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Assessment of Critical Care Nurses' Knowledge and Practice Regarding Care of Patients Undergoing Total Parenteral Nutrition

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ABSTRACT

Background: Patients with compromised or non-functioning gastrointestinal tracts (GITs) may be fed through a line implanted in a vein, a procedure known as parenteral nutrition (PN).

Objective: This study aimed to assess critical care nurses' knowledge and practices regarding care of patients undergoing total parenteral nutrition.

Subjects and methods: A descriptive exploratory design was utilized to achieve the aim of this study. The study was conducted at Intensive Care Unit of Tanta University Hospital. A convenient sample of all available nurses (50 nurses) from both sex were included in the study. Two tools were used in this study: Self-administered interview questionnaire and observational checklist to assess nurses' practice regarding care of patients undergoing total parenteral nutrition (TPN).

Results: 52% of the studied nurses their mean age was 31.56 ± 8.56 years. 56 % of the studied nurses attended training courses regarding care of patients with TPN. 82% of them had unsatisfactory level regarding total knowledge level, 84% of them had incompetent practice level regarding caring of patients with TPN. There was statistically significant relation between total level of nurses' knowledge and their gender and there was no statistically significant relation between total level of nurses' practices and their demographic characteristics.

Conclusion: A positive and statistically significant relationship was found between nurses' levels of overall knowledge and the level of care they provided to patients.

Keywords: Critical care, Knowledge, Practice, Total parenteral nutrition.

INTRODUCTION

Nutrition is the intake of all growth and regeneration nutrients to maintain appropriate tissue and organ function. Malnutrition can have far-reaching effects, including but not limited to growth retardation, delayed wound healing, and immunological suppression, loss of skeletal muscle mass, atrophy of the intestinal mucosa, expansive edema, and impairment in cognitive capacities. Hospitalization, sickness, and mortality rates have all been on the rise, and malnutrition is a major factor [(1)].

Parenteral nutrition (PN) is feeding of patients via a line placed over their vein which bypasses usual eating and digestion process. Patients without a functioning gastrointestinal tract (GIT) often require total parenteral nutrition (TPN) because they cannot absorb nutrients from food through their mouths or noses. Transfusion-dependent nutrition supplies life-sustaining substances such as glucose, amino acids, lipids, and supplemental vitamins and minerals. Those who are critically ill and dependent on medical care are the ones who typically receive TPN while hospitalized [(2)].

Indications for TPN include persistent intestinal obstruction due to conditions like intestinal cancer or bowel pseudo-blockage due to food intolerance or congenital gastrointestinal deformity or small bowel obstruction. The most common negative outcomes are metabolic problems, infection risk, and venous access complications. TPN is not recommended for individuals who are experiencing irreversible deceleration or who can be fed orally [(3)]. Critical care nurses are entrusted with the lives of patients who have been deemed critical. A critical care nurse is a registered nurse whose job is to provide the best possible care for seriously ill patients and their loved ones. ICU nurses play a crucial role in helping their patients achieve their nutritional objectives and keep their nutritional status stable. Most critical care nurses are responsible for ensuring patients have access to food and for starting feeding. In other cases, however, these nurses also determine calorie demands in relation to body composition and track the number of calories given on a daily basis [(4)].

However, as there are no universal standards, inconsistency in nursing care significantly increases the likelihood of the emergence of harmful deficits and problems. The inherent variation in nursing practice can be reduced, and the efficacy of dietary practices can be preserved, when adherence to evidence-based principles is ensured. As the provision of nutritional support is one of the most important elements of a critical care nurse's caring role, they should have proper knowledge and practice regarding administering TPN [(5)].

SIGNIFICANCE OF STUDY

Globally, increasing prevalence of chronic conditions, majorly cancer & malnutrition, and the rapidly growing geriatric population and natality incidence are key of increase using of TPN. In the year 2020, the prevalence of adult patients receiving PN was 53.26 per million, representing a 2.99-fold growth over the previous decade and an increasing trend. The percentage of patients aged 18–34 and 45–54 has decreased significantly, while the proportion of those

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aged 65–74 and above has increased [6].

The most common reported causes of requiring home parenteral nutrition were malnutrition (34.28%), GI disorders following surgery or other procedures (19.61%), intestinal malabsorption/other intestinal diseases (20.41%), and GI obstruction caused by cancer (17.36% as primary and 23.16% as secondary diagnosis). The most common types of cancer in patients were gastric (34.74%), ovarian (17.83%), and cancer of colon (12.3%) [7].

