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Effect of Training Program on Nurses knowledge and practice about Total Parenteral Nutrition of criticality ill child

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Abstract:
Background: Children in the critical care setting are at high risk of malnutrition due to the nature of their illness, stressors and their hyper-metabolic state **So, the present study was aimed** to evaluate the effect of training program on nurses, knowledge and practice about total parental nutrition of critically ill child. **Research Design:** quasi-experimental design was utilized in the present study. **Subjects:** Convenience sampling of 30 nurses from the intensive care unit at Assuit university children hospital. **Tools of data collection:** Three tools included: personal characteristics of nurses, nurses' knowledge and observational checklist regarding total parenteral nutrition of critically ill child. **Results:** There were statistically significant difference between nurses' knowledge and practice pre, immediate and post training program. **Conclusion:** Nurses had lack of knowledge and some unsafe practices regarding total parenteral nutrition, however, the training program showed a positive impact in improving nurses' knowledge and practice regarding total parenteral nutrition of critically ill child. **Recommendations:** the researchers recommended that the booklet program should be applied in similar settings to validate and improve nursing care related TPN of critically ill patients in children hospitals.

Keywords: Criticality ill child, Knowledge, Nurses, practice, Training program & Total parenteral nutrition.

Introduction

Critical providing adequate nutrition for children's normal growth, health, and development is critically, because nutrition has been shown to both cure and cause diseases. The importance of parenteral nutrition (PN) has grown significantly over the last decade. During critical illness, the kid experiences hormonal and metabolic changes known as the acute stress response, which temporarily halts the normal developmental process in order for the child to live. Furthermore, ischemia, abnormal blood flow, lack of enteral nutrition (EN), and medicine all have negative effects on the gut **(Renate et al., 2020).**

Total parenteral nutrition (TPN) is a method of feeding that bypasses the gastrointestinal tract. Fluids are given into a vein to provide most of the nutrients the body needs. The method is used when a person cannot or should not receive feedings or fluids by mouth. TPN are given into a vein to provide most of the nutrients the body needs avoids the gastrointestinal tract. The majority of the nutrients the body requires are delivered by a vein. When a person cannot or should not receive feedings or fluids by mouth, this approach is utilized (**Maqbool et al., 2020)**

The goal of parenteral nutrition is to prevent malnutrition in patients who are at risk of it, as well as to treat it in patients who are already malnourished. PN has been used to meet the increased nutritional requirements during burns and major surgical procedures in clinical practice for the last 30 years, owing to an increase in the reliability of application methods thanks to modern technological developments and the production of solutions containing essential nutrients prepared according to the needs of patients. In such circumstances, children require parenteral nutrition for a variety of reasons, the most common of which is intestinal insufficiency **(Jacobs, et al., 2019).**

Parenteral nutrition (PN) is a sterile intravenous solution of protein, dextrose, and fat, along with electrolytes, vitamins, trace elements, and water. Appropriate calories for energy expenditure and growth, carbohydrates to prevent hypoglycemia and in combination with lipids to provide the caloric intake to meet the infant's energy needs, adequate protein intake, including essential amino acids, to achieve positive nitrogen balance required for growth, fatty acids to prevent essential fatty acid deficiency and maximize overall non-protein energy intake and essential nutrient intake are all part of the PN for the critically ill child **(Joyce et al., 2020).**

There are two types of TPN lines that are used to provide nourishment via the catheter. Line in the middle: This type of line is frequently used for newborns and small children.

A vein in the neck or chest is inserted using the catheter. This enables nutrients to be delivered near to the heart's major blood arteries. The tip is found in the superior or inferior vena cava, as well as the right atrium. When a newborn requires continuous TPN feedings, a longer IV may be used. A peripherally inserted central catheter (PICC) line is put into a vein in the arm of the child. The line is carefully threaded up to the heart through the vein. The tip is not in the superior or inferior vena cava, nor in the right atrium. TPN is administered through a vein in the baby's hand, foot, or scalp using an IV line. A "peripheral" channel is used to distribute fluids. This is the most common approach for PPN (peripheral parenteral nutrition), which is used to provide nutritional assistance for a brief period of time **(Elke, et al., 2016) (Alrafy & Alsharkway, (2012**).

