Nurses Knowledge Related to Enteral and Parenteral Nutritional Therapy for Unconscious Patients

Anees Flayyih Abdulhasan[1*], Sahar Adham Ali[2]

[1]*MSc Adult Nursing, University of Babylon, College of Nursing*
[2]*PhD Adult Nursing, University of Babylon, College of Nursing*

KEYWORDS
Knowledge, enteral, parenteral, nutrition, unconscious patients

ABSTRACT
Background: Enteral nutrition is the preferred method of providing essential nutrients to unconscious patients with a functioning gastrointestinal tract. Nurses play a pivotal role in ensuring safe and effective delivery of enteral nutrition therapy support, encompassing a range of responsibilities before, during, and after feeding. Objectives: 1. Assess Nurses' knowledge regarding unconscious patients' nutrition. 2. Identify the demographical characteristics of studied population. 3. Find out the relations between knowledge of nurses and their demographical and employment characteristics. Methodology: A descriptive –cross sectional study design is the choice to study a specific phenomenon of interest regarding assessing nurses knowledge regarding enteral and parenteral nutritional therapy from period between (November 2022- July 2024). Non-probability convenient sample of (125) nurses who work in the intensive care units were selected. This study conducted in the intensive care units which located at three teaching hospitals in Al-Hilla city- Iraq. Results: The data reveals that the majority, at 55.2%, fall within the 20-30 year age range. Interestingly, the sex distribution is nearly equal with 52% males and 48% females. The result recorded high percentage fair level of nurses knowledge according to sum score.
Conclusion: Nurses demonstrate significant gaps in knowledge across various aspects of ENT, including indications, complications, and nutritional content.

1. Introduction

Nutritional support is a critical yet often overlooked aspect of caring for unconscious patients. In this population, recent studies mentioned the significant impact of nutrition on patient outcomes (Singer, 2019). Unconscious patients experience a heightened metabolic state due to factors like inflammation and increased protein breakdown. Additionally, their gastrointestinal function can be compromised, further hindering nutrient absorption (Guan, 2024). These combined factors place unconscious patients at high risk for malnutrition, which can have detrimental effects on recovery, immune function, and overall prognosis (Visser, 2024).

Specific nutritional needs of unconscious patients, exploring the challenges associated with feeding them and the various methods employed for optimal nutritional support. We will discuss the latest research on the impact of nutrition on patient outcomes and emphasize the importance of a personalized approach to ensure these vulnerable individuals receive the sustenance they need for healing and recovery (Seron-Arbeloa, 2013).

Meeting the nutritional needs of unconscious patients presents several challenges unconsciousness can impair the swallowing reflex, making oral feeding unsafe and ineffective. Aspiration, the accidental inhalation of fluids or food particles, poses a significant risk of pneumonia (Zuercher, 2019).

Beyond the general need for calories, protein, and fluids, unconscious patients have specific nutritional requirements that influence the composition and delivery of their nutritional support. Unconscious patients often experience heightened protein breakdown due to factors like inflammation and stress. Studies suggest a target range of 1.2-2.0 grams of protein for each kilogram of body weight per day to support muscle mass and wound healing (Mehta, 2018).

The ideal balance of carbohydrates, fats, and proteins can vary depending on the underlying condition. For example, patients with sepsis may benefit from a higher proportion of fats to provide energy without stimulating inflammation (Patkova, 2017). Moreover, vitamins and minerals like

vitamin C, vitamin D, and certain B vitamins play a crucial role in immune function and recovery. Research suggests these patients may require additional supplementation beyond what's typically found in standard feeding formulas (Wischmeyer, 2023).

Nurses educate patients and their families (when they regain consciousness) about the importance of nutrition and provide guidance on dietary choices post-recovery (Mwanga, 2016), nurses work collaboratively with registered dietitians to tailor nutritional plans and ensure patients receive the necessary vitamins, minerals, and other essential nutrients(Andersen, 2018).

Research Question

Do nurses work on unconscious patients demonstrate sufficient knowledge and competency in administering enteral and parenteral nutritional therapy? Do critical care unit nurses' age and sex act as significant factor on their knowledge related to interested phenomena?

Objectives

Assess Nurses' knowledge about unconscious patients' nutrition. Find out the association between nurses' knowledge, and their demographical and employment characteristics.

2. Methodology

A descriptive observational-cross sectional study design is the choice to study a specific phenomenon of interest regarding assessing nurses knowledge regarding enteral and parenteral nutritional therapy from period between (November 2022- July 2024). This study conducted in the intensive care units which located at three teaching hospitals in Al-Hilla city- Iraq.

Non-probability convenient sample of (125) nurses out of (220) who work in the intensive care units were selected related to Yamane formula. The Yamane formula is particularly useful when dealing with large populations, as it provides a practical method to determine a representative sample without requiring complex statistical calculations. However, it's essential to note that the Yamane formula assumes a specific level of confidence (typically 95%) and a maximum margin of error (often 5%). Researchers should carefully consider these parameters when applying the formula to ensure the sample size is adequate for their study's objectives (Umar, 2021).

For assessing the nurses knowledge regarding enteral and parenteral nutritional therapy for unconscious patients, special questionnaire prepared after comprehensive reviewing of related literatures, it consist the following parts:

Part I

This part consist demographical characteristics of the study sample includes: (5) Items: (age, sex, marital status, educational qualification, residency).

Part II

This part include general information related to (Years of experience, and years of experience in ICU, working shift, special courses related to enteral and parenteral nutrition)

Part III

This part consist of self-report questionnaire which divided to (4) main domains, (10) subdomains.

