deviation.			
* The differences are significant using one-way ANOVA (i.e., p-value < 0.05)			

4.3 Nurses' Practices Regarding Enteral Nutrition

Table 11 summarizes Nurses' practices regarding EN, see also figures 6-9.

- The majority of nurses (64.0%) flush the tube with 5 cm³ water after feeding.
- The most commonly used formula is the standard formula by (54.0%), followed by specialized formula (38.5%), and only 7.5% of nurses used Blenderized formula.
- Nearly half of nurses (47.8%) returned the patient to the original position after feeding.
- Almost three-quarters of nurses (75.2%) check residual volume.
- The majority of nurses (76.4%) reported that they elevate the patient head position 45° after feeding.
- Only 19.3% of nurses didn't give medications during feeding.
- In regard to the last step in nasogastric tube feeding, 33.5% of nurses auscultate tube placement and check pH, 29.8% of them access for bowel sounds, 28.6% flush the tube with water, 8.1% re-flush the tube with water.

Furthermore, it was found from chi-square test analysis that nurses' gender was not significantly associated with their practices, i.e., p-value > 0.05.

Variables		Males (n = 96, 60%)	Females (n = 65, 40%)	p- value
		n (%)	n (%)	
Dealt with EN patient	Yes	73 (76.0)	43 (66.2)	0.356
	Sometimes	8 (8.3)	9 (13.8)	
	No	15 (15.6)	13 (20.0)	
Flush the tube with 5 cm³ water after feeding	Yes	65 (67.7)	38 (58.5)	0.316
	Sometimes	7 (7.3)	9 (13.8)	
	NO	24 (25.0)	18 (27.7)	

Give medication for the patient	Yes	70 (72.9)	48 (73.8)	0.679
	Sometimes	6 (6.3)	6 (6.9)	
	No	20 (20.8)	11 (16.9)	
Check residual Volume	Yes	74 (77.1)	47 (72.3)	0.392
	Sometimes	7 (7.3)	9 (13.8)	
	No	15 (15.6)	9 (13.8)	
Most feeding formula in EN	Standard	59 (61.5)	28 (43.1)	0.072
	Specialized	31 (32.3)	31 (47.7)	
	Blenderized	6 (6.3)	6 (9.2)	
Elevate the patient head position to 45° after feeding	Yes	73 (76.0)	50 (76.9)	0.972
	Sometimes	4 (4.2)	3 (4.6)	
	No	19 (19.8)	12 (18.5)	
return the patient to his original position after feeding	Yes	53 (55.2)	24 (36.9)	0.074
	Sometimes	12 (12.5)	11 (16.9)	
	No	31 (32.3)	30 (46.2)	
Last step in nasogastric tube feeding	Assess for bowel sounds	33 (34.4)	15 (23.1)	0.365
	Auscultate tube placement	32 (33.3)	22 (33.8)	
	b& check pH	25 (26.0)	21 (32.3)	
	Flush the tube with water	6 (6.3)	7 (10.8)	
	Re-flush the tube with water			
EN: Enteral nutrition.				
* The differences are significant using Pearson Chi square test (i.e., p-value < 0.05).				

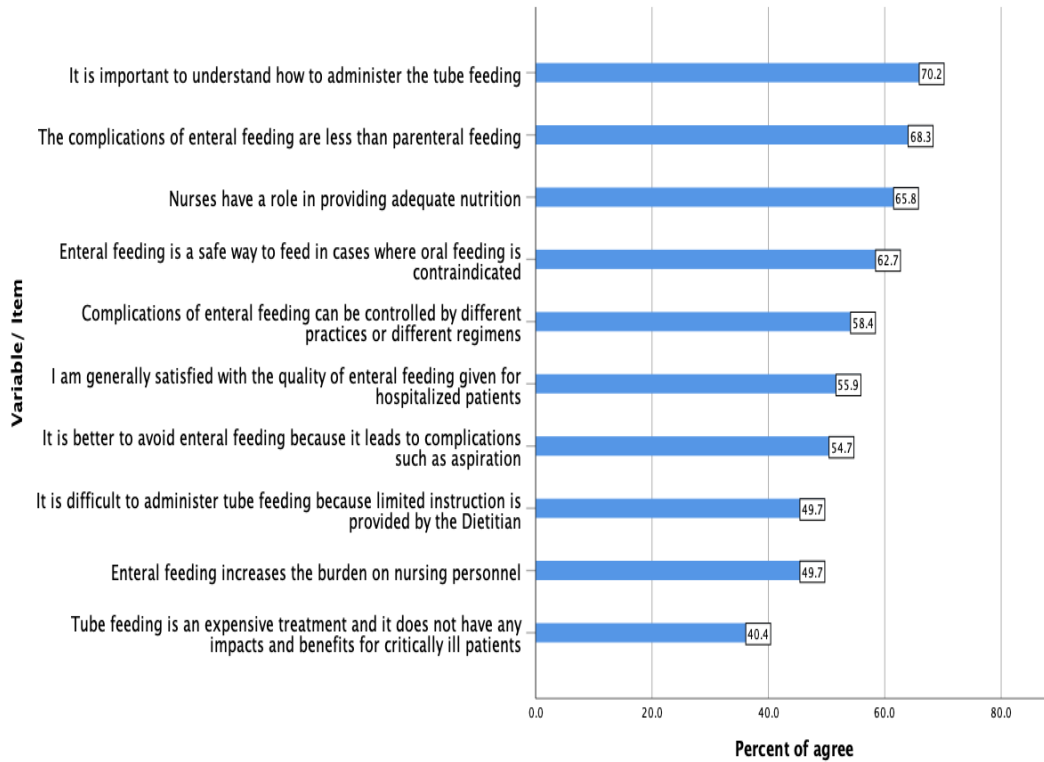


Fig. 6. Nurses' attitudes regarding EN (% of agree)