Several factors, such as intake and output 12-hour charts, necessitate monitoring when on TPN, according to Jacobs, et al., 2019. Every 8 hours, urine sugar estimation is made. Daily sodium, potassium, bicarbonate, calcium, and chloride values, day serum creatinine and blood urea values, twice-daily serum protein levels, and twice-daily liver function tests **(Jacobs, et al., 2019)**

Complications associated with parenteral nutrition include the immediate and late complications associated with catheter insertion, and those associated with the infused solution. Catheter infection affects 2 to 5% of individuals with central venous catheters, with Staphylococcus epidermidis accounting for half of the cases. Complications from the infused solutions (e.g. hyperglycemia) or deficiencies (e.g. refeeding syndrome' with hypophosphataemia, hypokalaemia, and hypomagnesaemia) can also develop (**Kovacevich, 2020).** They should be delivered through a central venous line rather than a peripheral venous line since peripheral infusion of some drugs might produce extravasations and serious local tissue damage. All medications must have their names, concentration diluents, and rate appropriately labeled. Total parenteral administration nursing expertise varies depending on experience, education, and knowledge of evidence-based practice. Patients may have a bad outcome due to a lack of awareness about current practice guidelines and care. It's also possible to have faith in ability to provide safe and high-quality nursing care. can also be affected by lack of knowledge **(Henneman, 2017).**

Nurse's role in relation to feeding varies by organization; however, the following are suggested nursing responsibilities: recognize feed readiness, recognize feeding habits characteristic of critically ill children, understand the infant's history and current medical condition, consider the environment, behavioral status, time of day, type of nipple, and positioning; understand the rationale for the various facilitation strategies and use them appropriately. Recognize infants who would benefit from direct therapy due to poor growth, structural problems, or irregular eating patterns, and assist nurses who choose to breastfeed **(Hockenberry, & Wilson, 2020).**

Significance of the Study

When enteral feeding is not possible, parenteral nutrition is a life-saving measure. Parenteral nutrition is a complicated intervention that necessitates appropriate care and coordination from the start, throughout the treatment process, and at the end. It's also crucial to have a teaching program place to deal with the numerous challenges that arise while feeding critically ill youngsters. Although the researcher observed occasional nursing noncompliance with parenteral feeding guidelines, little is known about critical care nurses' expertise of parenteral nutrition.

Aim of the study was to:

Specific objective are the following

- Assess the level of nurse's knowledge and reported practices regarding total parenteral nutrition of critically ill child
- Design and implement training program for nurses about total parenteral nutrition of criticality ill child
- Evaluate the training program about the total parental nutrition for nurses on their knowledge and practices

Research Hypothesis

H1: There will be significant differences between pre, immediate and post program for nurses' knowledge and reported practices scores regarding total parental nutrition.

H2: There will be a significant association between nurses' knowledge and their reported practices.

H3: There will be a significant association between nurses' knowledge and reported practices with their personal characteristics.

Subjects and Method

Research design:

Quasi experimental research design (pretest-posttest) was utilized in this study.

Setting:

The study was carried out at intensive care unit at Assiut university children hospital. Which serves the Upper Egypt from Beni-Suef to Aswan. It is located in second floor.it contains 12 sector with 12beds.the care for children is introduced by 10 medical professors and 30nurses.it admitted different diagnosis such as pneumonia, metabolic acidosis, poisoning, renal failure and Geillian Bare syndrome.

Subjects

A convenience sampling of 30 nurses. The sample was calculated by using power analysis according to the population flow at confidence interval 95% with precision levels 5% and $p \leq 0.05$. Inclusion criteria all nurses working in intensive care unit and accepted to participate in the study after written consent exclusion criteria nurses refuse to participated in the study.

Tools of data collection:

Three tools were utilized for this study as the following:

Tool I: Self - administered questionnaire sheet for nurses was developed by the researchers based on an extensive review of related literature and consultation of the experts and it included:

Part one: Sociodemographic characterstic of nurse as (age, level of education, and years of experience as critical nurse)

Tool II: Nurse's knowledge about the total parenteral nutrition for critically ill child which covered the following items (definitions, indication, types, components, risk factors, complications, prevention of complications and contra indication of TPN). It was containing 8 questions as definition of TPN, indication. Types, component, risk factor, complication, prevention of complication and contraindication of TPN. It was used as a tool for data collection in both pre& post-test and follow up after three months later of the training program.

Scoring system:

Scoring system for nurses' knowledge: The scoring system was graded according to the items of the interviewing questionnaire; nurses' answers were evaluated using a model answer sheet prepared by the researchers. The correct answer was scored (1 and incorrect or unknown answer scored zero= 0) with total score of 8 for nurses' knowledge..