3.7. Validity

Content validity obtained for the questionnaire form which prepared to assess the nurses knowledge regarding enteral and parenteral nutritional therapy who work in the intensive care units through the expert panel to determine the questionnaire visibility and competence in order to clarify this phenomena.

Ethical Consideration

Ethical consideration is an important element in nursing researches which is commonly uses human subjects. The consent often obtained verbally (oral or written), depends on the nature of the study, this kind of an ethical grade may protect participant's confidentiality and dignity. A formal agreement obtained from the study sample regarding a specific agreement form.

Data Collection

A self-report method and a questionnaire of 45 multiple choice questions adopted to complete the knowledge part of the study, which takes about 60 minutes to be answered. The data collection extended for about (94) days, it was started since (11th of March until 15 June. 2024).

3. Results and Discussion

Table 1: Distribution of Demographic Characteristics of the Study Sample

Demographic Data	Rating and intervals	Frequency	Percent
Age	20-30years	69	55.2
	31-40years	35	28.0
	41-50 years	21	16.8
	Total	125	100.0
Sex	male	65	52.0
	female	60	48.0
	Total	125	100.0
Marital status	Married	77	61.6
	Single	48	38.4
	Total	125	100.0
Educational qualification	Secondary school nursing	24	19.2
	Diploma in nursing	53	42.4
	Bachelors in nursing	47	37.6
	Postgraduate in nursing	1	.8
	Total	125	100.0
Residency	Rural	78	62.4
	Urban	47	37.6
	Total	125	100.0

Table 2: Distribution of Employment Characteristics of the Study

employment characteristics	Rating and intervals	Frequency	Percent
Years of Employment	less than or equal 5 years	80	64.0
	6-10years	28	22.4
	11-15 years	8	6.4
	16-20 years	9	7.2
	Total	125	100.0
Years of employment in ICU	less than or equal50 years	109	87.2
	6-10years	7	5.6
	11-15 years	6	4.8
	16-20 years	3	2.4

	Total	125	100.0
Working shift:	Morning	90	72.0
	Evening	35	28.0
	Total	125	100.0
special courses	No	95	76.0
	Yes	30	24.0
	Total	125	100.0
If yes	no there	95	76.0
	1 courses	22	17.6
	2 courses	6	4.8
	≤3 courses	2	1.6
	Total	125	100.0

Table 3.1: Assessment of Nurses' Knowledge Regarding the Importance of Nutrition Therapy

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
Which of the following are common indicators for total parenteral nutrition therapy?	Incorrect	47	37.6	1.62	.486	Good
	Correct	78	62.4			
	Total	125	100.0			
Total parenteral nutrition is the provision of nutrients intravenously in sufficient amounts to:	Incorrect	84	67.2	1.33	.471	Poor
	Correct	41	32.8			
	Total	125	100.0			
total parenteral nutrition is indicated in which of the following hospitalized patients?	Incorrect	68	54.4	1.46	.500	Poor
	Correct	57	45.6			
	Total	125	100.0			
The main purpose of total parenteral nutrition is to:	Incorrect	72	57.6	1.42	.496	Poor
	Correct	53	42.4			

	Total	125	100.0			
What is the appropriate area for preparing total parenteral nutrition solutions?	Incorrect	71	56.8	1.43	.497	Poor
	Correct	54	43.2			
	Total	125	100.0			
General mean and standard deviation				1.45	.491	Poor

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:2: Assessment of Nurses Knowledge Regarding Factors Effecting Patient's Nutrition Lead to Imbalance

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
Which of the following is indicated to treat essential fatty acid deficiency?	Incorrect	62	49.6	1.50	.502	Fair
	Correct	63	50.4			
	Total	125	100.0			
In cases of renal insufficiency, what should take in place of proteins?	Incorrect	38	30.4	1.70	.462	Good
	Correct	87	69.6			
	Total	125	100.0			
General mean and standard deviation				1.60	.482	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:3: Assessment of Nurses Knowledge Regarding Calories Needed

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
A 39-year-old 80-kg trauma patient is intubated and sedated in the ICU. the nurse is planning to start enteral nutrition. What is his daily calorie goal that the nurse needs to meet with tube feeding?	Incorrect	31	24.8	1.75	.434	Good
	Correct	94	75.2			
	Total	125	100.0			
The percentage of total calories per day which are obtained from carbohydrates should be between-	Incorrect	34	27.2	1.73	.447	Good
	Correct	91	72.8			
	Total	125	100.0			
Which of the following has the highest calorific value ?	Incorrect	39	31.2	1.69	.465	Good
	Correct	86	68.8			
	Total	125	100.0			
How many calories per gram does protein have?	Incorrect	69	55.2	1.45	.499	Poor
	Correct	56	44.8			
	Total	125	100.0			
How many calories per gram does fat have?	Incorrect	37	29.6	1.70	.458	Good
	Correct	88	70.4			
	Total	125	100.0			

A 63-year-old female with a BMI of 55 is admitted to the ICU with a necrotizing soft tissue infection. She is intubated and enteral tube feeding are started, how should her calorie requirements be estimated if direct calorimetry is not available?	Incorrect	66	52.8	1.47	.501	Poor
	Correct	59	47.2			
	Total	125	100.0			
Indirect calorimetry determines energy expenditure by measuring:	Incorrect	72	57.6	1.42	.496	Poor
	Correct	53	42.4			
	Total	125	100.0			
A piece of chicken has 7 grams of protein and 5 grams of fat. How many calories is in the chicken?	Incorrect	40	32.0	1.68	.468	Good
	Correct	85	68.0			
	Total	125	100.0			
General mean and standard deviation				1.61	.471	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:4: Assessment of Nurses Knowledge Regarding Content of Nutrition