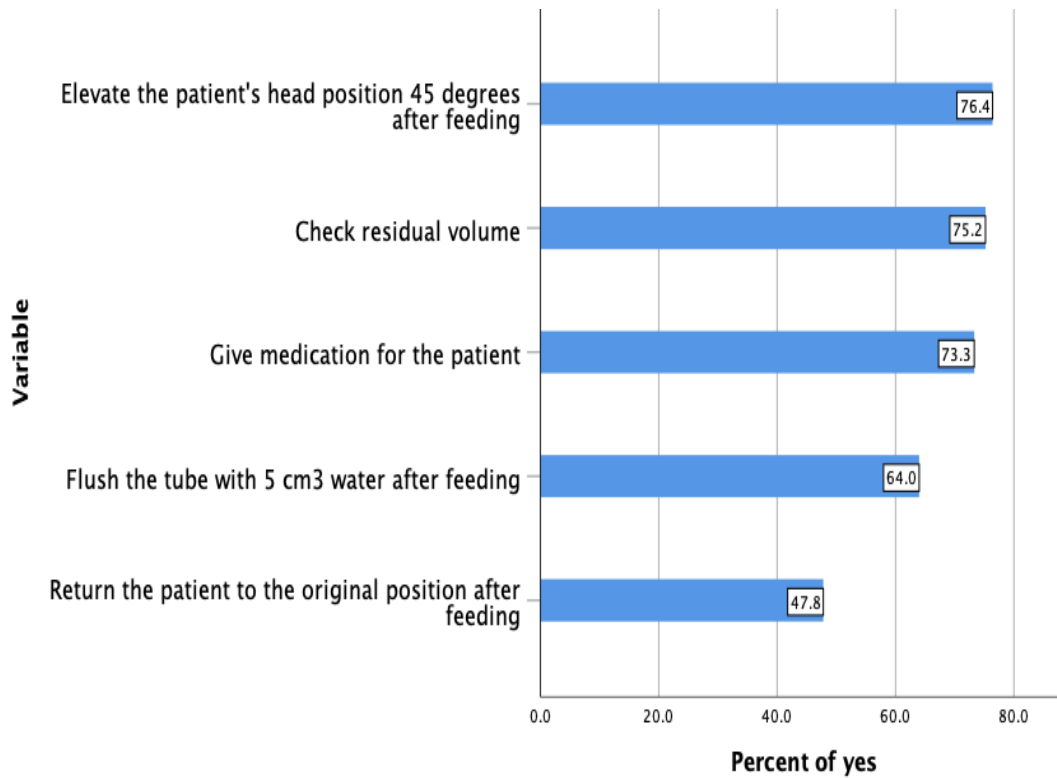


Fig. 7. Nurses' practices regarding EN (% of yes)

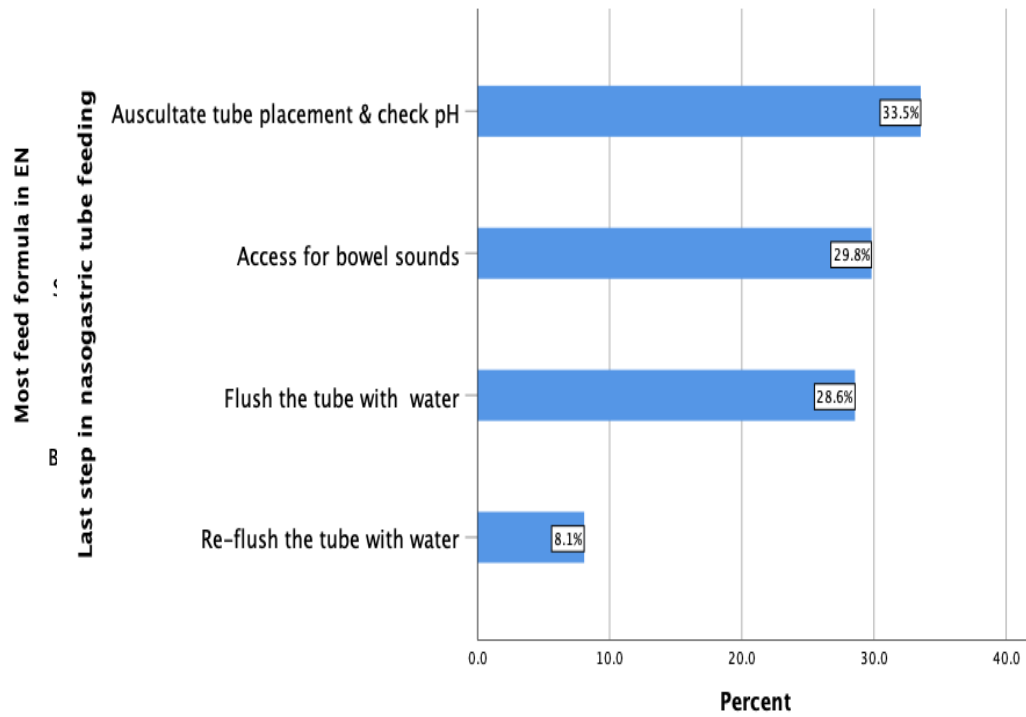


Fig. 8. Nurses' practices regarding EN (% of most feeding formula in EN)

