

Critical Care Nurses' Knowledge and Practice Regarding Administration of Total Parenteral Nutrition at Critical Care Areas in Egypt

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ABSTRACT

Background: Critical care nurses are responsible for administering total parenteral nutrition that affects on critically ill patient general condition. Nurses must know proper constituents of each solution and should be expert in calculating the dose of medication to prevent errors. Each nurse should be aware of indications, action, contraindications, adverse reactions and interactions of each parenteral solution. Moreover, nurses monitor patients for any negative signs of a change in condition, administer medication, and develop a plan of action for patients care. **Aim of the study:** to assess critical care nurses' knowledge and practices regarding total parenteral nutrition. **Research Design:** A descriptive exploratory design was utilized in this study. **Research questions:** the following two research questions were formulated ;a)what the nurses know about the administration of total parenteral nutrition?, b) what are the practices the nurses perform while administering the total parenteral nutrition. **Setting:** The study was carried out at different Critical Care units at Menofiyia and Benha University Hospitals, in Egypt. **Sample:** A sample of convenience of 80 nurses from different critical care units with a minimum one year of experience were included in the present study. **Tools of data collection:** Two tools were used to collect data; the first tool has two parts ;part one is background data sheet that included gender, age, years of experience, educational level and area of work. part two was total parenteral nutrition knowledge questionnaire that was designed by researcher to assess knowledge regarding indication, contraindication, and nursing measures towards total parenteral nutrition. The second tool was total parenteral nutrition observational checklist that was designed to assess nurses practices while administering. **Results:**The current study findings revealed that critical care nurses have got low knowledge and practice scores with significant correlations between years of experience and their level of knowledge and practice regarding total parenteral nutrition. **Conclusion:** it can be concluded that critical care nurses have inadequate knowledge and practice regarding total parenteral nutrition. **Recommendations:** Carrying out educational programs about nursing management of total parenteral nutrition complications and training on total parenteral nutrition administration. **Key words:** Critical Care Nurses' knowledge , Nurses practice, Total parenteral nutrition.

1.Introduction:

Malnutrition is associated with more frequent treatment complications and longer stays in the intensive care unit and hospital, as well as increased costs of medical care. Patients at high risk for malnutrition should be identified and evaluated for specialized nutrition support.

Determining the appropriate route of nutrition support for patients at risk for malnutrition is an important consideration when one is attempting to positively influence patient outcomes (*Merritt, Delegee and Holcombe, 2007*).

Total parenteral nutrition (TPN) is a widely accepted therapy for various indications, for example, to sustain life in patients with short-bowel syndrome, for perioperative use in nutritionally deprived patients, as an adjunct to therapy in patients with acute renal or hepatic failure, and for the hypermetabolic states of sepsis, trauma and burns. The primary indication for its use is to nutritionally support patients who should not eat (e.g. where it is prudent to rest the bowel post-operatively), who cannot eat, or who cannot eat enough (*Blackburn, Wollner & Bistrain, 2010*).

Nurses have important responsibilities in the care of patients who are receiving TPN, including maintaining the catheter and delivery system, preparation and administration of TPN solutions, replacing the dressings at the catheter insertion site and changing the infusion set at periodic intervals (*Martindale, 2009*).

Nursing practices, which reduce the risk factors for catheter related infection include hand washing between patient contacts and before and after touching the catheter or delivery system. Hands are recognised as the main vectors of infection in hospitals. During the preparation and mixing of fluids, aseptic techniques should be used. All parenteral fluid containers must be checked for visible turbidity, leaks, cracks, particulate matter, and the manufacturer's expiration date. The infusion sets, including the stopcocks, should be replaced at periodic intervals (24 or 48 h) for TPN therapy. The contamination of parenteral fluids during use is generally related to the duration of uninterrupted infusion through the same administration set and the frequency with which the set

is manipulated (*Penland, 2010*).

Nursing staff providing care to patients receiving TPN on a critical care unit must have an adequate knowledge about its administration.

Complications associated with parenteral nutrition include the immediate and late complications associated with catheter insertion, and those associated with the infused solution. Catheter infection occurs in 2 - 5% of patients with central venous catheters, 50% of which are due to Staphylo-coccus epidermidis. Complications relating to the infused solutions (e.g. hyperglycaemia) or deficiencies (i.e. 'refeeding syndrome' with hypophosphataemia, hypokalaemia and hypo-magnesaemia) may also occur (*Bankhead, 2009*). They should preferably be given through a central venous line than peripheral infusion of some drug cause extravasations and can cause severe local tissue damage. All drugs must be labeled accurately with name concentration diluents' and rate. Nursing expertise for total parenteral administration can vary according to experience educational level and the knowledge regarding evidence based practice. Lack of knowledge regarding current practice guideline and care may result in poor patient outcome. confidence in performing safe and quality nursing care can also be affected by lack of knowledge (*Kenny & Goodman, 2010*).