Tool III: Observation Checklist for nurses' practice regarding TPN: it was adopted from **perry et al**., (**2014**) and developed by the researchers to evaluate nurses' practices given to child with TPN. It consists of 24 steps apply for critically ill child undergoing Total parenteral nutrition. It was used as a tool for monitoring the nurses' practices in both pre& post- test and follow up after three months later of the training program.

Scoring system:

Total grades of performance equal 28 grads the items observed to be done correctly and complete were scored "1" and the items not done or incomplete were scored "0".

Pilot study:

A pilot study was carried out on 10%(3 nurses) of the sample size to ensure the clarity, applicability of the tools, test feasibility of the study and estimate sample size and the time needed for data collection. The result of pilot study confirmed that the study was feasible. The participants of the pilot study were included in the total sample size.

Tools validity and reliability:

Tools were submitted to a panel of five experts in the fields of pediatric nursing to examine the content validity (covering, clarity, wording, length, format and overall appearance) and validity index was equal 93%. Reliability test was done using Cronbach's test to be accepted reliability on (Cronbach alpha was 0.82).

Methods of data collection

Phases

Preparatory Phase

It was started with the administrative process, in which the official approval was obtained from the Research Ethical Committee of the Assuit Faculty of Nursing, the official approval was obtained from the hospitals' administrative authorities in the previously mentioned sitting in response to the official letters sent from the Faculty of the Nursing Assuit University to conduct the study after explaining the purpose of the study.

- Develop tools for data collection and develop the content of the training program by the researchers after reviewing the related literature using available books, articles, periodicals and magazines were necessary to be acquainted with all aspects of the study problem
- A constructed training program for nurses about the total parenteral nutrition of critically ill child in the intensive care unit was designed by the researchers in a simple Arabic language and based on the actual needs assessment of the studied nurses.

The training program:

A training program was developed by the researchers based on the knowledge and practices needs in a form of printed (Arabic booklet). It was also supplemented with information based on review of relevant literature (nursing textbook, journals, internet resources, etc.) about care provided to children with TPN. Then the program was reviewed by a panel of experts before its implementation.

General objective of this program: Was to improve nurses' knowledge and practices about care offered to the child received TPN.

Specific objective of the program:-

The program's specific objectives were that the nurse who attended the program should be able to:

- Define, Types, indication, contraindication, component, risk factor, complication and nursing care of critically ill child with TPN.
- Efficiently provide the nursing procedures offered for children with TPN in the intensive care unit.

The program included 2 parts:

- **Theoretical part:** it included two lectures, one session for each. The first lecture included definition of TPN, types of TPN, indication, The second lecture included contraindication, component ,risk factors, complication and nursing care of critically ill child with TPN

Practical part: this part covered the nursing procedures offered for critically ill child children of with TPN such as assessment of anthropometric measurement, Review physician's orders, Collect supplies, Verify of the correct child, Complete all safety checks for CVC as agency policy, etc. The time required for the program implementation was 6 months with approximately 280 hours divided in 80 hours theoretical and 200 hours practical.

Operational phase/fieldwork

- Data collection extended for six months started from the first of October 2020 to the end of March 2021.
- The researcher started by introducing herself to the nurses and gave them a brief idea about the aim and nature of the study. The actual work started by meeting the nurses throughout the morning shift, the researchers first introduced themselves to nurses and gave them a complete back ground about the study and its aim, then the pre test format, pre- designed by the researchers in Arabic Language, was distributed in order to collect the required data.

Planning phase

- Based on the findings of the assessment phase, the researchers designed the training program about TPN depending on the actual needs assessment of the nurses through reviewing the related literature and based on recent evidence guidelines for the nutritional requirements
- In this phase, three sessions were planned by the researcher for the nurses to provide them with knowledge regarding the total parenteral nutrition in critically ill child.
- A booklet was written in a simple Arabic language and supplemented by photos to help in the understanding of its content.

Implementation phase

- Each didactic session took between 30-45 minutes to discuss its items, taking into consideration the attention span of nurses.
- Each session started at 10 am. For nurses who attended the morning shift and at 2:30 pm. for nurses who attended the afternoon shift.
- The studied nurses were divided into small groups; each one has consisted of three to four nurses for each group, the researchers used teaching methods in the form of lectures, group discussion, questions, and other different teaching methods as brainstorming.