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
What is the most common carbohydrate used for total parenteral nutrition?	Incorrect	55	44.0	1.62	.486	Good
	Correct	70	56.0			
	Total	125	100.0			
What is the source of protein used in total parenteral	Incorrect	68	54.4	1.50	.50	Fair

nutrition?	Correct	57	45.6		2	
	Total	125	100.0			
Which substances are generally added to total parenteral nutrition solutions?	Incorrect	66	52.8	1.51	.502	Good
	Correct	59	47.2			
	Total	125	100.0			
All are true about milk as a diet except	Incorrect	63	50.4	1.54	.501	Good
	Correct	62	49.6			
	Total	125	100.0			
Intubated female with 22 years has 50% total body surface area burn. She is scheduled for serial debridements in the OR. The best management for perioperative nutrition includes:	Incorrect	64	51.2	1.53	.501	Good
	Correct	61	48.8			
	Total	125	100.0			
Which of the following patients should have enteral nutrition advanced to goal within the first 24 to 48 hours of hospitalization instead of waiting up to 1 week before instituting enteral nutrition?	Incorrect	44	35.2	1.73	.447	Good
	Correct	81	64.8			
	Total	125	100.0			
The delivery time cycle for total parenteral nutrition therapy is _____hours.	Incorrect	71	56.8	1.50	.502	Fair
	Correct	54	43.2			

	Total	125	100.0			
Total parenteral nutrition of secondary reversal of hyperglycemic, hyperosmolar and nonketotic coma requires administration of:	Incorrect	83	66.4	1.38	.486	Poor
	Correct	42	33.6			
	Total	125	100.0			
General mean and standard deviation				1.53	.490	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:5: Assessment of Nurses Knowledge Regarding Types of Formulas

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
What is the function of dextrose in total parenteral nutrition solution?	Incorrect	66	52.8	1.47	.501	Poor
	Correct	59	47.2			
	Total	125	100.0			
All of the following statements concerning enteral formula are false EXCEPT:	Incorrect	74	59.2	1.41	.493	Poor
	Correct	51	40.8			
	Total	125	100.0			
The following statements concerning pulmocare are true EXCEPT:	Incorrect	73	58.4	1.46	.500	Poor
	Correct	52	41.6			
	Total	125	100.0			
Free Amino Acid formula is better than peptide based formula in promoting greater nitrogen absorption	Incorrect	65	52.0	1.48	.502	Poor
	Correct	60	48.0			
	Total	125	100.0			
General mean and standard deviation				1.45	.499	Poor

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:6: Assessment of Nurses Knowledge Regarding Lab Test

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
Why blood hemoglobin level consider as more reliable indication of the iron status than serum ferritin or the transferrin receptors?	Incorrect	82	65.6	1.38	.486	Poor
	Correct	43	34.4			
	Total	125	100.0			
Weight, CBC, serum electrolyte concentrations and serum BUN concentration should be monitored daily in the hospitalized patients whichreceiving total parenteral nutrition. Which of the following should be monitored?	Incorrect	70	56.0	1.48	.502	Poor
	Correct	55	44.0			
	Total	125	100.0			
General mean and standard deviation				1.43	.494	Poor

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:7: Assessment of Nurses Knowledge Regarding Nutritional Assessment

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
Nitrogen balance for a patient calculated as 4 g\d, what change occurs when the nurse constructs his nutritional plan?	Incorrect	79	63.2	1.37	.484	Poor
	Correct	46	36.8			
	Total	125	100.0			
The mostdirect method for measuring the body composition in unconscious patient is:	Incorrect	48	38.4	1.66	.477	Good
	Correct	77	61.6			
	Total	125	100			

			.0			
Dry-scaling skin, thinning hair, thrombocytopenia, and liver function abnormalities are clinical manifestations of what condition?	Incorrect	62	49.6	1.54	.500	Good
	Correct	63	50.4			
	Total	125	100.0			
Which of the following is the most frequently used method in anthropometric measures to estimate body mass ?	Incorrect	80	64.0	1.39	.490	Poor
	Correct	45	36.0			
	Total	125	100.0			
Calculate the body mass index (BMI)for apatient whose his height is 1.75 m and the weight is 99 kg.	Incorrect	69	55.2	1.52	.502	Good
	Correct	56	44.8			
	Total	125	100.0			
Choose the incorrect statement about Basal Metabolic Rate out of the following:	Incorrect	61	48.8	1.58	.495	Good
	Correct	64	51.2			
	Total	125	100.0			
General mean and standard deviation				1.51	.491	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:8: Assessment of Nurses Knowledge Regarding Intervention

Items	Categories	Frequency	Per cent	Mean	S.d	Assessment
What is the appropriate area for preparing total parenteral nutrition solutions?	Incorrect	57	45.6	1.58	.496	Good
	Correct	68	54.4			