Nurses' lack of knowledge is considered to be one of the most significant factors contributing to medication administration errors. The frequency of medication errors made by nurses and the consequences of these errors affect not only the health of the patient but also the overall cost of health care. These medication errors and the reactions that result from them cause increased length of stay, cost, patient disability, and death. These include harm to the nurse involved, in regard to his or her personal and professional status, confidence, and practice (*Gillanders, Angstmann & Ball, 2009*). To ensure safe and effective drug therapy for patients, nurses need to be familiar with the indications, customary dosage, and intended effects of prescribed drugs. Also, nurses need to assess each patient before administering a drug. Just as important, nurses need the skills to be able to administer a drug efficiently, minimizing patient's anxiety and maximizing the drug's effectiveness (*McClave, 2009*).

2. Significance of the study:

Critical illness is typically associated with a catabolic stress state in which patients commonly demonstrate a systemic inflammatory response.

This response is coupled with complications of increased infectious morbidity, multi-organ dysfunction, prolonged hospitalization, and disproportionate mortality. Traditionally, nutrition support in the critically ill population was regarded as adjunctive care designed to provide exogenous fuels to support the patient during the stress response. This support had three main objectives: to preserve lean body mass, to maintain immune function, and to avoid metabolic complications. Recently, these goals have become more focused on nutrition therapy. Nutritional modulation of the stress response to critical illness includes total parenteral nutrition (TPN). Delivering early nutrition support therapy by using the TPN, is seen as a proactive therapeutic strategy that may reduce disease severity, diminish complications, decrease length of stay in the ICU, and favorably impact patient outcome.

As a critical care nurse, the researcher noticed some nursing noncompliance with the parenteral nutrition instructions and protocols regarding parenteral nutrition; such as amount and frequency of parenteral nutrition, checking solution bag and many other observations. At the same time, little is known about the nurses' knowledge regarding total parenteral nutrition administration in the critical care units; moreover, few studies handled the daily nursing practices regarding parenteral nutrition in critical care settings, especially in Egypt. As the basic knowledge and nursing activities regarding total parenteral nutrition can differ from health care institution to another and even within the same institution; therefore, special studies should be carried out to explore nurses' knowledge and identify their practices regarding total parenteral nutrition in order to determine the gaps, defects and work necessary to overcome the defects.

3-Aim of the study:

The aim of this study has two-folded purposes, first: to assess nurses' knowledge regarding total parenteral nutrition. , Second: to evaluate nurses' practice during administration of total parenteral nutrition.

4-Research questions:

To fulfill the aim of this study, the research questions were formulated:

- 4.1. What do nurses know about the total parenteral nutrition?
- 4.2. What practices the nurses perform while administering the total parenteral nutrition?

5-Subjects & Methods:

5.1. Research Design:

A descriptive exploratory design was utilized in the current study.

5.2.Setting:

This study was conducted in critical care units at Menofya and Benha University Hospitals in Egypt. It encompasses

Two critical care units who receives medical ,cardiac and neurological patients .These selected critical care units contains approximately 80 nurses with different educational categories.

5.3.Sample:

All nurses working at critical care units had a minimum of 1 year work experience and provide direct nursing care to their patients and administering total parenteral nutrition constituted the sample of this study. Criteria for inclusion were age 20 or over, minimum years of experience is 6 months, both sexes, and different educational categories. The exclusion criteria were subjects who were piloted and refused voluntarily to participate in the study. To participate will be the subjects of this study.

5.4.Tools: Two tools for data collections were utilized; it has included:

5.4.1 .Tool (1): Interview questionnaire sheet: it was designed by the researchers and included two parts:

Part 1: Personal and background data sheet: covers data related to age, sex, educational level, and years of experience in nursing and in critical care units.

Part 2 : Total parenteral nutrition knowledge questionnaire: to assess nurses' knowledge about administration of total parenteral nutrition . it consisted of 34 questions in the form of multiple choice and true/false ones. They covered knowledge pertinent to definition, indications, contraindications, and complications of TPN, formulation of TPN, doses of vitamins and trace elements.....etc. A total score for the questionnaire was 34 grades. The scoring system classified as follows; scores less than 85% was considered unsatisfactory and the scores equal or more than 85% considered satisfactory.