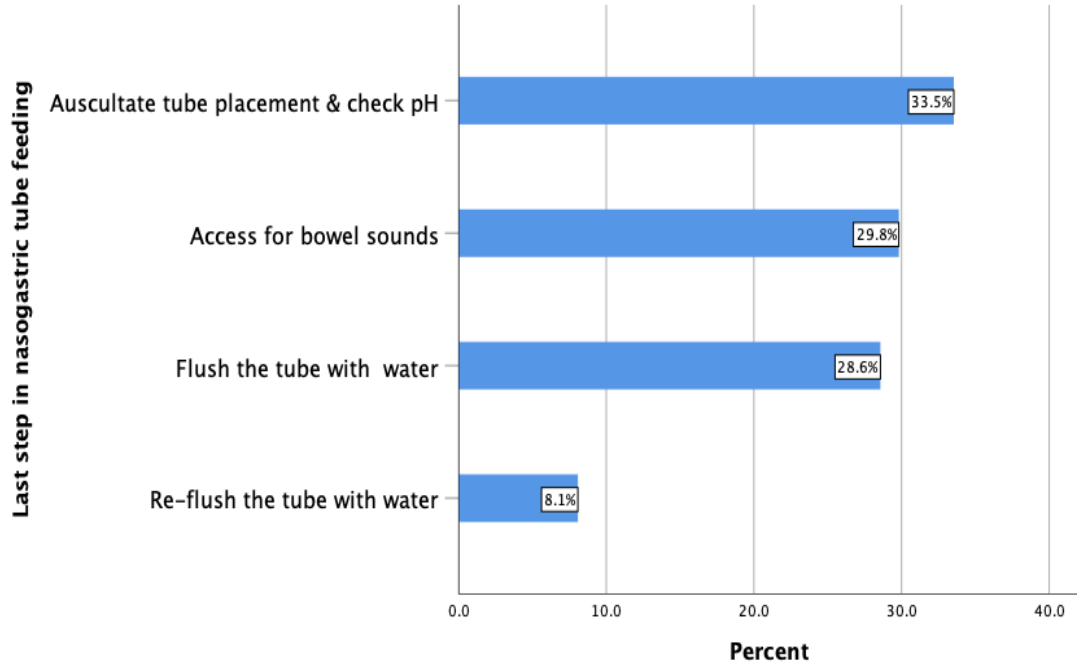


Fig. 9. Nurses' practices regarding EN (% of last step in nasogastric tube feeding)

4.4 Nurses' Attitudes Regarding Enteral Nutrition

Table 12 demonstrates our findings on nurses' attitudes regarding EN according to gender (see also Fig. 6).

- The majority of participants (70.2%) agree that understanding how to administer tube feeding is important.
- Most of the them (68.3%) believe that the complications of EF are less than parenteral feeding.
- About two-thirds of them (65.8%) believe that the nurses have a role in providing adequate nutrition.
- 62.7% of them think that EF is a safe way to feed in cases where oral feeding is contraindicated.
- Nearly a half of them (49.7%) think that is difficult to administer tube feeding because limited instruction is provided by the Dietitian.
- Only (40.4%) of them agree that tube feeding is an expensive treatment and it does not have any impacts and benefits for critically ill patients.

Table 12: Nurses' attitudes regarding EN according to gender.				
Variables		Males	Females	p-value
		(n = 96, 60%)	(n = 65, 40%)	
		n (%)	n (%)	
The complications of enteral feeding is less than parenteral feeding.	Agree	71 (74.0)	39 (60.0)	0.134
	Disagree	17 (17.7)	20 (30.8)	
	No opinion	8 (8.3)	6 (9.2)	
Enteral feeding is a safe way to feed in cases where oral feeding is contraindicated.	Agree	61 (63.5)	40 (61.5)	0.390
	Disagree	29 (30.2)	17 (26.2)	
	No opinion	6 (6.3)	8 (12.3)	

Enteral feeding increases the burden on nursing personnel.	Agree	49 (51.0)	31 (47.7)	0.850
	Disagree	35 (36.5)	24 (36.9)	
	No opinion	12 (12.5)	10 (15.4)	
It is better to avoid enteral feeding because it leads to complications such as aspiration.	Agree	53 (55.2)	35 (53.8)	0.452
	Disagree	33 (34.4)	19 (29.2)	
	No opinion	10 (10.4)	11 (16.9)	
Nurses have a role in providing adequate nutrition.	Agree	67 (69.8)	39 (60.0)	0.371
	Disagree	21 (21.9)	17 (26.2)	
	No opinion	8 (8.3)	9 (13.8)	
It is important to understand how to administer the tube feeding.	Agree	66 (68.8)	47 (72.3)	0.393
	Disagree	16 (16.7)	13 (20.0)	
	No opinion	14 (14.6)	5 (7.7)	
Tube feeding is an expensive treatment and it does not have any impacts and benefits for critically ill patients.	Agree	49 (51.0)	16 (24.6)	0.002*
	Disagree	39 (40.6)	37 (56.9)	
	No opinion	8 (8.3)	12 (18.5)	
I am generally satisfied with the quality of enteral feeding given for hospitalized patients.	Agree	56 (58.3)	34 (52.3)	0.487
	Disagree	31 (32.3)	21 (32.3)	
	No opinion	9 (9.4)	10 (15.4)	
It is difficult to administer tube feeding because limited instruction is provided by the Dietitian.	Agree	53 (55.2)	27 (41.5)	0.139
	Disagree	31 (32.3)	31 (47.7)	
	No opinion	12 (12.5)	7 (10.8)	
Complications of enteral feeding can be controlled by different practices or different regimens.	Agree	57 (59.4)	37 (56.9)	0.935
	Disagree	27 (28.1)	20 (30.8)	
	No opinion	12 (12.5)	8 (12.3)	
EN: enteral nutrition.				
* p-value < 0.05 using Pearson Chi square test (i.e.,).				

Furthermore, Chi-square test was performed to determine if nurses' gender is significantly associated with their attitudes. The analysis reveals that the only differences in gender

and nurses' attitudes about "tube feeding is an expensive treatment that does not have any impacts and benefits for critically ill patients" was statistically significant, i.e., p -value < 0.05 . We notice that almost half of male participants (51%) agreed with the latter, while only about a quarter of female participants (24.6%) agreed with it.

Conclusion

The current study aims at assess knowledge, attitudes and practices among ICU's nurses towards NE in Palestine. It is important to note that the first study, conducted by Hamdan et al. in 2022, gathered data from nurses working across various employment units in six hospitals across the entire West Bank region. In contrast, our study specifically concentrated on ICU nurses working in seven hospitals situated in the southern West Bank. This focused approach allows for a more in-depth examination of EN practices within this specific healthcare setting, complementing the broader insights gained from the previous research. Together, these studies contribute valuable information to enhance the quality of care and training for nurses involved in EN management in Palestine.

The study reveals that the mean knowledge score among ICU nurses regarding the subject matter was inadequate, with an average score of 10.3 out of 20. Specifically, only 29.2% of the nurses demonstrated a good level of knowledge, while a mere 1.9% exhibited an excellent level of understanding. These findings underscore the need for targeted educational interventions and training programs aimed at improving the knowledge base of ICU nurses in this area, ultimately enhancing the quality of care provided to patients in the critical care setting.