However, there is scant data on how well-versed nurses are in administering TPN in intensive care units. Furthermore, limited research has focused on routine TPN nursing procedures. ICU nurses play a crucial role in ensuring that TPN patients continue to improve their nutritional status and move closer to their nutritional goals.

The majority of the time, critical care nurses are in charge of providing patients with access to food and starting the feeding process. However, there are cases in which these nurses must also determine the patient's caloric needs in light of their individual physiological makeup and track the amount of food consumed each day. However, due to a lack of information and unified rules, imparity in nursing practices adds to the development of major inadequacies and difficulties [1].

AIM OF THE STUDY

This study aimed to assess critical care nurses' knowledge and practices regarding care of patients undergoing total parenteral nutrition. This aim was achieved through the following objectives: (1) Assessing nurses' knowledge regarding care of patients undergoing TPN (2) Assessing nurses' practice regarding care of patients undergoing TPN.

SUBJECTS AND METHODS

I - Technical Item:

The methodology section covers such details as the study's design, participants, and methods for collecting data.

- **Research design:** A descriptive, exploratory approach was utilized.
- **Setting:** The current study was conducted in Intensive Care Unit of Tanta University Hospital which located on third floor and composed of 6 halls, 4 of them contain 6 beds and 2 of them contain 4 beds.
- **Subjects:** A convenient sample of all available nurses (50 nurses) from both sexes working in the intensive care units who provide care for patients undergoing total parenteral nutrition.
- **Tools of data collection:** The two tools listed below were used to collect the data:

Tool (I) nurses Self-administered interview questionnaire:

It was created by the researcher after a thorough review of literature, and it was written in clear Arabic to collect information about the following:

Part (1): demographic features:

Nurses' age, gender, marital status, education, number of years practicing, number of continuing education units completed, and number of specialty certifications earned.

Part (2): Knowledge assessment questionnaire:

The researcher created this tool to test nurses' understanding of how to care for patients receiving total parenteral nutrition based on a survey of the relevant literature [8, 9] and included 4 sections:

1. General knowledge regarding TPN: Nutrition that is administered intravenously is called total parenteral nutrition (TPN), and TPN is both a treatment and a source of nutrition **(31 questions with score 62).**
2. Knowledge regarding administration of TPN: it included TPN kept in refrigerator and TPN covered by light protective to reassure the patients **(5 questions with score 10).**
3. Knowledge regarding weaning from TPN: it included insulin stopped before TPN weaning and rate of administering TPN must be reduced gradually to prevent hypoglycemia **(5 questions with score 10).**
4. Knowledge regarding home parenteral nutrition, patients/family education and follow up: it included patients and their families trained about TPN care in hospital before discharge and patients and their families trained about how to prevent the infection **(8 questions with score 16).**

Scoring system: Items total global score of 98 for 49 sub items, were rated on three ranks as don't know= 0, correct answer=1 and incorrect answer= 2). The total score of this scale classified into three categories based on the following:

Satisfactory level ≥ 85% of total score (83.3-98 score).
Unsatisfactory level < 85% of total score (< 83.3 score).

Tool (III): Observational checklist to assess nurses' practice regarding care of patients undergoing TPN: it was adopted from **Canberra Hospital and Health Services Clinical Procedure [10].**

The investigator translated it into Arabic in order to evaluate how well-versed nurses are in TPN administration. It included of the following parts:

Part (1): Nurses' practice regarding administration of TPN included reminders to wash hands before touching patients, clean the dressing trolley with disinfectant wipes, gather supplies, and transport the TPN from the fridge to the trolley **(26 items with score 26).**

Part (2): Nurses' practice regarding weaning from TPN in order to prevent hypoglycemia where we stopped the insulin infusion before giving TPN and we gradually decreased the rate at which we were giving parenteral nourishment before stopping it altogether **(6 items with score 6).**

Part (3): Nurses' practice regarding home parenteral nutrition (HPN) – patient education and discharge planning: It included having a planned timeline for the setting up of the HPN patient, coordinated by the hospital ward nurse and covering a two week period **(2 items with score 2).**

Part (4): Nurses' practice regarding patient/family care education: It included uses of aseptic techniques during procedures, operates a pump and other equipment safely, and storing of HPN in a sterile manner **(7 items with score 7).**

Scoring system: Items total global score of 41 for 41 sub items, were rated on two ranks as not done = 0, done = 1). The total score of this scale was classified into three categories based on the following:
Competent level ≥ 85% of total score (≥34.85-41score).
Incompetent level < 85% of total score (<34.85score).