5.4.2. Tool (2): Total parenteral nutrition observational checklist: It was designed by the researcher through literature review to assess nurses' practices related to administration of TPN . The designed tool consists of 28 steps related to preparation and care for central venous pressure insertion, preparation & administering of TPN solutions, assessment for complications, prevention strategies and management of complications, It was carried out three times for each nurse during drug administration and the average mean of three observational checklists was obtained . The scoring system was distributed as follows; complete done step took two grades, incomplete one took one grade and incorrect / not done was took zero grade . A total score for the questionnaire was 56 grades .scores less than 85% was considered unsatisfactory and the scores equal or more than 85% considered satisfactory.

5.5.Tools validity and reliability:

The developed knowledge questionnaire and observational checklist tools were reviewed by three panel of experts in critical care nursing to ensure its validity . the reliability of the knowledge was confirmed by alpha Crobach of 85 % and the TPN checklist was tested and retested and its items were significantly correlated with pearson correlation ($r=0.891, p 0.00$) t.

5.6.Pilot Study:

A pilot study was carried out on 10 nurses from the study subjects to test the clarity, applicability, feasibility & relevance of the tools used and to determine the needed time for the application of the study tools. Modifications on tools were done and the 10 nurses were excluded from the final study sample.

5.7.Protection of Human Rights:

An official permission to conduct the proposed study was obtained from the ethical committee and hospital directors .Participation in this study was voluntary; each potential subject was informed about the purpose, procedure, benefits, and nature of the study and that he/she had the right to withdraw from the study at any time without any rationale, then written consent obtained from them. Confidentiality and anonymity of each subject was assured through coding of all data.

5.8.Procedure:

The current study was conducted on two phases: preparation and implementation phases.

5.8.1. Preparation phase:

It was concerned with constructing ,testing and piloting different data collection tools. In addition the managerial arrangements were made to conduct the current study .Nurses who agreed to participate in the study were interviewed individually by the researcher to explain the nature and purpose of the study and obtain a written consent was obtained.

5.8.2.Implementation phase:

Data were collected from June 2013 to November 2013. The researcher visited the selected intensive Care Units on daily basis during morning shift. Each potential nurse was interviewed for 20- 30 minutes to fill out the personal and background data sheet and the knowledge questionnaire schedule . The researcher clarified any obscure questions. Later, each nurse was observed three times during administration of total parenteral nutrition in morning shift utilizing observational check list. The average mean of three observations was calculated and tabulated.

5.9.Data Analysis:

Upon completion of data collection each sheet was manually scored. The background data sheet was coded and listed into numbers for calculation. Calculations were made manually. The following tests for significance were used: Means and standard deviation as well percentage, frequency, correlation coefficient, and t-test. Probability level of 0.05 was adopted as the level of significance for testing hypothesis.

5.10..Limitations of the study:

- The sample size was restricted due to administrative constraints.
- This study was limited to the staff nurses working in previously determined settings.

6. Results:

Table (1) showed percentage distribution of the studied sample regarding age , educational level ,Years of experience in nursing , years of experience in ICU and area of work. It revealed that less than half of studied subjects (47.5%) their age was ranged between 26 -35 years with a mean age of 23.86 ± 4.12 . Most of nurses participants carrying diploma degree (43.75%) and technical institute (31.25%). Regarding years of experience in nursing field, 41.25% of the study subjects were having 1-5 years of experience, with mean years of experience of 4 ± 3.924 while 68.75% of the study subjects were having 1-5 years of experience in ICU, with the mean of 5.5125 ± 5.203 .

Table (2) clarify total and subtotal knowledge scores of the studied subjects related to total parental nutrition administration (N = 80).It showed that the total mean knowledge scores of the studied subjects were 24.175 ± 4.982 out of 34 items. In relation to Sub-items questions about total parenteral nutrition, all the studied subject has got low scores.

Especially related to knowledge pertinent to complications and trouble shouting guide with a mean scores of (5.95 ± 2.0730 out of 9 and 4.6 ± 1.437 out of 7., respectively).

Table (3) demonstrated total and subtotal practice scores of the studied subjects related to total parenteral nutrition administration (N = 80).It showed that the total mean practice scores of the studied subjects were 41.825 ± 6.661 out of 56 items. In relation to Sub-items questions about total parental nutrition, all the studied subject has got low scores.