No. of session	Time	Content (items)	Material used
1	10-10.30 10:30-12 Am	- Personal interviewing of the studied nurses. - The aim, duration of the study explained by the researcher through direct personal communication - Define TPN, Types of TPN., Components of TPN	Open discussion Lecture, open discussion and hand out booklet
2	10- 12 Am	Indication, risk factors, complications of TPN	Lecture, open discussion
3	10:12 Am	Prevention of complications and Contra indication of TPN	Lecture, open discussion, role play, demonstration, redemonstration and hand out booklet,
4	11:1 Am	Procedure (Checklist of TPN for critically ill child)	Lecture, open discussion, demonstration hand out booklet, role play
5	2.30-4pm	Revision of procedure (Checklist of TPN for critically ill child)	demonstration, redemonstration , open discussion, hand out booklet demonstration
6	2.30-3.30 3.30-4 pm	- The end Revision for training program	Lecture, open discussion, hand out booklet, demonstration. Redemonstration

- Guiding colored booklet about the total parenteral nutrition in critically ill children was given to each nurse after the assessment phase
- Brief, clear and simple words used during the session by the researchers, as well as at the end of each session, a summary was given.

Evaluation phase

Every nurse was interviewed separately after the training program was conducted to evaluate the level of knowledge by using tool (II) and observation checklist by using tool (III).This evaluation was done before the program and immediately after the end of the program. And then was repeated after three months later using the same tools in each time.

Ethical consideration

1. Research proposal will be approved from Ethical Committee in the Faculty of Nursing.
2. There is no risk for study subject during application of the research.
3. The study will follow common ethical principles in clinical research.
4. Written consent will be obtained from students that are willing to participate in the study, after explaining the nature and purpose of the study.
5. Nurses were assured that the data of this research will be used only for the purpose of research.
6. Confidentiality and anonymity will be assured.
7. Nurses have the right to refuse to participate and or withdraw from the study without any rational any time.

Statistical analysis

The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by **number and percent** (N, and %), where continuous variables described by mean and standard deviation **(Mean±SD).**. **Chi-square test** and fisher exact test used to compare between categorical variables where compare between continuous variables by **t-test** \and **ANOVA TEST** .used person Correlation to Appear the Association between scores, .**A two-tailed p < 0.05** was considered statistically significant all analyses were performed with the **IBM SPSS 20.0** software.

Results

Table (1): Percentage distribution of the studied nurses according to their personal characteristics (n=30)

Items	No	%
Age group		
Less than 25 year	8	26.7
From 25-30 year	12	40.0
More than 30 year	10	33.3
Mean±SD(range)	**29.43±4.90(23-39)**	
Experience of the nurse in the ICU		
Less than 2years	10	33.3
2< 5 years	4	13.3
5-10 years	8	26.7
More than 10 years	8	26.7
Qualification of the nurse		
Diploma nursing degree	20	66.7
Bachelor nursing degree	10	33.3

Table (2): Frequency distribution of the studied nurse's knowledge regarding total parenteral nutrition before, immediate and after the program mplementation (three months) (n= 30)

Items	Before		Immediate		After		P. Value
	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	
	No (%)	No(%)	No(%)	No(%)	No (%)	No (%)	
Definition of TPN	18(60)	12(40)	2(6.7)	28(93.3)	5(16.7)	25(83.3)	<0.001**
Indication of TPN	15(50)	15(50)	0(0)	30(100)	3(10)	27(90)	<0.001**
Types of TPN	16(53.3)	14(46.7)	2(6.7)	28(93.3)	5(16.7)	25(83.3)	<0.001**
Component of TPN	20(66.7)	10(33.3)	5(16.7)	25(83.3)	8(26.7)	22(73.3)	<0.001**
Risk factor of TPN	23(76.7)	7(23.3)	2(6.7)	28(93.3)	5(16.7)	25(83.3)	<0.001**
Complication of TPN	18(60)	12(40)	1(3.3)	29(96.7)	9(30)	21(70)	<0.001**
Prevention of complication TPN	25(83.3)	5(16.7)	9(30)	21(70)	14(46.7)	16(53.3)	<0.001**
Contra indication of TPN	20(66.7)	10(33.3)	4(13.3)	26(86.7)	8(26.7)	22(73.3)	<0.001**

***High Significant level*

Table (3): Percentage distribution of nurses' reported practices regarding total parental nutrition before, immediate and after the program implantations (after three months) (n= 30)