II-Operational Item:
Operational design consisted of a preliminary stage, validity of tools, reliability, pilot research, and field visits.

A) **Preparatory phase:** Tools for data collection were developed after a thorough evaluation of the relevant literature and theoretical understanding of the study's numerous components that was conducted utilizing print and digital periodicals and journals, as well as the internet.
B) **Tool validity:** A group of five experts from the School of Nursing, Helwan University assessed the validity. One adjunct instructor and four adjunct lecturers in medical-surgical nursing made up the committee. To ensure the final forms met the needs of their intended audience, they were reviewed by subject matter experts who looked for things like clarity, relevance, comprehensiveness, simplicity, and application.
C) **Tool Reliability:** Cronbach's Alpha coefficients for Tools 1 (Part 2) and 2 (Total) in this investigation found a reliability of 0.711 and 0.803, respectively.
D) **A pilot study:** Ten percent (5 nurses) of the final sample were used in a pilot study to evaluate the instruments' usefulness, clarity, and efficacy. Despite the results of the pilot study, the patients were enrolled in the final study population with no changes or improvements made.
E) **Field work:** The researcher provided an overview of the study's aims to the nurses who participated in the trial. The time frame for this study was only six months, from the beginning of January (2022) to the end of June (2022). The researcher gathered data twice weekly, once in the morning and once in the afternoon, in the aforementioned scenario.

Ethical approval:

Approval was sought from the director of Tanta University Hospital and was granted after official letters were given by the dean of the College of Nursing, Helwan University. Title, aims, primary information sources, and expected findings were all described. Researchers were able to secure verbal agreement from participating nurses and reassure all staff members that their privacy would be protected.

Statistical analysis

Descriptive statistics, including means and standard deviations to illustrate variation, were used to compile, tabulate, and present the data. For statistical analysis, we turned to SPSS version 26 because it includes the test of significance found in textbooks on the subject of statistics. Quantitative information were presented as a percentile rank. The student's t-test was used to evaluate the significance of a difference between two numerical variables. Significant results were defined as having a probability (P-value) equal or less than 0.05. The correlation coefficient was determined using the Pearson's correlation test, with the smaller the P-value, the more significant the result (*). A P-value equal or less than 0.001 was regarded as extremely significant (**).

RESULTS

Table (1) showed that 52% of the studied nurses their ages ranged from 19 to 29 years and their mean was 31.56 ± 8.56 years. Concerning gender and marital status, 58% & 70% of the studied nurses were females and married respectively. Regarding educational level and years of experience, 52% of the studied nurses had technical institute of nursing and 46% of them had 5-10 years of experiences. Moreover, 56 % of the studied nurses attended training courses regarding care of patients with total parenteral nutrition.

Table (1): Frequency and percentage distribution of demographic characteristics for the studied nurses (n=50)

Variables	N	%
Age group:		
19-29 years	26	**52**
30-39 years	15	30
40-49 years	5	10
≥50 years	4	8
Mean ± SD	**31.56 ± 8.56**	
Gender:		
Male	21	42
Female	29	**58**
Marital Status:		
Single	8	16
Married	35	**70**
Divorced	6	12
Widow	1	2
Level of Education:		
Diploma	10	20
Technical institute of nursing	26	**52**
Bachelor of nursing	11	22
Master's degree	3	6
Years of experience:		
>5 year	7	14
5>10 years	23	**46**
More than 10 years	20	40
Training courses related to TPN		
No	22	44
Yes	28	**56**

Table (2) revealed that 76% of studied nurses had correct answers regarding air in IV line removed by TPN, 56% of them had incorrect answers regarding obtain oral consent from patients or their families not necessary for administering total parenteral nutrition and 12% of them didn't know about TPN kept in refrigerator.