Generally, nurses have a positive attitude and their practices consist with the guideline.

Chapter Five

Overview

On the basis of the current literature, this is the second research that has been designed to assess the knowledge, attitudes, and practices regarding EN among nurses in Palestine. In the first research (Hamdan et al., 2022), the authors collected data from nurses at different employment units at 6 hospitals in the entire region of the West Bank. However, this study focused on ICU nurses from 7 hospitals located in the southern West Bank.

5.1 Discussion

5.1.1 What is the level of knowledge of ICU nurses in Palestine regarding enteral nutrition?

The mean knowledge score among ICU nurses was inadequate (i.e., 10.3 ± 2.8) out of 20. It was found that 29.2% of nurses have a good knowledge while only 1.9% of nurses have an excellent knowledge level. This finding was consistent with the study conducted by (Hamdan et al., 2022), where the mean knowledge score was (9.6 ± 2.8) out of 20. Furthermore, similar conclusions were also obtained from former studies (Darawad et al., 2015; Morphet et al., 2016; Ramuada, 2017).

We also observed that the following were the primary areas/guidelines where ICU nurses had EN knowledge gaps (i.e., the percentage of correct answers was less than 50%):

- Nasogastric feedings are preferred over intestinal feedings (such as nasojejunal and nasoduodenal), for example.
- When the position of the bed can be altered.
- The tube feeding technique that causes the most drug-nutrient interactions.
- Blenderized tube feeding is not advised for people with impaired immune systems.

- When should the tubes be flushed.
- Pancreatitis is a sign that EF should be started.
- giving out medication.
- Generally, our findings about the above-mentioned guidelines are consistent with the study performed by (Hamdan et al. 2022), see Fig.10. For instance, we noticed the following:
 - Only 32.3% participants in the current study, respectively 36.0% in study of Hamdan et al., (2022) could know that blenderized formula is prohibited for immune-compromised patients. Let us remark that the blenderized formula should not be used in the following cases (see e.g., Novak et al., 2009):
 - 1) Immune-compromised patients.
 - 2) When the daily fluid intake is less than 900 ml.
 - 3) In cases where patients have food sensitivities.
 - 4) When using a jejunostomy tube, number three.
 - 5) Never stop feeding unless the formula hangs for no more than two hours.
 - Only 41.6% in this study of participated nurses and only 45.2% of participated nurses in (Hamdan et al., 2022) study, know that intragastric feeding provides greater physiologic benefits compared to other types of feeding. For instance, (Cde et al., 2016) documented that intragastric feedings are more easily afforded and less intricate to transfer compared to intestinal feedings, where the stomach controls the rate at which nutrients get into the intestine.
 - Early administration of EF is useful for patients who undergoing gastrointestinal surgery as well as for patients suffering from pancreatitis (Reid, 2006; Al-Omran et al.,

2010) and (Andersen et al., 2011). Only 37.9% of participated nurses in this study and only 38.2% in (Hamdan et al., 2022) study, were aware of this guideline.

On the other hand, unlike (Hamdan et al., 2022) where about three-quarters (72.0%) did not know that ensure provides 250 cal and 9 g protein whereas ensure plus provides 350 cal and 13 g protein per serving, we have observed that nearly half of the participated ICU nurses in this study (52.2%) knew this guideline.

Furthermore, similar to (Hamdan et al., 2022), it was found that sociodemographic characteristics (gender, marital status, residence, and qualification) were not statistically associated with nurses' knowledge score. Let us remark that a former study conducted by (Das et al. 2014), the authors observed that females and unmarried nurses are more likely to have above average level of knowledge. Lastly, we also observed in this study that ICU nurses with 6 – 10 years of working experience had a higher mean knowledge score than nurses with 5 years or less experience. Furthermore, there was no statistically significant difference between the mean knowledge score for nurses who are working in private and governmental hospitals.

5.1.2 What are the practices of ICU nurses in Palestine related to EN for critically ill patients?

Overall, our findings about nurses' practices regarding EN guidelines are consistent with the results obtained in study performed by (Hamdan et al. 2022), see Fig.11. For instance, it was noticed the following in both studies:

The majority of nurses give patients medications. To prevent tube obstruction, excessive drug toxicity, and poor drug efficacy, nurses should use extreme caution when giving medications intravenously.

- Most nurses reported that they maintained their patients' backrests elevated by 45 degrees while they were being fed. In addition, over half of them said they put the patient back in his original posture after feeding.
- The majority of nurses said they regularly measure stomach residual volume. The usefulness of stomach residual volume as a measure of EN tolerance is hotly contested (Bankhead et al., 2009). The monitoring of stomach residual volume may not provide aspiration protection for patients. Constant subglottic suctioning, oral cleansing, and elevating the head of the bed are the best methods for reducing the risk of aspiration. Noting that patients who are established on a feeding schedule or who use a feeding tube on a regular basis do not need to have their stomach residual volume monitored precisely.

5.1.3 What are the attitudes of ICU nurses in Palestine related to EN for critically ill patients?

Generally, nurses have positive attitudes towards EN. Overall, the percentage of participated nurses' attitudes regarding EN in this study and that conducted by Hamdan et al. (2022) are very close, see Fig. 12. For instance, we noticed the following in both studies:

- The majority of enrolled nurses (68.3%) in the present study and 70.7% in (Hamdan et al., 2022) believed that the complications of EF are less than parenteral feeding. There is a strong consensus and a belief that a lack of controversy exists when comparing EN with parenteral nutrition (PN), and most experts report that EN is always preferred to PN (Seres et al., 2013).

- Less than half of nurses believed that EN is an expensive treatment and it is difficult to administer.

Nevertheless, almost half of the nurses believed that EN can increase the work burden.

It was also surprising, about two-thirds of nurses believed that nurses have a role in providing adequate nutrition.

5.1.4 Are there any significant differences in the level of knowledge based on practices and attitudes of ICU nurses in Palestine towards EN?