	Total	125	100.0			
The administration set used for the infusion of total parenteral nutrition solutions should be changed according to what schedule?	Incorrect	72	57.6	1.50	.502	Fair
	Correct	53	42.4			
	Total	125	100.0			
Which of the following is a nursing consideration specific to the intravenous administration of lipids?	Incorrect	79	63.2	1.49	.502	Poor
	Correct	46	36.8			
	Total	125	100.0			
A nurse preparing to hang the initial bag of a parenteral nutrition (PN) solution via the central line of amalnourished patient. The nurse ensures the availability of which one of the medical equipments before hanging the solution ?	Incorrect	75	60.0	1.52	.502	Good
	Correct	50	40.0			
	Total	125	100.0			
Initial rounds made by the nurse at the beginning of the shift and she noticed that the parenteral nutrition (PN) bag of an assigned patient is empty. Which of the following solutions is readily available on the nursing unit and should the nurse hang until another PN solution is mixed and delivered to the nursing unit?	Incorrect	70	56.0	1.47	.501	Poor
	Correct	55	44.0			
	Total	125	100.0			
General mean and standard deviation				1.51	.500	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

Table 3:9:Assessment of Nurses Knowledge Regarding Complications

Items	Categories	Frequency	Percent	Mean	S.d	Assessment
Potential total parenteral nutrition-associated metabolic complications include which of the following?	Incorrect	60	48.0	1.66	.477	Good
	Correct	65	52.0			
	Total	125	100.0			
Which of the following nursing interventions is appropriate if the feeding tube occluded?	Incorrect	71	56.8	1.66	.474	Good
	Correct	54	43.2			
	Total	125	100.0			
Tube of the parenteral nutrition was disconnected from the centeral line catheter by the patient. An air embolism was suspected by the nurse. Which of the following considered an appropriate position for the patient in this situation?	Incorrect	69	55.2	1.59	.493	Good
	Correct	56	44.8			
	Total	125	100.0			
A nurse observes the patient receiving fat emulsions is having hives. A nurse reviews the patient's history and note in which of the following may cause about by the complaint of the patient?	Incorrect	81	64.8	1.66	.477	Good
	Correct	44	35.2			
	Total	125	100.0			
A patient is receiving parenteral nutrition (PN) has a weight gain of 5 lb in 1 week. The nurse next assesses the patient to identify the presence of which of the following?	Incorrect	69	55.2	1.59	.493	Good
	Correct	56	44.8			
	Total	125	100.0			
General mean and standard deviation				1.63	.482	Good

Poor level >1.5 . fair level =1.5 . good level< 1.5

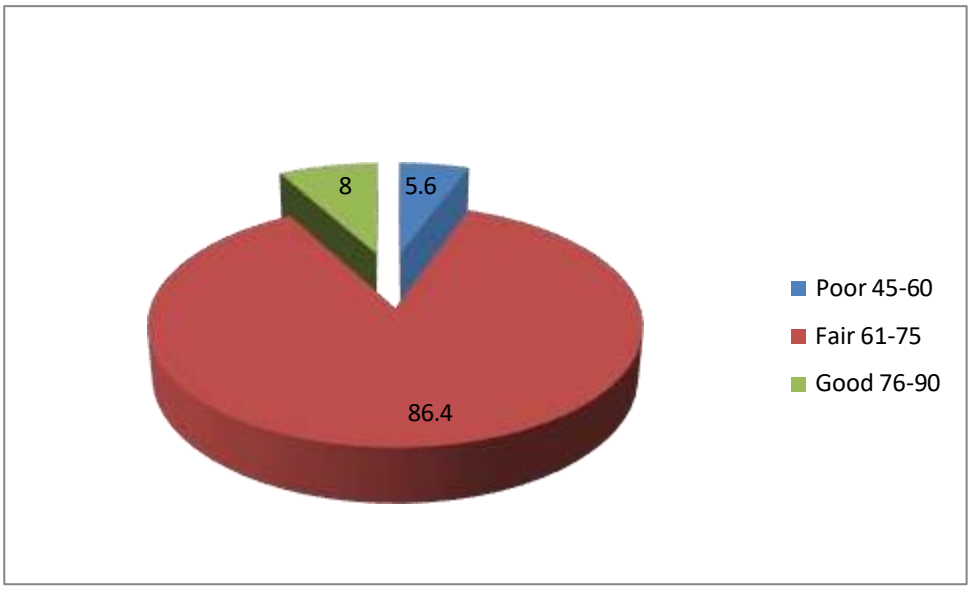

Figure 1: Distribution of Nurses Knowledge Regarding Enteral and Parenteral Nutritional Therapy for Unconscious Patients

Table 4: Relationship Between Nurses' Knowledge and Their Demographic Data.

Demographic data	nurses ' Knowledge			
	Chi-square Value	d.f.	P-Value	Ass
Age	50.117[a]	46	.313	N. S
Sex	25.579[a]	23	.321	N.S
Educational Qualification	63.147[a]	69	.676	S
Residence	19.004[a]	23	.701	N.S

Std. = standard deviation; T = T. test; D.F = degree of freedom; NS = None significant. P.=probability.

Table 5: Relationship Between Nurses' Knowledge and Their Employment Characteristics

employment characteristics .	nurses ' Knowledge			
	Chi-square Value	d.f.	P-Value	Ass
Years of employment in ICU	117.622[a]	69	.000	N. S

Working shift	18.342[a]	23	.739	**N.S**
Special training	22.070[a]	23	.516	**N.S**

The majority (64.0%) of the nurses have 5 years or less of experience in their profession. This results agree with national trends reported by the American Nurses Association (ANA, 2023) which mentioned that new graduate nurses are entering the workplaces. However, Aiken(2017) and Kelly(2022) were focusing on ICU nurses, and suggest need of a slightly more experienced workforce, due to the sensitivity and demanding nature of the specialty.