Table (2): Frequency and percentage distribution of the studied nurses' knowledge regarding administration of total parenteral nutrition (n=50)

Variables	Correct answer		Incorrect answer		Don't know	
	N	%	N	%	N	%
TPN kept in refrigerator	34	68	10	20	6	**12**
TPN covered by light protective to reassure the patients	31	62	15	30	4	8
Obtain oral consent from patients or their families not necessary for administering TPN	20	40	28	**56**	2	4
Light protective cover completely removed before administering TPN	25	50	23	46	2	4
The air in IV line removed by TPN	38	**76**	10	20	2	4

Table (3) illustrated that 76% of studied nurses had correct answer regarding insulin stopped before TPN weaning, 56% of them had random blood glucose not measured before weaning process and 26% of them didn't know enteral nutrition started as soon as TPN stopped.

Table (3): Frequency and percentage distribution of nurses' knowledge regarding weaning from total parenteral nutrition (n=50)

Variables	Correct answer		Incorrect answer		Don't know	
	N	%	N	%	N	%
Insulin stopped before TPN weaning?	27	54	14	28	9	18
Rate of administering TPN must be reduced gradually to prevent hypoglycemia?	38	**76**	6	12	6	12
Random blood glucose not measured before weaning process?	21	42	28	**56**	1	2
Duration of administering TPN increased during weaning process?	24	48	13	26	13	**26**
Enteral nutrition started as soon as TPN stopped?	31	62	12	24	7	14

Figure (1) suggested that, eighteen percent of evaluated nurses had satisfactory level and eighty two of them had unsatisfactory levels considering total knowledge level.

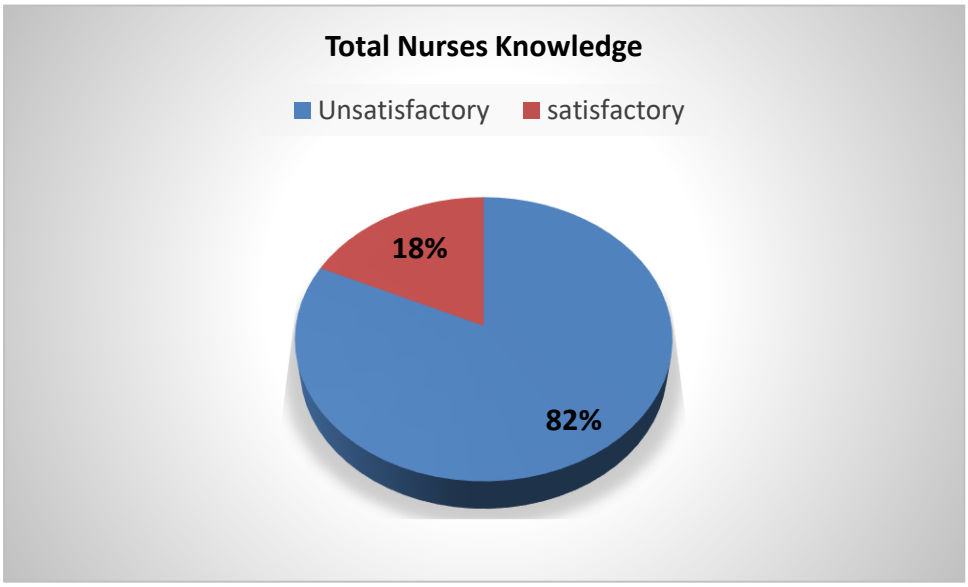

Figure (1): Percentage distribution of the total level of nurses' knowledge regarding caring of patients with TPN.

Study revealed that when TPN was stopped completely or if cyclic TPN was needed but nutritional needs were not fulfilled, 90% and 88% of nurses, respectively, stopped the insulin infusion before administering TPN to prevent hypoglycemia and explored enteral feeding. Despite the fact that it is recommended that the rate of parenteral nutrition be tapered prior to discontinuation in order to prevent hypoglycemia in such patients (32 percent of whom did not do so). Tapering TPN was accomplished through a weaning process that entailed reducing the administration rate by half to two hours prior to cessation, with regular monitoring of blood glucose levels, which are required until tolerance to the weaning process is established (Table 4).