Especially related to practice pertinent to implementation phase of TPN administration with a mean scores of (24.25 ± 2.8744).

Figure (1) shows Percentage distribution of the studied subjects related to total knowledge and practice scores of the studied subjects (N = 80).It delineated that more than half (52.5% & 53.75%,respectively) of the studied sample had unsatisfactory knowledge and practice level. While less than half (47.5% & 46.25%,respectively) of the studied sample had obtained satisfactory knowledge and practice level related to TPN administration.

Table (4) shows that percentage distribution of correct and incorrect answers of questions regarding total parenteral nutrition administration among the studied subjects. It revealed that (24.38%, 28.75%, 33.75 %, 34.37%,34.37%,Respectively) of the studied subjects answered questions incorrectly regarding disadvantages, indications, complications, types of TPN solutions and trouble shouting guide. While the majority (96.25% & 86.87 %,respectively) of the studied subjects answered questions correctly regarding definition and advantages of total parental nutrition administration.

Of note, table (5) cleared that percentage distribution of the practice steps in relation to administration of total parenteral nutrition among the studied subjects. It revealed that 23.75% nurses participants didn't compare type and amount of solutions within the bag. And 47.5% nurses participants didn't able to prepare feeding solution bag. While less than half (48.75%) of nurses didn't assess the following parameters: urine glucose level, vital signs and didn't use aseptic techniques during preparation and mixing of TPN solutions.

Table (6) demonstrated that age is positively correlated with knowledge and practice scores of nurses with p-values <0.001. The above table also revealed that years of experience are positively correlated with knowledge and practice scores of nurses with highly statistical significant differences with p-values of<0.001.As well as knowledge was correlated with practice scores of nurses. with highly statistical significant differences with p-values of<0.001.

Table (7) shows that the highest mean scores were related to bachelor degree (27.8 ± 3.6 SD), female (24.25 ± 5.153 SD) , married (25.328 ± 5.148 SD), having offspring's (25.333 ± 4.857 SD) and not attend any previous training (12.821 ± 1.648 SD).

Table (8) shows that the highest mean scores were related to bachelor degree (46.7 ± 1.361 SD), male (42.15 ± 5.935 SD) , married (42.828 ± 6.402 SD) , having offspring's (43.175 ± 6.548 SD) and not attend any previous training (26.071 ± 2.698 SD) .A statistical significant differences occurred at P- values of < 0.001.

Table (1): Distribution of the study subjects according to age, marital status, job, off springs, years of experience, education and previous training (N=80).

Socio demographic data	Frequency	No n = 60	Percentage % 100.0
* Aging groups:			
< 20 years		5	6.25
20 – 25 years		21	26.25
26 – 35 years		38	47.5
> 35 years		16	20
$\bar{X} \pm SD = 23.86 \pm 4.12$ SD			
* Sex			
Male		20	25
Female		60	75
* Marital status:			
Married		64	80
Not married		16	20
* Education:			
Secondary school		35	43.75
Technical school		25	31.25
Bachelor degree		20	25
* Off springs			
Present		57	71.25
Absent		23	28.75
* Experience:			
1 – 5 years		33	41.25
6 – 10 years		27	33.75
11 – 20 years		15	18.75
>20 years		5	6.25
$\bar{X} = 4 \pm 3.924$ SD			
* Experience within ICU:			
1 – 5		55	68.75
6 – 10		12	15
11 – 20		8	10
>20		5	6.25
$\bar{X} \pm SD = 5.5125 \pm 5.2033$ SD			

Table (2): Total and subtotal knowledge scores of the studied subjects related to total parental nutrition administration (N = 80)

Items	Total scores	$\bar{X} \pm SD$
Total knowledge score	34	24.175 ± 4.982
Knowledge sub items		
Definition	1	1.25 ± 2.566
Types of TPN solutions	4	2.625 ± 0.659
Indications	5	3.562 ± 0.566
Advantages	4	4.325 ± 7.632
Disadvantages	4	3.025 ± 0.156
Complications	9	5.95 ± 2.0730
Troubleshooting Guide	7	4.6 ± 1.437

Table (3): Total and subtotal practice scores of the studied subjects related to total parenteral nutrition administration (N = 80).

Items	Total scores	$\bar{X} \pm SD$
Total Practice Score.	56	41.825 ± 6.661
Practice sub items		
Equipment	12	7.6125 ± 2.3102
Preparation	10	7.9 ± 6.276
Implementation	30	24.25 ± 2.8744
Evaluation	4	3.075 ± 2.5188



Fig.(1): Percentage distribution of the studied subjects related to total knowledge and practice scores of the studied subjects (N = 80).