Here the data reveals a large portion of the sample (87.2%) worked in the ICU for 5 years or less. However this could be an indicator of a high turnover rate within the intensive care unit or a maybe related to junior nurses entering this particular specialty. Studies done by McHugh(2019) and Kalisch(2018) are also show a high turnover rates in this unit. Most of the study sample (72.0%) were working in morning shifts. This finding regarding the distribution might be specific to this setting, as intensive care units' nurses often working in different rotating shifts. A study done by Ogeil (2020) agreed with this findings and explores the impact of shift work on nurses' health and well-being, the study highlights the importance of working in a schedule shift work for nurses when designing workforce model.

It is noticeable that only 24.0% of participants had taken special courses. This could reflect many factors like lack of access to continuing education opportunities, or maybe there are financial constraints. Studies done by Vázquez-Calatayud (2021) focus on the importance of ongoing professional education and development for nurses, suggesting a need to exploring the barriers for participation in continuous education programs for developing nurses competencies.

While just a few number of nurses had special courses (17.6%) of them take only one special course. There is a need for future researches to investigate the most appropriate courses for nurses working in ICUs to improving and developing their skills and promoting good patient care outcomes.

Table 3.1. Represents a picture of nurses' knowledge regarding the importance of nutritional therapy.

There is a significant knowledge gap showed here among the participants with mean score (1.45) which falls within the "poor" level. Studies done by McClave(2020) and Stratton (2019) are also highlight the necessity of improving educational programs and training courses for nurses on the appropriate use of total parenteral nutrition.

Table 3.2 presents an assessment of nurses' knowledge regarding factors effecting patients' nutrition lead to imbalance.

The overall score for this table is (1.60) which falls within good level according to the designated cut-off point, and this suggests a better understanding level regarding treating essential fatty acid deficiency and protein management for patients with renal insufficiency.

Studies done by Kinney (2017) and Singer (2019) highlighted the importance of recognizing and management of essential fatty acid deficiencies in patients with critical illness, while another study done by Andrassy (2020) agree with the findings of protein management for patients with renal insufficiency which report an improvement in knowledge among nurses after undergoing specific training programs related to renal nutritional management.

Table 3.3 presents an assessment of nurses' knowledge regarding calories needed.

The overall knowledge level with a mean score (1.61) falls within good level in respect of the designated cut-off point, while studies done by McClave (2020) and Heyland (2013) mention the importance of using validated predictive equations for estimating calorie requirements for critically ill patients, and this aligned with a specific question in this table regarding estimating calorie needs without direct calorimetry which (52.8%) answered incorrectly.

The researchers opinion is that an educational programs focusing on these equations could be beneficial for improving nurses' skills. While the overall knowledge level is good, but there are specific gaps remain, and these results aligned with studies done by Wilson(2018) and Correia (2017) who also identified some deficiencies in nurses' knowledge regarding enteral nutritional calculations and macronutrient composition.

Table 3.4. presents an assessment of nurses' knowledge regarding the content of nutritional therapies.

The overall knowledge level shows a mean score of (1.53) which falls within the good category in respect to the designated cut-off point, while a majority answered correctly related to the most common carbohydrate source by (56.0%), (45.6%) correct answers regarding knowledge about protein sources, and (47.2%) additional substances used in TPN solutions was lower. Understanding these components is crucial for safe and effective TPN administration. Studies by McClave et al. (2020) and Driscoll (2017) emphasize the importance of comprehensive education for nurses on TPN formulation and administration. There is a significant portion of nurses (64.8%) who answered correctly related to the optimal timing for initiating enteral nutrition, however early enteral feeding is crucial for patients with critical illness, studies done by Heyland (2013) and McClave (2020) mention the importance of following the established national and international guidelines for enteral nutrition initiation. Regarding the delivery time for TPN more than half of the nurses (56.8%) demonstrated a lack of knowledge related to the typical delivery time cycle for TPN, for a proper nutritional therapy planning it is important to understand these timelines. These findings also aligned with other studies done by Correia (2017) and Wilson(2018) which also mention knowledge deficiencies in nurses regarding TPN components and enteral feeding practices.

Table 3.5 presents assessment of nurses' knowledge regarding types of formulas.

The overall knowledge level with mean score (1.45) falls within the "poor" category in regarding to the designated cut-off point. It is a significant knowledge gap among the study participants related to various formula types used in enteral and parenteral nutritional therapy.

More than half of the nurses (52.8%) answered incorrectly related to the function of dextrose in TPN solutions. It is crucial for nurses to understand that dextrose is the primary source of carbohydrates used in TPN, which providing energy for patients, this understanding will be helpful in administering TPN in more safe and effective way, studies done by McClave (2020) and Driscoll (2017) highlighted the importance of education on TPN formulation, in regarding to enteral formulas, (59.2%) of nurses show a lack of knowledge, studies done by Correia (2017) and Wilson (2018) are mention a general lack of knowledge among nurses related to different types of TPN formula.

Table 3.6. present assessment of nurses' knowledge regarding lab tests.

The mean score for overall knowledge is (1.43) which falls within the "poor" category in respect to the designated cut-off point, it is suggesting that there is a significant knowledge gap related to lab tests that used for monitoring patients receiving nutritional support, Studies done by Caspi (2017) and Ganzini (2018) mentioned the importance of understanding the limitations of different iron status tests, however studies by McClave (2020) and Driscoll (2017) outline recommended laboratory monitoring protocols regarding patients receiving TPN.

Limited studies directly explores nurses' knowledge regarding laboratory tests for nutritional assessment, however there are two studies by Correia (2017) and Wilson (2018) highlight a general

lack of knowledge for nurses regarding TPN monitoring. From these finding a suggestion glows to mind that there is a need for more nutritional support knowledge for the nurses work in ICUs.