Table (4): percentage distribution of nurses' practice regarding weaning from total parenteral nutrition (n=50)

Variables	Done		Not done	
	N	%	N	%
Ceased the insulin infusion before TPN administration to prevent hypoglycaemia.	45	**90**	5	10
Parenteral nutrition rate is tapered prior to discontinuation to prevent hypoglycaemia.	34	68	16	**32**
Tapering TPN is achieved by a weaning process involving decreasing the administration rate by half for two hours before cessation.	34	68	16	**32**
Regular checking of blood glucose level must be attended during the process until tolerance to the weaning process is ascertained.	34	68	16	**32**
Cycling TPN refers to having time off TPN, for example, eight hours off TPN a day. Weaning TPN refers to the gradual reduction of the TPN rate prior to ceasing TPN	36	72	14	28
Enteral feeding considered when TPN ceased completely or if cyclic TPN is required but full nutritional requirements are not being met.	44	**88**	6	12

It was found that 96% of the study participants had a scheduled timeline for the trying to set up of the home parenteral nutrition patient (HPN), which was coordinated mostly by hospital nurse and covered a period of two weeks. On the other hand, 24% of the nurses did not educate the patient and/or family care in the management of HPN, which is carried out in hospital and included care of the central venous access, administration procedures, and monitoring for complications such as pump fault finding and septicemia (Table 5).

Table (5): Frequency and percentage distribution of the studied nurses' practice regarding Home Parenteral Nutrition (HPN) – Patient Education and Discharge Planning (n=50)

Variables	Done		Not done	
	N	%	N	%
Having a planned timeline for the setting up of the home parenteral nutrition patient (HPN), coordinated by the hospital ward nurse, covering a two week period.	48	**96**	2	4
Education of the patient and/or family carer in the management of HPN is carried out in hospital: - Care of the central venous access. - Administration procedures - Monitoring for complications, for example, pump troubleshooting, sepsis	38	76	12	**24**

Table (6) displayed that 90%, 86% & 82% of studied nurses were demonstrated safe use of equipment and pump, demonstrated principles of asepsis when doing procedures and demonstrated safe handling and storage of HPN and recognizing signs and symptoms of hyperglycemia and hypoglycemia, respectively.

Table (6): Frequency and percentage distribution of nurses' practice regarding Patient/Family Care Education (n=50)

Variables	Done		Not done	
	N	%	N	%
Demonstrates principles of asepsis when doing procedures	43	**86**	7	14
Demonstrates safe use of equipment and pump.	45	**90**	5	10
Demonstrates safe handling and storage of HPN.	43	**86**	7	14
Recognises mechanical problems related to central venous access and responds appropriately.	35	70	15	30
Recognizes signs and symptoms of infection and responds appropriately.	39	78	11	22
Recognizes signs and symptoms of fluid imbalance	36	72	14	28
Recognizes signs and symptoms of hyperglycemia and hypoglycemia	41	**82**	9	18

Table (7) displayed that 76% of studied nurses had competent regarding home HPN – Patient education and discharge planning. While, 82% &76% of studied nurses had incompetent level regarding administration of TPN and nurses 'practice patient/family care education respectively.

Table (7): Frequency and percentage distribution of the studied nurses' subtotal level of practice regarding caring of patient with total parenteral nutrition (n=50)

Items	Competent		Incompetent	
	N	%	N	%
Nurses' practice regarding administration of total parenteral nutrition	9	18	41	**82**
Nurses' practice regarding weaning from total parenteral nutrition	25	50	25	50
Nurses' practice regarding home parenteral nutrition (HPN) – patient education and discharge planning.	38	**76**	12	24
Nurses' practice patient/family care education	12	24	38	**76**

Figure (2) illustrated that, 16% of studied nurses had competent practice level, while 84% of them had incompetent practice level regarding caring of patients with TPN.

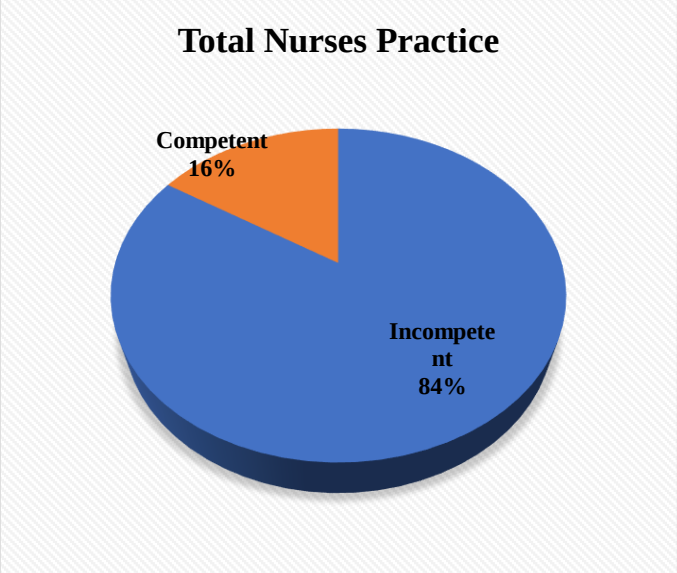

Figure (2): Percentage distribution of the total level of nurses' practice regarding caring of patients with TPN (n=50).