Analyzing data of the study uncovered that the relationship is significant in certain practices and not significant with others, its significant with dealing with EN patients, flush tube feeding, and checking residual volume but not significant with: giving medication.

Also, the relationship is significant with a certain attitude and not significant with others for instance it's significant with the complication of enteral feeding are less than parenteral feeding and not significant when with its better to avoid enteral feeding because it leads to complication such as aspiration.

5.1.5 Are there any significant differences in the level of knowledge of ICU nurses in Palestine regarding EN based on demographic characteristics?

Analyzing data of the study revealed that only the years of experience were significant in the knowledge score. Nurses with experience from 6 to 10 years had a higher mean knowledge level than the nurses with less than one year to five years.

This category had the lowest mean of knowledge level. Let us remark that in a former study conducted by (Das et al. 2014), the authors observed that females and unmarried

nurses are more likely to have an above average level of knowledge. Also, the current result goes in line with the study of Moustafa et al., (2016) that showed that there was statistically significance relation between level of knowledge, practice and attitude. It also found that knowledge, practice and attitude level was found to differ significantly in relation to years of experience.

5.2 Conclusion

A conclusion that can be drawn from the results of the current study is that the mean knowledge score among ICU nurses was insufficient, which may have increased the risk of mortality, complications, hospitalization, and hospital costs.

The results for ICU nurses' attitudes towards EN demonstrate that they have favorable opinions. The majority of nurses who participated in the study thought EF had less difficulties than parenteral feeding, and roughly two-thirds of ICU nurses thought their job included ensuring patients to get enough nourishment.

Less than 50% of ICU nurses returned the patient to their original position after feeding, almost three-quarters of nurses checked the residual volume, and the majority of nurses said they elevated the patient's head position 45 after feeding, according to the practice of ICU nurses.

A regular training programmed for EN care must be implemented in order to improve and refresh the knowledge of ICU nurses given the large knowledge gap about EN care that has been observed.

5.3 Recommendation

In the light of the main findings of the research, the study has suggested several recommendations that may help improve ICU nurses' knowledge, practice, understanding and competence towards EN. These recommendations specifically focus on three main domains; nurses' education and training, research and policymakers as follows:

First, education and Training:

- Nurses should undergo formal education and training on EF; they can attend workshops, seminars, or enrolled in courses that are focus on EF.
- Encourage ICU nurses to pursue continuous learning to improve delivering best EF service. They can attend conferences, webinars, or reading research articles.
- Enhancing incorporate simulations and skills labs into the ICU nurse's training. These can help the ICU nurse practice EF techniques in a controlled environment before performing them on actual patients.

Secondly, nursing research:

- Conduct more needs assessment to understand the specific challenges and gaps in enteral feeding practices in the hospital in Palestine through surveys, interviews and data collection from healthcare facilities, practitioners and patients.
- Initiate epidemiological studies to determine the prevalence of conditions that require enteral feeding such as malnutrition, dysphagia, and critical illnesses in the Palestinian territories. This may help nurses to improve establishing better knowledge and understanding regarding EN.

Thirdly, policymakers:

- Decision-makers should develop appropriate guidelines and provide crucial data for developing clear guidelines and regulations.
- Legislating laws enhancing workforce development and quality improvement to ensure that healthcare providers have the capacity to meet these standards effectively.

5.4 Limitation

The current research is limited to the hospitals located two northern cities only; Bethlehem and Hebron. It does not include other hospitals located in the southern cities in the West Bank. Also, the tool of collecting data of the current research was only the questionnaire. It would have been better to use the observation as a tool side by side to the questionnaire used so that provide better understanding of ICU's nurses' practices towards EN. Finally, no local literature reviews could be accessed except Hamdan's study (2022), so that no comprehensive comparison with wider scope of local studies was made.

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Appendix 1: The questionnaire



Subject:

Assessment of Knowledge, Practices and Attitude Regarding Enteral Nutrition Among ICU Nurses in Palestine

Dear ICU nurse,

I kindly invite you to participate in my research project on the assessment of knowledge, practices, and attitudes regarding enteral nutrition among ICU nurses in Palestine. Your participation is valuable to me as it will provide me with insights on how I can improve patient care in hospitals in the future.

If you agree to participate, you will be asked to complete the questionnaire. Your participation is completely voluntary and you have the right to withdraw at any time without any consequences.

Rest assured that all the information you provide will be treated with confidentiality. The data collected will be used for research purposes only and any published results will be anonymous and will not contain any identifying information.

Thank you in advance for your cooperation and your valuable contribution to this important research.

Best Regards,

Researcher: Manal Adawi

Instructor: Dr. Nisreen Salama

Participant number	
Date	

Instructions:

1. Please complete this questionnaire honestly. Your responses are completely confidential and will not be shared with anyone else.
2. Answer all questions by making a circle on the relevant box(es).
3. Please do not leave any questions unanswered. If you do not understand a question, please do not hesitate to contact the researcher for clarification.
4. Please do not share your answers with anyone else.

Part One: Socio- demographic Information

- **Gender**
 - A. Male
 - B. Female
- **Age:** _____
- **Educational Level**
 - A. Diploma Degree
 - B. Bachelor Degree
 - C. Master's Degree
 - D. Other (please specify) _____
- **Marital status**
 - A. Single
 - B. Married
 - C. Widowed
 - D. Divorced
- **Area of living**
 - A. Camp
 - B. Village
 - C. City
- **Name of hospital** _____
- **Which department do you work in?**
(Surgery, ICU, etc.) _____
- **Years of experience**
 - A. Less than one yea
 - B. 1-5
 - C. 6-10
 - D. 11-15
 - E. More than fifteen years