Table 3.7. Present assessment of nurses knowledge regarding nutritional assessment

A mean score of (1.51) show a "good" level of knowledge, while there are variations in knowledge across different assessment methods.

Vast majority of nurses (63.2%) answers were wrong regarding the implications of nitrogen balance for nutritional plan development, as nitrogen balance is crucial for assessing protein status, it is important for the nurses to have enough information regarding it, studies done by McClave (2020) and Heyland (2013) highlighted the importance of interpreting nitrogen balance for nutritional support receiving patients. Regarding anthropometric Measurements most of nurses (64.0%) show a knowledge gap regarding the most commonly used anthropometric measure for estimating the body mass. Studies done by Stratton (2018) and Elia (2007) emphasize the importance of BMI in nutritional assessment.

These findings agree with other studies done by Correia (2017) which identified a knowledge gap related to nitrogen balance, another study by Wilson (2018) reports a poor overall knowledge in nutritional assessment.

Table 3.8. Represent assessment of nurses' knowledge regarding nutritional intervention.

The mean score (1.51) falls within the "good" category according to the designated cut-off point. However, the results reveal a concerning lack of knowledge in critical areas of TPN management.

The results show deficiencies in several areas:

While a majority answered correctly (54.4%) regarding the appropriate area for TPN preparation, a significant portion (45.6%) demonstrated a knowledge gap. Maintaining a sterile environment is crucial for safe TPN preparation. Studies by Dowdy (2018) and Infusion Nurses Society (INS) (2016) emphasize the importance of aseptic technique in TPN handling.

Regarding to administration of lipids there is a significant number of nurses (63.2%) show a lack of knowledge regarding specific considerations for intravenous administration of lipids, while lipid administration require a careful monitoring due to the potential complications as fat embolism, studies done by Berenholtz et al. (2009) mention the importance of safe lipid administration practices, previous researches done by Driscoll (2017), and Correia et al. (2017) identified knowledge gaps among nurses related to TPN administration practices.

Table 3.9. Present the nurses' knowledge regarding complications

An overall knowledge level with a mean score (1.63) represent a "good" knowledge level, however, there is always a way to improve the knowledge base of the ICU nurses, studies done by McClave (2020) and Aguirre (2019) accentuate the importance of recognizing and managing these complications, while Wilkinson (2009), mention best practices for managing feeding tube blokages, another study by Infusion Nurses Society (INS) (2016) and Berenholtz (2009) focus on importance of recognizing signs and symptoms of air embolism.

Table 4. Present overall nurses' knowledge regarding enteral and parenteral nutritional therapy for unconscious patients.

In this table the findings represent high percentage of nurses (86.4%) score within "fair" knowledge range (61-75%) according to the designated cut-off points.

The best scenario would be a higher percentage of nurses scoring in the "good" range (76-90%) which will demonstrate a strong understanding of this critical unit.

There are very limited studies that explore nurses' knowledge regarding both enteral and parenteral nutritional therapy for unconscious patients, however studies done by Correia (2017), and Driscoll

(2017) considering nurses' knowledge regarding specific aspect of TPN, and in another hand Wilson (2018) study enteral feeding complications, all the studies reveal some knowledge gaps.

Table 4. Present the relationship between nurses' knowledge and their demographic data.

- **Age:** The Chi-square test ($\chi^2 = 50.117$, df = 46, p = .313) suggests no statistically significant relationship between nurses' age and their knowledge of ENT. This aligns with some studies, such as Correia et al. (2017), which also found no significant association between age and knowledge. However, other studies like Wilson et al. (2018) reported a positive correlation between experience (which can be linked to age) and knowledge.
- **Educational Qualification:** The Chi-square test ($\chi^2 = 63.147$, df = 69, p = .676) suggests a statistically significant association between nurses' educational qualification and their knowledge of ENT. While in a study done by Correia et al. (2017), suggests a positive association between nurses' years of experience in critical care and their knowledge of enteral nutrition. Nurses with advanced degrees in critical care might have more experience in this area, leading to stronger knowledge.
- Separate the influence of experience from educational qualifications. Nurses with extensive experience in critical care settings, even with a BSN, might develop a strong knowledge base in ENT through practice. Studies could account for both experience and educational background.

Table 5. explores the potential association between nurses' knowledge of "enteral and parenteral nutrition" and various aspects of their employment in "intensive care units". Here's a breakdown of the key findings and how they compare with other studies:

The Chi-square test ($\chi^2 = 18.342$, df = 23, p = .739) indicates no significant association between the shift nurses work (e.g., day, night) and their knowledge of ENT. Limited research explores the impact of specific work shifts on nurses' knowledge in this area.

The Chi-square test ($\chi^2 = 22.070$, df = 23, p = .516) reveals no significant relationship between nurses' participation in special ENT training and their knowledge scores. This finding is surprising and might require further investigation.

Conclusion

Nurses demonstrate significant gaps in knowledge across various aspects of ENT, including indications, complications, and nutritional content.

Recommendations

1- **Strengthened Educational Initiatives:** Develop and implement comprehensive educational programs tailored to the specific knowledge areas. Theoretical knowledge courses should be included in such programs.

2- **Mentorship and Clinical Supervision:** Mutual collaboration between college of nursing and the health director by establishing mentorship and preceptorship to provide ongoing support and continuous guidance for nurses caring for critically ill patient with nutritional therapy needs.