Table (8) showed that, there was a statistically significant direct (positive) difference correlation among the studied nurses regarding total knowledge and their practice (P-Value =0.013) meaning that an increase in their knowledge led to an increase in the level of practice.

Table (8): Correlation between studied variables

Items	Total knowledge	
	Correlation Coefficient	P-value
Total practice	0.939	0.013*

DISCUSSION

In relation to demographic characteristics of the studied nurses, more than half of the nurses in this study fell into the 19-29 age bracket, with a mean age of 31.56 ± 8.56 years. This is consistent with the findings **of Khalefa *et al.*** [11], who published a study more than a third of the nurses in this research were between the ages of 20 and 29. However, **Hussien and Sayed's** [4] study found that only approximately a third of the nurses they studied were older than 25.

Our results showed that over two thirds of the nurses in the sample were wed. According to **Taherkhani *et al.*** [5] the majority (or more specifically, two-thirds) of the nurses under study were females, and roughly as many were married.

More than half of the nurses in this study had completed a program at a technical nursing institute. Although, **Rogers** [12] found that over half of the tested sample held a bachelor's degree, this finding ran counter to that finding. In addition, this result contradicted a finding by **Al-Qalah & Alrubaiee** [13], which concluded that only a small proportion of the nurses in the sample had attended a technical nursing institute.

Almost half of the nurses in this study had five or more years of experience, which the researchers speculated may be due to the fact that these nurses were older. This study coincides with the results of **Faris & Abed** [14] who found that only 26% of the nurses polled had more than 5 years ' experience. **Khan *et al.*** [15] study found that more than a third of the nurses they surveyed had 6-10 years of experience in the intensive care unit, corroborating our findings.

More than half of the nurses in this study reported having taken a course on how to care for patients receiving complete parenteral feeding. More than two-thirds of the nurses in the study had attended training courses on total parenteral nutrition, which is consistent with the findings of a **Khalefa *et al.*** [11].

Concerning nurses' knowledge regarding administration of total parenteral nutrition, the current study reported that, more than three quarters of studied nurses had correct answers regarding air in IV line removed by TPN, more than half of them had incorrect answers regarding obtaining oral consent from patients or their families is not necessary for administering total parenteral nutrition and minority of them didn't know about TPN kept in refrigerator, this could be due to that more than half of them had attended training courses. Similarly, **Ameri *et al.*** [16] found that over two-thirds of the nurses tested possessed sufficient information regarding care prior to and during the administration of TPN. However, **Hussien & Sayed** [4] in their study found that more than three quarters of investigated nurses had inaccurate answers regarding the storage of TPN solution.

Regarding nurses' knowledge regarding weaning from total parenteral nutrition, it was noted in the current study that while more than three-quarters of the nurses correctly answered that insulin should be stopped before TPN weaning, more than 50% of the nurses did not measure random blood glucose before the weaning process, and more than a quarter of the nurses were not aware that enteral nutrition began as soon as TPN was stopped. This finding is consistent with that of a study by **Mahmoud *et al.*** [17]**,** which found that over half of the studied nurses provided the correct answer when asked about the timing of stopping parenteral nutrition, gradually stopping parenteral nutrition, and starting enteral nutrition after stopping parenteral nutrition.

In relation to total level of nurses' knowledge regarding caring of patients with TPN, most of the nurses in this study had an inadequate understanding of TPN. One possible explanation is that more than half of the nurses in the study were in their

twenties. This finding is consistent with that of a study by **Khalefa *et al.*** [11], which found that the majority of nurses surveyed knew little to nothing about TPN. However, the results of a study by **Rupawaththa *et al.*** [18] found that only half of the nurses surveyed had adequate knowledge of TPN.