Steps	Before		Immediate		After		P. value
	Not Done	Done	Not Done	Done	Not Done	Done	
	No(%)	No(%)	No(%)	No(%)	No(%)	No(%)	
1.Assessment of anthropometric including weight, height, skin fold and mid arm circumference)	30(100)	0(0)	6(20)	24(80)	15(50)	15(50)	<0.001**
Current laboratory profile as (sodium, potassium. Chloride, co2)	15(50)	15(50)	2(6.7)	28(93.3)	7(23.3)	23(76.7)	0.001**
Current nutritional status including weight-	18(60)	12(40)	5(16.7)	25(83.3)	8(26.7)	22(73.3)	0.001**
2.Review physician's orders and compare to Medication administration record and content label on TPN solution bag and for rate of infusion.	27(90)	3(10)	7(23.3)	23(76.7)	15(50)	15(50)	<0.001**
3.Collect supplies	10(33.3)	20(66.7)	0(0)	30(100)	7(23.3)	23(76.7)	0.003**
4.Verify orders with pharmacy label on parental nutrition	19(63.3)	11(36.7)	2(6.7)	28(93.3)	14(46.7	16(53.3)	<0.001**
5.5-. Perform hand hygiene	7(23.3)	23(76.7)	0(0)	30(100)	2(6.7)	28(93.3)	0.008**
6.Identify herself, and identify patient using two patient identifiers	25(83.3)	5(16.7)	3(10)	27(90)	8(26.7)	22(73.3)	<0.001**
7.Explain the procedure to the patient	30(100)	0(0)	10(33.3)	20(66.7)	15(50)	15(50)	<0.001**
8.Compare patients identification label on parenteral nutrition	5(16.7)	25(83.3)	0(0)	30(100)	0(0)	30(100)	0.005**
9.Complete all safety checks for Central Venous Catheter as per agency policy	26(86.7)	4(13.3)	2(6.7)	28(93.3)	12(40)	18(60)	<0.001**
10. Aseptically wipe PN bag with administration set for electronic infusion device	6(20)	24(80)	0(0)	30(100)	3(10)	27(90)	0.036*
11. Add appropriate in line filter	0(0)	30(100)	0(0)	30(100)	0(0)	30(100)	-
12. Wear non sterile gloves	5(16.7)	25(83.3)	0(0)	30(100)	2(6.7)	28(93.3)	0.053
13. Clean catheter port with povidine iodine	19(63.3)	11(36.7)	0(0)	30(100)	12(40)	18(60)	<0.001**
14. Remove I.V tube from catheter hub	0(0)	30(100)	0(0)	30(100)	1(3.3)	29(96.7)	0.364
15. If starting TPN for the first time, flush and disinfect CVC lumens as per agency policy	1(3.3)	29(96.7)	0(0)	30(100)	1(3.3)	29(96.7)	0.600
16. Place IV tube into electronic infusion device	0(0)	30(100)	0(0)	30(100)	0(0)	30(100)	-
17. Set prescribed rate of infusion	0(0)	30(100)	0(0)	30(100)	0(0)	30(100)	-
18. Open clamps on IV set and catheter	0(0)	30(100)	0(0)	30(100)	0(0)	30(100)	-
19. Assess patency of catheter or venous access device	9(30)	21(70)	5(16.7)	25(83.3)	8(26.7)	22(73.3)	0.457
20. Label PN bag and IV set with date time and other information	24(80)	6(20)	6(20)	24(80)	14(46.7)	16(53.3)	<0.001**
21. If changing TPN solution, pause EID and remove old TPN administration set. Disinfect connections and change IV tubing as per agency policy.	13(43.3)	17(56.7)	4(13.3)	26(86.7)	9(30)	21(70)	0.037*
22. Discard old supplies as per agency protocol,	5(16.7)	25(83.3)	0(0)	30(100)	2(6.7)	28(93.3)	0.053
23. Perform hand hygiene	2(6.7)	28(93.3)	0(0)	30(100)	2(6.7)	28(93.3)	0.351
24. Monitor of complications related to TPN.	29(96.7)	1(3.3)	6(20)	24(80)	12(40)	18(60)	<0.001**
25. Practice about TPN	27(90)	3(10)	0(0)	30(100)	0(0)	30(100)	<0.001**

**Significant level at P value < 0.05,* ***high Significant level at P value < 0.001*

Table (4): Correlation between nurses' total mean score of their knowledge and practice regarding total parenteral nutrition before, immediate and after program implementation(three months) (n= 30)