Information related to nutrition		
1.	If you have a question about an issue in EN, you go to? <u>(you can choose more than one)</u>	A. Books B. Internet C. Doctor D. Dietitian E. Colleagues at work place
2.	What are your sources of nutritional information? <u>(you can choose more than one)</u>	A. University course B. Experience C. Joining seminar D. Joining workshop E. Internet
3.	Have you taken any training course in enteral feeding during your study?	A. Yes B. No
4.	Have you taken any training course in enteral feeding after you study?	A. Yes B. No
5.	Do you have experience in applying enteral feeding for patients? <u>If "Yes", answer the following questions, if "No" go to the "Knowledge Section"</u>	A. Yes B. No
6.	How often do you deal with patients whoneed enteral feeding?	A. Almost every day B. Once a week C. 2 to 3 time per month D. 1 time every three months
7.	What method of tube feeding administration did you deal with? <u>(you can choose more than one method)</u>	A. Bolus feeding B. intermittent drip C. continuous drip

Knowledge Section		
8.	Pancreatitis Is an indication to start enteral feeding.	A. Yes B. No C. I do not know
9.	Nasogastric can be administrated by bolus injection or by intermittent or continuous infusions?	A. Yes B. No C. I do not know
10.	Continuous drip method doesn't require pump	A. Yes B. No C. I do not know
11.	Intermittent drip-feeding regimen can be given by pump or gravity drip	A. Yes B. No C. I do not know
12.	Continuous drip method is the most problematic for drug-nutrient interaction	A. Yes B. No C. I do not know
13.	The closed tube system is better as compared to the opened tube system due to:	A. Less contamination B. Less complication such as diarrhea C. Both are the same
14.	Tube dislodgment is considered one of the complications of EN?	A. Yes B. No C. I do not know
15.	Blenderized tube feedings are contraindicated for patients who are immunocompromised?	A. Yes. B. No. C. I do not know.
16.	The difference between ensure and ensure plus is:	A. Ensure provides 250 calories and 9 g protein per serving and ensure plus provides 350 calories and 13 g protein per serving. B. Ensure provides 350 calories and 13 g protein per serving and ensure plus provides 250 calories and 9 g protein per serving. C. I do not know.

17.	The purpose of flushing is to check for preventing clogging of enteral tubes?	A. Yes. B. No. C. I do not know.
18.	Enteral feeding tubes should be flushed with water just prior to feeding?	A. Yes. B. No. C. I do not know.
19.	Enteral tubes should be flushed with 5- 20 ml of water?	A. Yes. B. No. C. I do not know.
20.	Medications can be administered with feeding?	A. Yes. B. No. C. I do not know.
21.	Nasogastric route is part of short-termenteral feeding support for less than 4weeks?	A. Yes. B. No. C. I do not know.
22.	The ongoing assessment of nasogastric tube placement every:	A. 4 hours B. 8 hours C. 24 hours
23.	Feeds are usually commenced at (mL/h):	A. Low rate (about 25-50 ml/hour) B. High rate (about 100-150ml/hour) C. None of the above
24.	The bed position of conscious patient can be changed after:	A. 15 minutes after feeding. B. 30 minutes after feeding C. 60 minutes after feeding.
25.	Post-pyloric feeding is associated with fewer interruptions once EN has been started.	A. True B. False
26.	Post-pyloric feeding may reduce the risk of gastroesophageal reflux.	A. True B. False
27.	Which of the following provides greater physiologic benefits?	A. Nasoduodenal tube feeding B. Nasojejunal tube feeding C. Intragastric feeding

Attitude section		
28.	I think that the complications of enteral feeding are less than parenteral feeding?	A. Agree B. Disagree C. No opinion
29.	I think that enteral feeding is safe way to feed in cases where oral feeding is contraindicated?	A. Agree B. Disagree C. No opinion
30.	I think that enteral feeding increases the burden on nursing personnel?	A. Agree B. Disagree C. No opinion
31.	I think it is better to avoid enteral feeding because it leads to complications such as aspiration.	A. Agree B. Disagree C. No opinion
32.	I think that the nurses have a role in providing adequate nutrition.	A. Agree B. Disagree C. No opinion
33.	I think that it is important for nursing personnel to understand how to administer tube feeding for the well-being of the patient?	A. Agree B. Disagree C. No opinion
34.	I think that tube feeding is an expensive treatment and it does not have any impacts and benefits for critically ill patients.	A. Agree B. Disagree C. No opinion
35.	I am generally satisfied with the quality of enteral feeding given for hospitalized patients.	A. Agree B. Disagree C. No opinion
36.	I think that It is difficult to administer tube feeding because limited instruction is provided by the Dietician.	A. Agree B. Disagree C. No opinion
37.	I think that complications of enteral feeding can be controlled by different practices or different regimen.	A. Agree B. Disagree C. No opinion

Practices Section		
38.	Have you ever dealt with an EN patient?	A. Yes B. No C. Sometimes
39.	Do you flush the EFT tube with 5 cc water after feeding?	A. Yes B. No C. Sometimes
40.	Do you give the medications for the patient?	A. Yes B. No C. Sometimes
41.	Do you check residual volume to prevent complications?	A. Yes B. No C. Sometimes
42.	How many patients, who need tube feeding, you see in a day?	
43.	How do you administer the formula if self fed in enteral feeding?	
44.	What is the generally most used formula for enteral feeding patient?	A. Standard formula B. Specialized formula C. Blenderized diet
45.	Do you elevate the patient head position to 45 degrees after feeding?	A. Yes B. No C. Sometimes
46.	Do you return the patient to his original position after feeding?	A. Yes B. No C. Sometimes
47.	When preparing for an enteral feeding through a nasogastric tube, what is the last step to do?	A. Assess for bowel sounds B. Auscultate tube placement and check pH C. Flush the tube with water D. Re-flush the tube with water

Thank you for offering your precious time!