Table (4): Percentage distribution of correct and incorrect /don't know answers questions sub items regarding total parenteral nutrition among the studied group (N= 80).

Items	Correct		Incorrect/Don't Know	
	No	%	N0	%
Definition	77	96.25	3	3.75
Types of TPN Solutions				
Dextrose	80	100	0	0
Amino acids	53	66.25	27	33.75
Lipids	36	45	44	55
Electrolytes	41	51.25	39	48.75
Total	52.5	65.63	27.5	34.37
Indications				
Short bowel syndrome	57	71.25	23	28.75
Chronic intestinal obstruction	73	91.25	7	8.75
Gastrointestinal surgery	55	68.75	25	31.25
Severe burns	46	57.5	34	42.5
Cancer of bowel	54	67.5	26	32.5
Total	57	71.25	23	28.75
Advantages				
Decrease mortality rate	78	97.5	2	2.5
Free from pain	77	96.25	3	3.75
Maintain ideal weight	65	81.25	15	18.75
Increased immunity	58	72.5	22	27.5
Total	69.5	86.87	10.5	13.13
Disadvantages				
Central venous catheter associated factors	55	68.75	25	31.25
Metabolic abnormalities	54	67.5	26	32.5
Non-use of the gut related factors	56	70	24	30
Cost per day 5 fold greater with TPN	77	96.25	3	3.75
Total	60.5	75.62	19.5	24.38
Complications				
Primary related to insertion				
Hemorrhage	50	62.5	30	37.5
Pneumothorax	55	68.75	25	31.25
Arrhythmia	52	65	28	35
Cardiac tamponade	54	67.5	26	32.5
Long related to catheter				
Thrombosis	55	68.75	25	31.25
Pulmonary embolism	49	61.25	31	38.75
Pericardial effusion	52	65	28	35
Bacterial endocarditis	56	70	24	30
Electrolyte disturbances	54	67.5	26	32.5
Total	53	66.25	27	33.75
Trouble shouting guide				
Stop TPN abruptly	51	63.75	29	36.25
TPN bag has not arrived on the ward	54	67.5	26	32.5
Patients access has become red and inflamed	50	62.5	30	37.5
TPN bag has unusual appearance	54	67.5	26	32.5
Patient wishes is allowed to go out on leave	51	63.75	29	36.25
Patient need to have a shower	56	70	24	30
The TPN bag was disconnected	52	65	28	35
Total	52.5	65.63	27.5	34.37

Table (5): Average Percentage distribution of the practice steps in relation to administration of total parenteral nutrition among the studied group (N= 80).

Items	Correct		Incorrect		Don't Know	
	No	%	N0	%	No	%
Equipment						
Feeding solution bag	36	45	6	7.5	38	47.5
Administration set	61	76.25	13	16.25	6	7.7
I/V pole	61	76.25	10	12.5	9	11.25
Alcohol cotton swaps	43	53.75	13	16.25	24	30
Emesis basin	56	70	14	17.5	10	12.5
Dressing set	58	72.5	14	17.5	8	10
Total	52.5	65.63	11.7	14.62	15.8	19.75
Preparation						
Wash hands	55	68.75	18	22.5	7	8.75
Explain procedure to the patient	34	42.5	31	38.75	15	18.75
Provide privacy	58	72.5	15	18.75	7	8.75
Compare type & amount of solutions	51	63.75	21	26.25	8	10
Check feeding solution bag	37	46.25	24	30	19	23.75
Total	47	58.75	21.8	27.25	11.2	14
Performance phase						
Wear gloves	55	68.75	16	20	9	11.25
Prepare the TPN solutions	60	75	15	18.75	5	6.25
Remove outer wrap around solution	57	71.25	20	25	3	3.75
Inspect the bag carefully for tear or leaks	53	66.25	21	26.25	6	7.5
Examine the bag for any discoloration, cloudyness	55	68.75	19	23.75	6	7.5
Break the seal in between the bag and mix the content if present	57	71.25	18	22.5	5	6.25
Attach solution to tubing.	58	72.5	15	18.75	7	8.75
Cleanse the IV port insertion site with antiseptic solution pad	57	71.25	16	20	7	8.75
Using aseptic technique, attach tubing to appropriate IV line	56	70	17	21.25	7	8.75
Doctor order is required to administer TPN	52	65	22	27.5	6	7.5
Maintain continuous flow rate as ordered	56	70	18	22.5	6	7.5
When the bag is going to empty: dextrose 5% or normal saline is apply as primary fluid	55	68.75	19	23.75	6	7.5
Discard the empty nutrition bag	57	71.25	16	20	7	8.75
Wash other equipments and keep them in proper place	54	67.5	20	25	6	7.5
Wash hands	48	60	22	27.5	10	12.5
Total	55.3	69.12	18.3	22.88	6.4	8
Evaluation						
The type, amount and time of feeding	31	38.75	42	52.5	7	8.75
Evaluate the patient for any reaction	36	45	39	48.75	5	6.25
Total	33.5	41.88	40.5	50.62	6	7.5