Correlations	Knowledge about TPN	
	R	P
Practice about TPN		
Before	0.138	0.466
Immediate	.471	0.009*
After	0.169	0.371

*** Statistically Significant correlation at P. value <0.01*

Table (5): The relationship between nurses' knowledge regarding total parenteral nutrition and their personal characteristics (n=30)

Items	No	Knowledge about TPN (maximum score 8)		
		Before	Immediate	After
		Mean±SD	Mean±SD	Mean±SD
Age group				
Less than 25 year	8	2.5±0.53	6.88±0.83	6±1.51
from 25-30 year	12	3.83±1.34	7.25±0.87	5.92±1.24
More than 30 year	10	1.9±0.74	7.3±1.06	6.4±0.52
P.value		**<0.001****	**0.585**	**0.595**
Year of Expirience				
Less than 2years	10	3.3±1.34	6.8±0.79	5.4±1.26
2<5 years	4	2.75±1.5	7.25±0.96	6.5±1.29
5-10 years	8	3.25±1.16	7.5±0.76	6.5±1.07
more than 10 years	8	1.88±0.83	7.25±1.16	6.38±0.52
P.value		**0.078**	**0.445**	**0.112**
Education				
Technical	20	2.25±0.79	7.15±0.99	6.25±1.02
Baccalaureate	10	4±1.33	7.2±0.79	5.8±1.32
P.value		**<0.001****	**0.890**	**0.310**

- Independent T-test was used - One-way Anova test quantitative data was used

**High Significant level at P value < 0.01

Table (6): Relation between nurses' practice regarding total parenteral nutrition and sociodemographic characteristics (n=30)

Items	N	Practice about TPN (maximum score 24)		
		Before	Immediate	after
		Mean±SD	Mean±SD	Mean±SD
Age group				
Less than 25 year	8	13.63±1.77	23.88±1.25	21.13±1.36
from 25-30 year	12	15.67±2.57	23.75±0.87	20.58±2.07
More than 30 year	10	15.8±1.87	24.6±0.84	19.5±1.51
P.value		**0.079**	**0.120**	**0.138**
Years of Experience				
Less than 2years	10	13.8±1.62	23.7±1.25	20.6±2.01
2-5 years	4	16±1.41	24±0.82	21.75±1.89
5-10 years	8	16.25±3.45	23.88± 0.83	20.63±1.19
more than 10 years	8	15.38±1.06	24.75±0.71	19.13±1.46
P.value		**0.108**	**0.153**	**0.078**
Education				
Technical institute of nursing	20	14.8±1.91	24.1±1.07	20.5±1.7
Baccalaureate of Nursing	10	15.9±2.88	24±0.94	20.1±2.02
P.value		**0.221**	**0.804**	**0.573**