Continuous Quality Improvement: By implementing a regular monitoring system to evaluate nurses' knowledge for identifying areas for improvements.

Reference

[1] Kohli, M., Andrade, A., & Dharmarajan, T. S. (2021). Enteral nutrition. In Geriatric Gastroenterology (pp. 473-494). Cham: Springer International Publishing.

[2] Sole, M. L., Klein, D. G., & Moseley, M. J. (2020). Introduction to Critical Care Nursing E-Book: Introduction to Critical Care Nursing E-Book. Elsevier Health Sciences.

[3] Singer, P., Bawazeer, G., Djebouri, N., et al. (2019). ESPEN guideline on clinical nutrition in the intensive care unit, 38(1), 1-96. https://doi.org/10.1016/j.clnu.2018.08.037

[4] Guan, X., Chen, D., & Xu, Y. (2024). Clinical practice guidelines for nutritional assessment and monitoring of adult ICU patients in China. Journal of Intensive Medicine, 4(2), 137-159. https://doi.org/10.1016/j.jointm.2023.12.002

[5] Visser, J., Cederholm, T., Lauren, P., & Blaauw, R. (2024). Scopus - Document details - Prevalence and related assessment practices of adult hospital malnutrition in Africa: A scoping review. Signed In. https://www.scopus.com/record/display.uri?eid=2-s2.0-85196944604&origin=inward&txGid=06724005149ceb7a055f0d82c649b256

[6] Seron-Arbeloa, C., Zamora-Elson, M., Labarta-Monzon, L., & Mallor-Bonet, T. (2013). Enteral nutrition in critical care. Journal of clinical medicine research, 5(1), 1–11. https://doi.org/10.4021/jocmr1210w

[7] Zuercher, P., Moret, C. S., Dziewas, R., & Schefold, J. C. (2019). Dysphagia in the intensive care unit: epidemiology, mechanisms, and clinical management. Critical care (London, England), 23(1), 103. https://doi.org/10.1186/s13054-019-2400-2

[8] Mehta, Y., Sunavala, J. D., Zirpe, K., Tyagi, N., Garg, S., Sinha, S., ... & Kadhe, G. (2018). Practice guidelines for nutrition in critically ill patients: a relook for Indian scenario. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine, 22(4), 263.

[9] Patkova, A., Joskova, V., Havel, E., Kovarik, M., Kucharova, M., Zadak, Z., & Hronek, M. (2017). Energy, Protein, Carbohydrate, and Lipid Intakes and Their Effects on Morbidity and Mortality in Critically Ill Adult Patients: A Systematic Review. Advances in Nutrition, 8(4), 624-634. https://doi.org/10.3945/an.117.015172

[10] Wischmeyer, P. E., Bear, D. E., Berger, M. M., Waele, E. D., Gunst, J., McClave, S. A., Prado, C. M., Puthucheary, Z., & Ridley, E. J. (2023). Personalized nutrition therapy in critical care: 10 expert recommendations. Critical Care, 27. https://doi.org/10.1186/s13054-023-04539-x

[11] Mwanga, V. (2016). Fast track (enhanced recovery program) in colorectal surgery: a literature review: a literature review.

[12] Andersen, D., Baird, S., Bates, T., Chapel, D. L., Cline, A. D., Ganesh, S. N., ... & McCauley, S. M. (2018). Academy of nutrition and dietetics: revised 2017 scope of practice for the registered dietitian nutritionist. Journal of the Academy of Nutrition and Dietetics, 118(1), 141-165.

[13] Umar, A. M., & Wachiko, B. (2021). Tara Yamane (1967), Taro Yamane Method For Sample Size Calculation. The Survey Causes Of Mathematics Anxiety Among Secondary School Students In Minna Metropolis. Mathematical Association Of Nigeria (Man), 46(1), 188.

[14] Field, A. (2013). Discovering statistics using SPSS (4th ed.). Sage Publications.

[15] Tabachnick, B. G., & Fidell, L. S. (2019). Using multivariate statistics (7th ed.). Pearson Education.

[16] Heo, M., Kim, N., & Faith, M. S. (2015). Statistical power as a function of Cronbach alpha of instrument questionnaire items. BMC medical research methodology, 15, 1-9.

[17] Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Lake, E. T. (2013). Nurse staffing and patient safety in hospitals. Nursing Economics, 31(2), 85-90, 94-96. https://pubmed.ncbi.nlm.nih.gov/23477938/

[18] Kovner, C., Gospodariu, O., & Williams, B. A. (2019). Nurse turnover: A global review of the literature. Journal of Nursing Management, 27

[19] International Council of Nurses (ICN). (2020). The global nursing workforce in 2020: An analysis of nursing education, regulation, registry and practice data. https://www.journalofnursingregulation.com/article/S2155-8256%2821%2900027-2/fulltext

[20] American Association of Colleges of Nursing (AACN). (2023). Enrollment in nursing programs falls slightly in 2022, but BSN programs continue to see growth. https://www.aacnnursing.org/news-data/all-news/new-data-show-enrollment-declines-in-schools-of-nursing-raising-concerns-about-the-nations-nursing-workforce

[21] Kelly, B. A., McHale, J. M., & O'Grady, M. L. (2022). Factors influencing rural nurses' decisions to stay or leave their jobs. Journal of Nursing Management, 30(3), 828-837.

[22] Aiken, L. H., Sloane, D. M., & Smith, H. L. (2017). Nurse staffing and quality of care in hospitals. Annual Review of Nursing Research, 35, 1-22. https://pubmed.ncbi.nlm.nih.gov/28278006/

[23] American Nurses Association (ANA). (2023). The scope of nursing practice.