As regards nurses' practice regarding weaning from total parenteral nutrition, Nursing staff in the current study were more likely to stop insulin infusions before administering TPN in order to reduce the risk of hypoglycemia, and they were more likely to consider switching to enteral feeding when either TPN was discontinued altogether or when cyclic TPN was needed but nutritional needs were not being met. Weaning TPN is accomplished by reducing the administration rate by half to two hours prior to cessation, and regular checking of blood glucose level must be attended during the process until tolerance to the weaning process is determined. However, slightly less than a third of them did not do this in order to prevent hypoglycemia. This study contradicts the findings of **Taherkhani *et al.*** [5], whose research found that Iranian ICU nurses have only rudimentary knowledge of how to handle TPN withdrawal safely. However, **Othman & Ahmed** [19] found that nurses' practices were bad at Rapareen Public Hospital.

Concerning nurses' practice regarding home parenteral nutrition – patient education and discharge planning, the majority of the nurses surveyed in this study followed a two-week schedule devised by the hospital ward nurse for the preparation of a patient to receive home parenteral nutrition (HPN), and only about a quarter of them did not educate the patient and/or family on the care of HPN, which is administered and monitored for complications while the patient is still in the hospital, problems with pumps and sepsis are two such examples. Similar to this a study by **Cotogni *et al.*** [20], which highlighted the importance of training programs from nurses to patients and family to enhance their dealing with TPN to improve maximum benefits, improve quality of life for patients and carers, and lessen infectious disease as well as other complications.

Regarding nurses' practice patient/family carer education, the majority of the nurses in the current study demonstrated safe equipment and pump use, applied the concepts of asepsis during procedures, handled and stored HPN in a sterile manner, and were able to identify the symptoms of hyperglycemia and hypoglycemia. This finding corroborates the findings of study by **Marofi *et al.*** [21], which found that more than half of the nurses studied educated families about nursing standards during the care of total parenteral nutrition to avoid infection in the houses.

Concerning the studied nurses' subtotal level of practice regarding caring of patient with total parenteral nutrition, according to the results of this study, more than 75% of the nurses surveyed considered knowledgeable in the areas of HPN - patient education and discharge planning. While most of the nurses in the study lacked the skills necessary to properly administer TPN or educate patients and their families about the procedure. This result is consistent with the findings of **Hashem *et al.*** [22] who found that more than half of the studied nurses had an incompetent practice level in caring for patients requiring total parenteral nutrition and educating families about home parenteral nutrition. These findings are consistent with those of a study by **Mahmoud *et al.*** [17] which found that almost two-thirds of the nurses studied had incompetent in their total performance scores.

In relation to the total level of nurses' practice regarding caring of patients with TPN, according to the results of the current investigation, only around a quarter of the nurses surveyed were at a competent level of practice when it came to caring for patients on TPN. In their study **Hussien and Sayed** [4] found that nurses lacked knowledge and engaged in unsafe total practice with respect to TPN. A study by **Marofi *et al.*** [21] found that more than 75% of the nurses who were surveyed had a "good practice level" when it came to the care of TPN, which contradicts the results of the current study.

Concerning correlation between the studied variables, it was found in this study that nurses who were surveyed had a statistically significant (positive) difference between their theoretical knowledge and their actual clinical practice. The findings are in agreement with those of **Hussien & Sayed** [4] who found that nurses' levels of knowledge and practice improved together. Furthermore, the findings of this study are consistent with those of **Mahmoud *et al.*** [17] who found a favorable relationship between overall competency and actual application.

CONCLUSION

Over half of the nurses in the present sample were young adults (defined as between the ages of 19 and 29), according to the results of the current study. Inadequate knowledge of TPN was reported by the great majority of nurses in this survey. Concerning TPN patient care, less than a quarter of the sampled nurses demonstrated competence, while the vast majority did not. Nursing knowledge was also significantly correlated with nurses' gender. None of the evaluated demographic factors were significantly correlated with nurses' averaged years of expertise. The nurses' entire knowledge was found to be positively correlated with their actual practice via direct difference.

RECOMMENDATIONS

- Providing continuous education and update to improve nurses' knowledge regarding care of patients receiving TPN.

- Planning and establish for training programs to improve nurses' practice about assessment and management of patients receiving TPN.

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Conflict of interest: Nil.

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