- Independent T-test was used - One-way Anova test was used

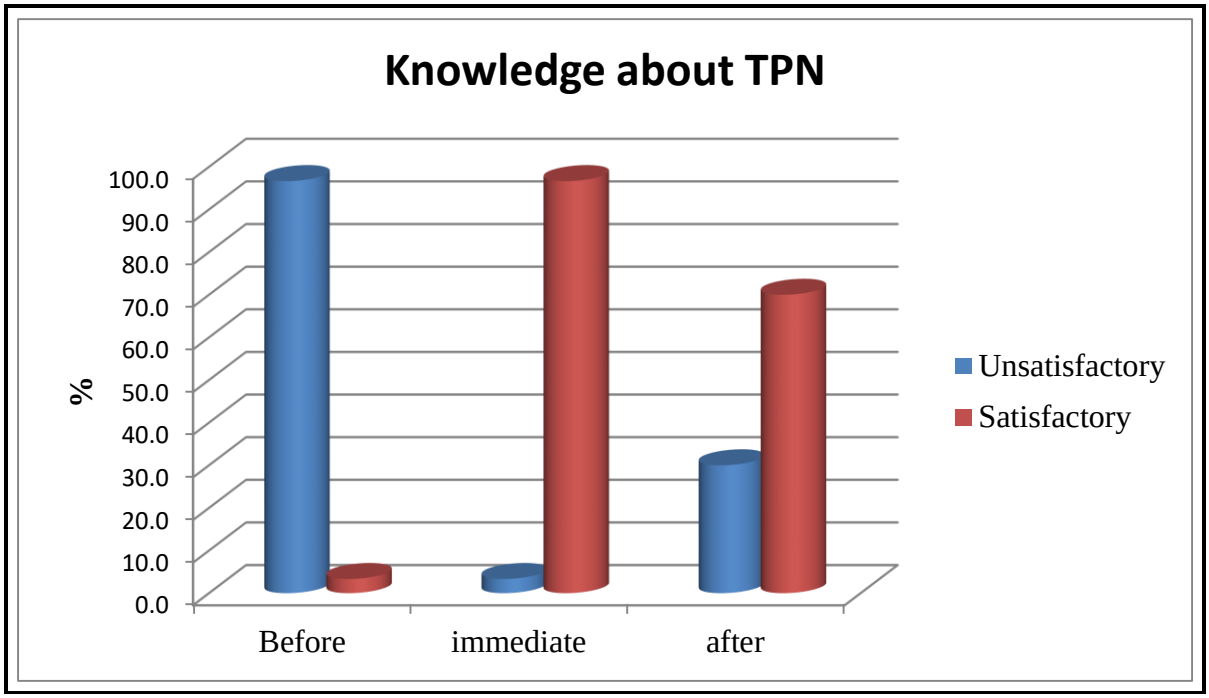

Figure (1): Distribution of studied nurse's total mean knowledge score regarding total parental nutrition before, immediate and after program (n= 30)

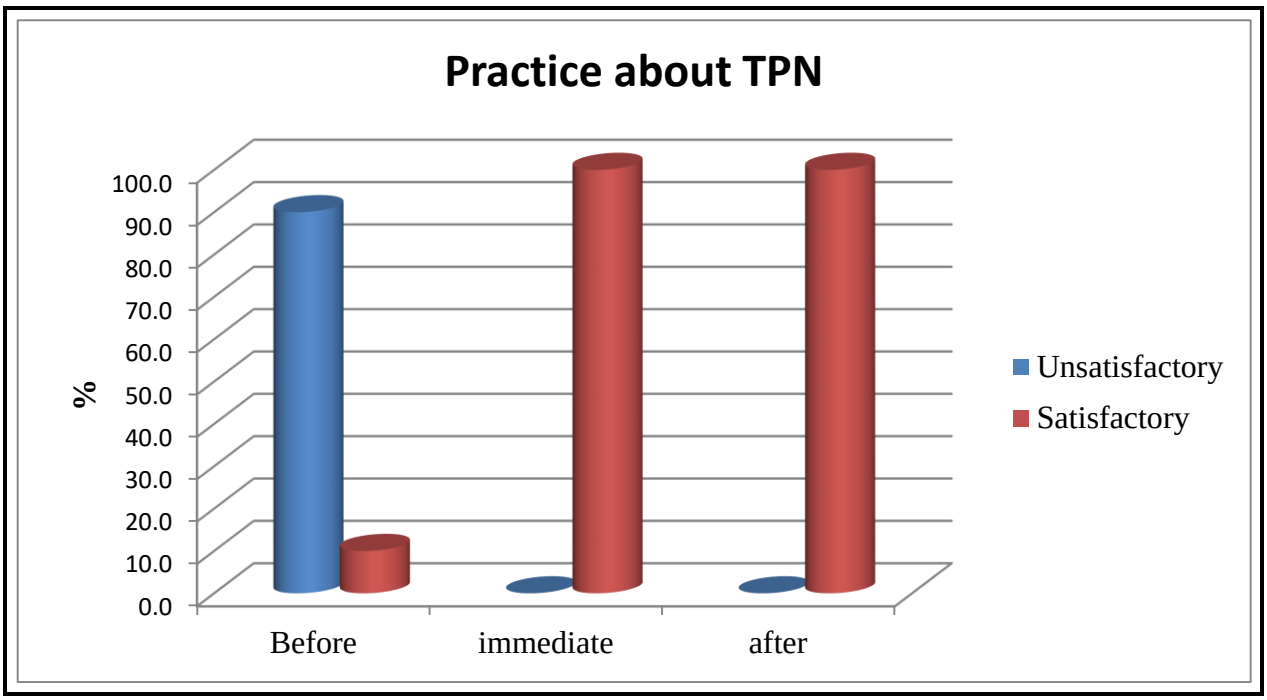

Figure (2): Distribution of studied nurse's total mean practices score regarding total parental nutrition before,immediate and after program (n= 30)

Table (1): Showed percentage distribution of the studied nurses according to their personal characteristics, it was found that less than half of the nurses (40%) their age ranged from 25-30 old years with mean of (29.43±4.90). The minority of the studied nurses (13.3%) had years of experience ranged from 2<5years and (66.7 %) of them graduated from technical school of Nurses.