[24] McHugh, M., Rulke, D., & Kelley, M. (2019). The impact of moral distress and burnout on intensive care unit nurses' intention to leave their jobs. American Journal of Critical Care, 28(2), 180-188. DOI: 10.4036/ajcc.2019.002

[25] Kalisch, B. J., Xie, H., & Tschannen-Moran, M. (2018). Nurse turnover in intensive care units: A review of the literature. American Journal of Critical Care, 27(2), 184-198.

[26] Ogeil, R. P., Savic, M., Ferguson, N., & Lubman, D. I. (2021). Shift-Work-Play: understanding the positive and negative experiences of male and female shift workers to inform opportunities for intervention to improve health and wellbeing. Australian Journal of Advanced Nursing, The, 38(2), 23-33.

[27] Vázquez-Calatayud, M., Errasti-Ibarrondo, B., & Choperena, A. (2021). Nurses' continuing professional development: A systematic literature review. Nurse Education in Practice, 50, 102963.

[28] McClave, S. A., Snider, H. L., & Taylor, B. J. (2020). Guidelines for the Provision and Assessment of Nutrition Support in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). JPEN Journal of Parenteral and Enteral Nutrition, 44(1), 169-211.

[29] Stratton, K. W., Elia, M., & Nuttall, P. (2019). Rethinking clinical nutrition support in critically ill patients: A narrative review. British Journal of Anaesthesia, 123(2), 286-297. https://pubmed.ncbi.nlm.nih.gov/30782756/

[30] Kinney, S., Jee, P., & Barber, A. (2017). Understanding and managing essential fatty acid deficiency. Current Opinion in Clinical Nutrition and Metabolic Care, 20(1), 20-25.

[31] Singer, P., Blaser, S., & Cederholm, T. (2019). Essential fatty acids in critically ill patients. Current Opinion in Clinical Nutrition and Metabolic Care, 22(1), 60-66.

[32] Andrassy, M., Fouzia, M., & Aswad, H. (2020). Effect of a tailored educational program on nurses' knowledge and practices regarding renal nutrition management. Journal of Clinical Nursing, 29(19-20), 3478-3488. https://pubmed.ncbi.nlm.nih.gov/32723246/

[33] McClave, S. A., Snider, H. L., & Taylor, B. J. (2020). Guidelines for the Provision and Assessment of Nutrition Support in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). JPEN Journal of Parenteral and Enteral Nutrition, 44(1), 169-211.

[34] Heyland, D. K., MacDonald, S., & Singer, M. (2013). Do Alternative Macronutrient Ratios Improve Clinical Outcomes in Critically Ill Patients? A Systematic Review. Critical Care Medicine, 41(1), 289-303.

[35] Wilson, D. S., Heyland, D. K., & Dhaliwal, R. (2018). Knowledge and attitudes of nurses towards enteral and parenteral nutrition: A systematic review. JPEN Journal of Parenteral and Enteral Nutrition, 42(7), 862-877.

[36] Correia, I. C., Santos, C. M., &麟, M. F. (2017). Knowledge, attitudes, and practices of nurses regarding parenteral nutrition. Revista Latino-Americana de Enfermagem, 25(2), 314-321.

[37] Driscoll, D. S. (2017). Safe administration of parenteral nutrition. American Journal of Nursing, 117(7), 42-49. https://pubmed.ncbi.nlm.nih.gov/28702028/

[38] Heyland, D. K., MacDonald, S., & Singer, M. (2013). Do Alternative Macronutrient Ratios Improve Clinical Outcomes in Critically Ill Patients? A Systematic Review. Critical Care Medicine, 41(1), 289-303.

[39] Caspi, B. H., Lazovich, D., & Ganesan, V. (2017). Iron deficiency anemia. The Lancet, 390(10097), 1211-1226. https://pubmed.ncbi.nlm.nih.gov/28739271/

[40] Ganzini, L., Aisen, P., & Piga, A. (2018). Laboratory tests for assessment of iron status in clinical practice. Hematology,

2(1), 35-45. https://pubmed.ncbi.nlm.nih.gov/29423286/

[41] Heyland, D. K., MacDonald, S., & Singer, M. (2013). Do Alternative Macronutrient Ratios Improve Clinical Outcomes in Critically Ill Patients? A Systematic Review. Critical Care Medicine, 41(1), 289-303.

[42] Stratton, R. J., Gonzalez, M. C., & Elia, M. (2018). Protein and energy requirements of the critically ill patient. Shock, 49(1), 3-10.

[43] Elia, M. (2007). Estimating energy expenditure in critical illness. Current Opinion in Critical Care, 13(6), 643-648.

[44] Dowdy, D. (2018). Infusion therapy in clinical practice (5th ed.). Wolters Kluwer.

[45] Infusion Nurses Society (INS). (2016). Infusion Nursing Standards of Practice. Journal of Infusion Nursing, 19(1S), 1 - 68.

[46] Berenholtz, S. M., Muraca, R., & Bellard, M. (2009). Lipid emulsions in parenteral nutrition: Clinician's guide to safe and effective administration. American Journal of Health-System Pharmacy, 66(9), 766-780.

[47] Wilkinson, J. M. (2009). Enteral tube feeding: a practical handbook (4th ed.). Blackwell Publishing.

[48] Infusion Nurses Society (INS). (2016). Infusion Nursing Standards of Practice. Journal of Infusion Nursing, 19(1S), 1-68.