Appendix 2: Discussion Figures

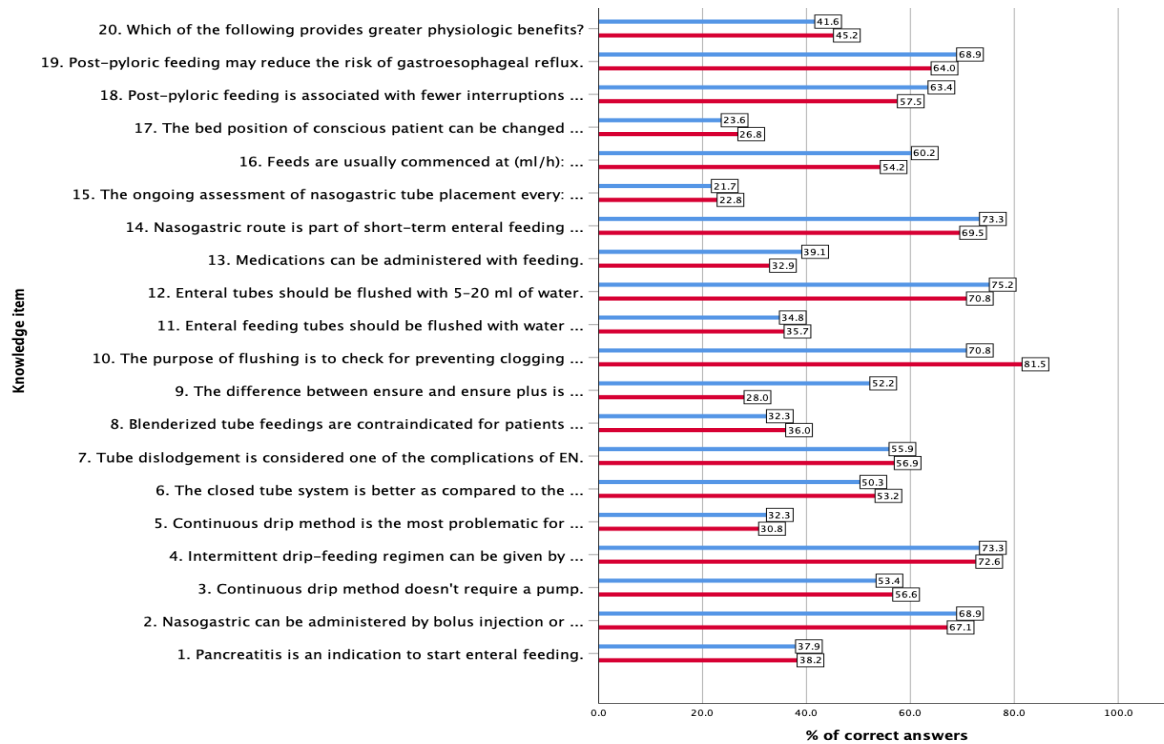


Fig. 10. Nurses' knowledge level regarding EN (% of correct answers): Blue bars (current study) and red bars (Hamdan et al., 2022)

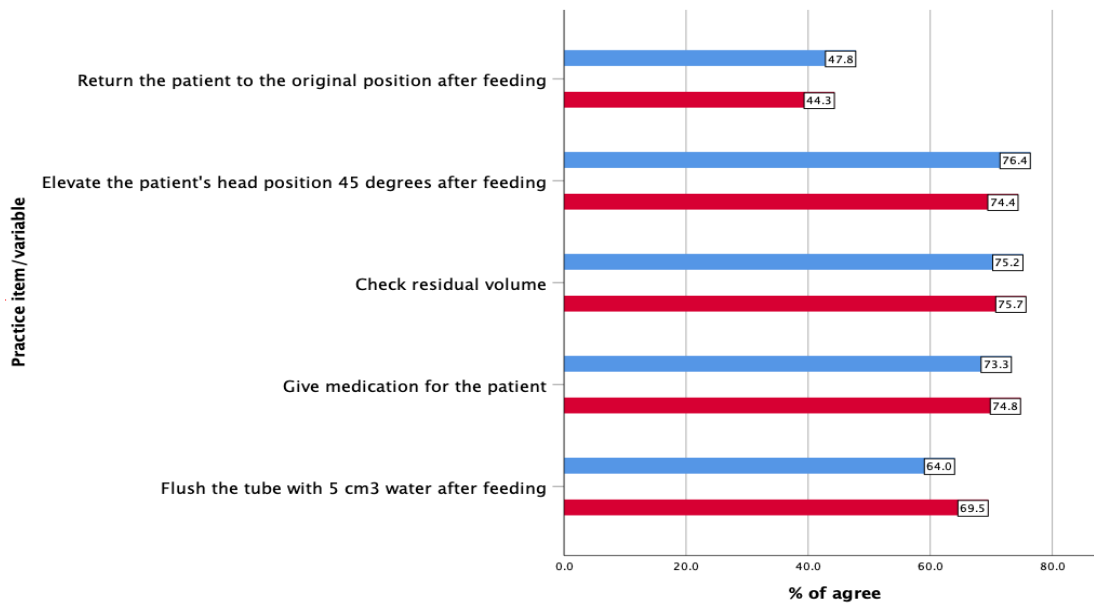


Fig. 11. Nurses' practices regarding EN (% of correct answers): Blue bars (current study) and red bars (Hamdan et al., 2022)