Table (6):The relationship between Knowledge, practice ,years of experience in nursing and ICU years of experience of selected sociodemographic variables

Variables	Knowledge		Practice	
	P value	R value	P value	R value
Age	0.6697	<0.001*	0.6639	<0.001*
years of experience in nursing	0.4065	<0.001*	0.3856	<0.001*
ICU years of experience	0.4189	<0.001*	0.4124	<0.001*
			P value	R value
Knowledge with practices			0.9327	<0.001*

* = indicates statistical significance at 0.001

Table (7):The relationship between nurses knowledge and selected sociodemographic variables

Items	$\bar{X} \pm SD$	T-test	P-value
Knowledge with			
	Marital status		
Married (n=64)	25.328 ± 5.148	7.006	<0.001***
Single (n=16)	19.625 ± 1.996		
	Sex		
Male (n =20)	23.95 ± 4.421	0.252	>0.05 n.s
Female (n =60)	24.25 ± 5.153		
	Offspring's		
Present (n=57)	25.333 ± 4.857	0.661	>0.05 n.s
Absent (n=23)	21.304 ± 4.037		
	Previous training		
Yes (n = 7)	29.428 ± 0.495	9.515	<0.001***
No (n = 73)	23.671 ± 4.927		
	Education		
	$\bar{X} \pm SD$		
Secondary school (n=35)	23.485 ± 5.061	49.11	<0.001***
Technical school (n=25)	21.4 ± 5.824		
Bachelor degree (n=20)	27.8 ± 3.6		

n.s = no statistical significance *** = indicates statistical significance at 0.001

Table (8):The relationship between nurses practice and selected sociodemographic variables

Items	$\bar{X} \pm SD$	T-test	P-value
Practice with			
Marital status			
Married (n=64)	42.828 \pm 6.402	5.553	<0.001***
Single (n=16)	35.875 \pm 3.854		
Sex			
Male (n =20)	42.15 \pm 5.935	0.281	>0.05 n.s
Female (n =60)	41.7 \pm 6.897		
Offspring's			
Present (n=57)	43.175 \pm 6.548	5.175	<0.001***
Absent (n=23)	38.434 \pm 1.428		
Previous training			
Yes (n =7)	49.285 \pm 0.451	10.445	<0.001***
No (n =73)	41.096 \pm 6.550		
Education			
	$\bar{X} \pm SD$	F-test	P-value
Secondary school (n=35)	41.171 \pm 6.367	57.008	<0.001***
Technical school (n=25)	38.8 \pm 4.325		
Bachelor degree (n=20)	46.7 \pm 1.361		

n.s = no statistical significance *** = indicates statistical significance at 0.001

7. Discussion

Total parenteral nutrition (TPN) is a form of nutritional support that has become an essential adjunct to the management of patients who are unable to obtain adequate nutrition either via the oral or enteral route. Previous studies indicate that TPN can be administered safely and effectively to patients; however, there are associated risks with this form of nutritional support. Researchers have indicated that due to the complexity of TPN therapy a high level of knowledge and expertise is required in the management of these patients. The multidisciplinary team approach has been supported for its ability to assess the patients' nutritional status, prescribe the nutritional requirements, and reduce the incidence of metabolic complications through regular monitoring. However, contradictory views on the effectiveness of multidisciplinary TPN teams in health-care facilities have also been reported.

* Regarding Sociodemographic characteristics:

Findings of the present study indicated that more than half of nurses their age from 26-35 years old, with secondary school education and had from 1-4 years nursing experience. This might be due to almost of nurses were newly graduates and working together at intensive care unit. This agree with *Erdil & Dinc (2000)* who studied " The effectiveness of an educational intervention in changing nursing practice and preventing catheter-related infection for patients receiving total parenteral nutrition ". Revealed that, the age range of most nurses was between 18 to 35years old (mean = 28). In Contradiction to these findings also, *Erdil & Dinc (2000)* who demonstrated that the educational level of the studied sample was nursing high school diploma program graduates(6.7%), associate degree program graduates (50%),and baccalaureate degree program graduates (43.3%).

Regarding the gender of the participants, the results of the study declared that 75% of the study sample was female nurses. This high proportion of female nurses is most probably attributes to the fact that the study of BSN in the Egyptian universities was exclusive for females only till few years ago, so the profession of nursing in Egypt was mostly feminine.

Nurses knowledge related to administration of total parental nutrition:

Finding of the present study revealed that more than half (52.5%) of the studied sample had unsatisfactory knowledge scores related to administration of TPN while less than half (47.50%) of the studied sample had satisfactory knowledge scores. In agreement of these findings *Erdil & Dinc (2000)* demonstrated that The mean score of nurses' knowledge about TPN was (68.7) before starting the educational program. This finding was consistent with their lack of knowledge prior to the educational intervention and failed to show any improvement. Supporting to these finding *Kochevar & Guenter (2007)* who revealed that total parenteral nutrition (TPN) has been a life-saving modality in clinical practice. Although its safety and efficacy have been greatly improved through increased knowledge and skill, close patient monitoring and the establishment of

specialized nutritional support teams were required. As well, *Prelack, et al. (2007)* who reported that Parenteral feeding strategies have become increasingly sophisticated and enable considerable flexibility in the initiation, advancement, and composition of nutritional therapy. However the ease in which parenteral nutrition can now be provided, should be tempered by sound clinical judgment, in particular to avoid complications offering in the critically ill patient who may be intolerant. So the nurse should have broad base of nursing knowledge and practice to ensure that the benefits of parenteral nutrition outweigh the potential risks to any given patient are needed.

Nurses practices related to administration of total parental nutrition:

In relation to data that answered the second research questions, it revealed that the nurses has got low practice scores pertinent to administration of total parental nutrition especially related to preparation of total parental nutrition solutions, changing central catheter dressing, monitoring patient reaction to total parental nutrition administration. The investigator interpreted the rationale of lack of nurses practice pertinent to TPN administration to lack of any previous training about how to administer total parental nutrition and related precautions especially to critically ill patients in the critical care areas. As well as nurses at the critical care department at Menofya and Benha University hospital had no available written protocols or resources of information to update their knowledge and improve their practices about total parenteral nutrition. However, that may explain the level of nurses' knowledge and practices regarding total parenteral nutrition. In agreement with these findings *Shahin (2012)* in his study entitled "Nurses' Knowledge and Practices regarding Enteral Nutrition at the Critical Care Department of Al-Manial University Hospital in Egypt: Impact of a Designed Instructional Program" conducted on 85 nurses representing approximately all practitioner nurses at the critical care department at Al-Manial University Hospital. Stated that the mean score of preprogram practice was 103.6 out of 138 degrees that reflected many incompetent and unsafe practices of nurses.

Relatively similar results were reported by *Al-Kalaldehy (2011)* who concluded that the nursing practice regarding enteral nutrition is not enough and highly reflected on the improvement of the patients' nutritional status and health condition, as well as, the patients' safety and reported medications errors in the critical care units.

This finding is supported by *Erdil & Dinc (2000)* who reported that The mean score of observations of nurses' practices with the control group before the in-service education was 45.7; the mean score afterwards was 66.5. This improvement was statistically significant ($p < 0.5$). The current studies emphasized on increased nurses practice related to parental nutrition administration. This consistent with *Shamsuddin (2003) & Simpson (2005)* who reported that the need to Provide TPN was realized in the effort of reducing treatment cost due to long hospital stay, and to avoid hospital-acquired complications (e.g. infection) in the stabilized patients whose main reason for continued hospitalization is for TPN therapy. With the increase in knowledge, development, and improvement in TPN support, the provision of TPN provides a comforting environment, and gives patients the freedom to return to normal activities.

The role of staff nurses in care of patient with central venous access device is an important one. Nurses are the one who can provide specialized assessment and interventions to the patients. This study implies that staff nurses can use the knowledge which was gained through structured teaching programme for carrying out the nursing care in an effective manner. From this study, it is seen that nurses should be periodically evaluated to determine their level of knowledge and skill based on which appropriate education programme can be planned (*Smeltzer and Bare, 2008*).