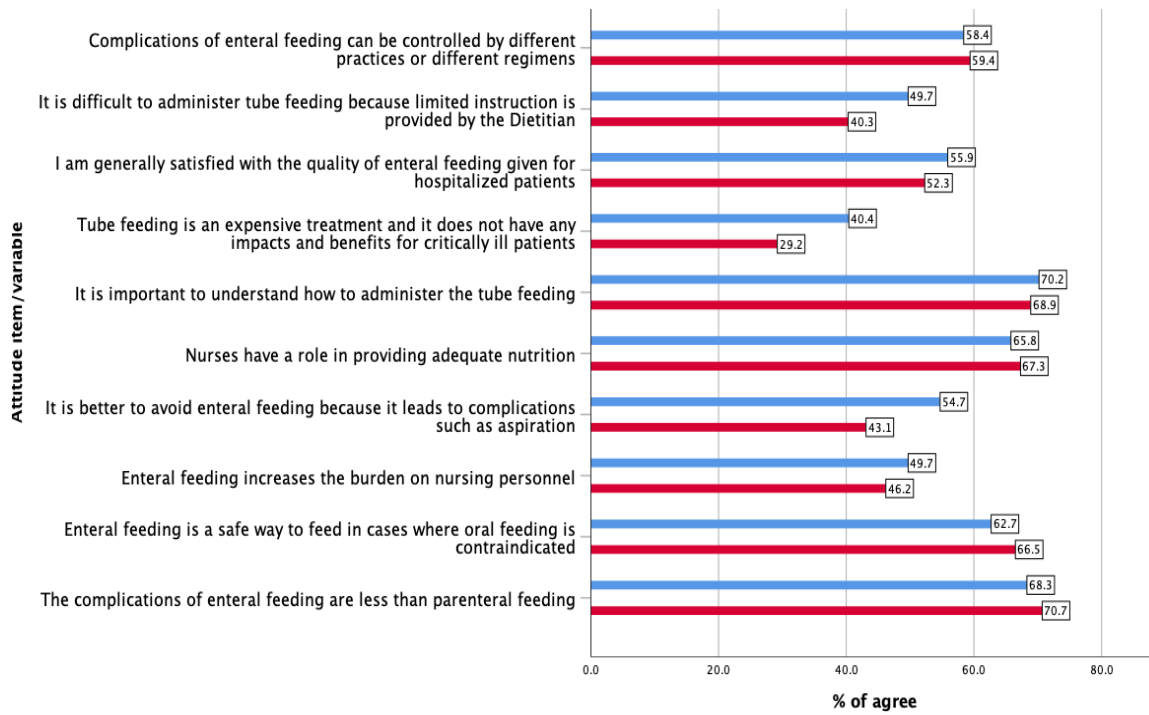


Fig. 12. Nurses' practices regarding EN (% of correct answers): Blue bars (current study) and red bars (Hamdan et al., 2022)

Appendix 3: IRB Approval Letter

Arab American University- Palestine
 Deanship of Scientific Research
 IRB committee
 Tel: 04-241-8888, ext 1196
 E-mail: irb.aaup@aaup.edu



الجامعة العربية الأمريكية فلسطين
 عمادة البحث العلمي
 لجنة أخلاقيات البحث العلمي
 تلفون: 1196 ext 04-241-8888
 البريد الإلكتروني: irb.aaup@aaup.edu

IRB Approval Letter

Study Title: Assessment of knowledge, practices and attitude regarding to enteral nutrition among ICU nurses in Palestine

Submitted by: Manal Yousef Ali Adawi

Date received: 10th April 2023

Date reviewed: 1st May 2023

Date approved: 1st May 2023

Your Study titled "Assessment of knowledge, practices and attitude regarding to enteral nutrition among ICU nurses in Palestine" With archived number 2023/A/75/N was reviewed by the Arab American University IRB committee and was approved on 1st May 2023.

Reham Khalaf-Nazzal, MD, PhD
 IRB committee chairman
 Arab American University of Palestine



General Conditions:

1. Valid for 4 months from date of approval.
2. It is important to inform the committee with any modification of the approved study protocol.
3. The committee appreciates a copy of the research when accomplished.

لجنة أخلاقيات البحث العلمي في الجامعة العربية الأمريكية

IRB at Arab American University

الملخص

خلفية الدراسة: تلعب التغذية المعوية دوراً مهماً في رعاية المرضى المصابين بأمراض خطيرة الذين يتم إدخالهم إلى وحدات العناية المركزة (ICUs). ومن الناحية القانونية، تعتبر التغذية المعوية علاجاً طبياً ويحكمها اعتبارات أخلاقية. ويُنظر لمستوى المعرفة والممارسات وتوجهات الصحاح لمرضات وحدة العناية المركزة كعوامل ضرورية لتقديم التغذية المعوية بشكل فعال.

هدف الدراسة: تقييم المعرفة والممارسات والتوجهات المتعلقة بالتغذية المعوية لدى مرضات وحدة العناية المركزة في فلسطين.

مهجية الدراسة: تم إجراء تصميم مستعرض اشتمل على 161 ممرضاً وممرضة ممن يعملون في وحدة العناية المركزة في المستشفيات الجنوبية في فلسطين. كما وتم استخدام استبيان منظم لجمع المعلومات الديموغرافية للممرضات، ومعرفة المبادئ التوجيهية للتغذية المعوية، وممارساتهم في إدارة التغذية المعوية، واتجاهات اراء التغذية المعوية. وتم تحليل البيانات باستخدام الإحصاء الوصفي، واختبار ت لتحليل العينات المستقلة، واختبار تحليل التباين الأحادي ANOVA، واختبار مربع كاي، والانحدار الخطي.

نتائج الدراسة: كشفت نتائج الدراسة أن هناك درجة غير كافية من المعرفة بين ممرضات وحدة العناية المركزة فيما يتعلق بموضوع الدراسة، حيث بلغت متوسط حسابي مقداره 10.3 من 20. وعلى وجه التحديد، أظهر 29.2% فقط من الممرضات مستوى جيد من المعرفة، في حين أن 1.9% فقط أظهروا مستوى عالي من الفهم. كما وكشفت النتائج أن لدى الممرضات مواقف ايجابية وممارسات متسقة إلى حد ما مع المبادئ التوجيهية. ومع ذلك، كشفت الاتجاهات عن وجود ميول ايجابية بشكل عام نحو التغذية المعوية. كما وأظهرت النتائج عدم وجود فروق ذات دلالة إحصائية بين متوسطات المستوى المعرفي لدى افراد عينة الدراسة في المستشفيات الخاصة والحكومية.

الاستنتاج: تسلط هذه الدراسة الضوء على نقاط القوة والمجالات التي تتطلب الاهتمام في المعرفة والممارسات والاتجاهات لدى ممرضات وحدة العناية المركزة فيما يتعلق بالتغذية المعوية في المستشفيات الجنوبية في فلسطين. وتؤكد النتائج على أهمية التعليم والتدريب المستمر للممرضات لضمان رعاية متسقة وقائمة على الأدلة للمرضى المصابين بأمراض خطيرة والذين يتلقون التغذية المعوية، كما يمكن أن تؤدي معالجة هذه الفجوات في المعرفة والممارسة إلى تحسين نتائج العلاج وجودة الرعاية المقدمة في وحدات العناية المركزة.

الكلمات المفتاحية: المعرفة، الممارسة، التوجه، التغذية المعوية، ممرضات وحدة العناية المركزة.