In addition, this finding is agreed with *Dudrick (2009)* who documented that nurses have important responsibilities in the care of patients who are receiving TPN, including maintaining the catheter and delivery system, preparation and administration of TPN solutions, replacing the dressings at the catheter insertion site and changing the infusion set at periodic intervals. Nursing practices, which reduce the risk factors for CRI include hand washing between patient contacts and before and after touching the catheter or delivery system. As well as *Daniel, et al, (2013)* in his study which entitled "A study to assess the effectiveness of structured teaching programme on care of patient with central venous access device among staff nurses in selected oncology hospital of Bangalore" stated that the overall mean percent of pre test knowledge score was 67% and post test knowledge score was 87%. The data further support that post test knowledge scores were greater than the pre test knowledge scores. So, there is 20% enhancement in overall knowledge after the structured teaching program.

***Relation between nurses knowledge scores and practice scores regarding to their characteristics:**

As regarding to relation between knowledge, practice and level of education, the present study finding revealed that there were highly statistical significant relation between level of education (bachelor degree) ,female nurse with knowledge. This finding is in agreement with *Hamed (2009)* who reported that Bachelor degree nurses scores were significantly better than diploma nurses possibly because of the basic knowledge received during academic years, which is different than that received by diploma nurses. These findings contradicted with (*Taha, 2006*) in his study which reported that the Bachelor degree nurses obtained a low mean scores than others regarding knowledge items. This possibly because they didn't receive any knowledge

related to this topic during their academic preparation on the under graduate level. This agrees with *Shahin (2012)* who reported that as regards to the relationship between sociodemographic variables and the nurses' knowledge and practice regarding enteral nutrition, findings of the present study revealed no statistical significant difference between males and females in pre-test knowledge and practice.

Regarding correlation between nurses knowledge, age and experience. The current study showed that there was highly significant positive correlation between age and nurses knowledge. As well, a positive correlation between years of experience and nurses knowledge and practices. Contradiction to these study findings *Pancorbo-Hidalgo et al, (2007)*. It was found that nurses with more years of working experience (21-30 years) had lower levels of knowledge than those with less years of working experience (1-10 years). And explained these result due to nurses with more years of working experiences may have had less chance to gain access to up-to-date information about pressure ulcer prevention.

Regarding correlation between practice, nurses age and experience. The current study showed a positive correlation between practice, age and experience in the present study. These findings are supported by *(Daniel, et al, 2013)* who reported that more the years of working in ICUs and years of experience the higher efficiency of nurses clinical practices. As years of experience were positively correlated to their knowledge and performance. In contradiction to these study a study done by *Mohamed & Wafa (2011)* at Mansoura University Hospital, the results found no significant statistically differences between practice score and selected sociodemographic data.

Findings of the present study reported that there is a positive correlation between nurses knowledge and practice. This agrees with *Shahin (2012)* who stated that a highly statistical significant correlation between participants' scores of knowledge and practice in pre-program, post program, 1 month and 2 months following the instructional program. This strong correlation between nurses' knowledge and practice is highly expectable; however, the effective establishment of enteral feeding is often hindered by lack of knowledge, basic knowledge about enteral feeding is essential for nursing practice. This result was congruent with a recent study which was about "the development of evidence-based guidelines and critical care nurses' knowledge of enteral feeding". The study found that several enteral nutrition practices are directly influenced by nurses, and that practices suggests that nurses' knowledge related to enteral nutrition is essential to achieve the best practice and optimal outcomes for patients *(Bourgault et al., 2007)*.

8. Conclusion:

The nurses' knowledge and practices regarding total parenteral nutrition at the critical care department were not enough with some unsafe practices. There was a lack of educational materials, policies and protocol about parenteral nutrition in the critical care department. As well as a significant correlation were existed between age, years of experience in nursing, work area and their level of knowledge and practice.

9. Recommendations: Based on results of the present study, the following can be recommended:

- Repetition of the study on other hospitals in Egypt.
- It is recommended to establish a written updated protocol about total parenteral nutrition to ensure enough knowledge, unified and safe nursing practice.
- An education program based on evidence related to total parenteral nutrition is of utmost importance for critical care nurses due to the shortage of new evidence-based knowledge and practices and the work overload on the nursing staff most of the time.
- Enhancing collaboration between health care providers and offering appropriate counseling should also be emphasized because the quality and safety in
- relation to nutritional nursing care is dependent on the interactions between the nurse and patient, between the nurse and the team, and the nurse and the organization.

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