Table (2): Illustrated frequency distribution of the studied nurse's knowledge regarding total parental

nutrition before, immediate and after program implementation. It was found that, most of nurses answered incorrectly the questions of prevention of complication TPN and risk factor of TPN (83.3% and 76.7% respectively) while immediately program only 30% and 6.7% of them.thier answers respectively were incorrect compared to46.7% and 16.7% after the program. With highly statistically significant difference between nurses' knowledge regarding total parental nutrition before, immediate and after the program (*P*-value < 0.001).

Table (3): Illustrated frequency distribution of nurses' reported practices regarding total parenteral nutrition before, immediate and after the program implementation(3 months). .It revealed that there was statistically significant difference between nurses' reported practices regarding total parental nutrition before, immediate and after the program (*P*-value = 0.001).

Table(4): Showed that there was statistically significant difference between nurses' total mean score of knowledge and practice regarding total parenteral nutrition immediate program at p= (0.009) with correlation.

Table (5): Displayed that the relationship between nurses' knowledge regarding total parenteral nutrition and their personal characteristics. It pointed to that statically significant association revealed between nurses' knowledge and their age and education of their nurses before the program implementation and no statically difference between nurse's knowledge and their personal characteristics immediate and after the program implementation (Three months later).

Table (6): Illustrated the relationship between nurses' reported practice regarding total parental nutrition and their personal characters**..** It founded that no statically significant association revealed between nurses' reported practice and their personal characteristics before, immediately and after the program implementation (three months later).

Figure (1): Revealed that, the majority of the studied nurses 96.7% had unsatisfactory knowledge score regarding total parenteral nutrition before the program implementation while only 3.3% of them had good knowledge before the program compared to 70.% of them had satisfactory mean score of knowledge after program and 96.7% immediate program.

Figure (2): Revealed that, the majority of the studied nurses(90 %) had unsatisfactory level in their reported practices regarding total parenteral nutrition before program compered to all of them 100% had good practices' score immediate and after the program implementation(three months later).

Discussion

Parenteral nutrition is indicated for initiation of nutritional support for critically ill child, as it provides nutritional support and a lifesaving therapy when enteral intake is not possible or does not provide sufficient caloric requirements.

The assessment of nurses' knowledge of diverse themes connected to TPN was the first dimension addressed in the current study by intensive care nurses. This evaluation was carried out in order to assess the basic information that pediatric nurses use when caring for children with TPN, as well as to highlight areas of knowledge deficiency that need to be addressed.

Regarding the total nurses' knowledge about TPN of critically ill child. The present study clarified that more than half of the studied nurses answered incorrectly, pre implementation of program. Relatively similar results were reported by **Al-Kalaldeh, (2011)** who concluded that the nursing practice regarding parenteral nutrition is not enough in the critical care units. This finding was in disagreement with **Al-wily, 2015** who reported that two-thirds of the study sample responded with correct complete answers.

From the analysis of the mean scores of the participants' knowledge about parenteral nutrition, the results revealed that the instructional program had a positive impact in the improvement of the nurses' knowledge about parenteral nutrition and this improvement was sustainable after 1 and 2 months , The results revealed significant increment in mean score of knowledge after program implementation **(Bourgault et al., 2007) .**

According to the findings of the current study, nurses had limited knowledge of TPN before to the training program, as evidenced by their low ratings. This low baseline knowledge among nurses could be explained by the fact that, after graduation, nurses stop reading and don't keep up with their professional knowledge.

The immediate post-test and follow-up test (three months later) after the program revealed statistically significant gains in total knowledge in regard to TPN. Although there were some reductions in the follow-up scores, they were still higher than pre-program levels. The observed significant improvement in studied nurses' knowledge when exposed to an educational experience indicates that these nurses could readily benefit from it. This might be due to the fact that information was simple, in addition to the use of suitable media for clarification, and the guidance offered during application of the program that enhanced the process of learning. Thus, the improvement points to the effectiveness of the training program, which was successful in nurses' acquisition of knowledge. The present study findings

are in agreement with**, Abo-El Ezz et al., (2019).** Prior to implementing remedial training program, the author analyzed the base knowledge of nurses in various specialties. They all indicated that nurses' knowledge levels were extremely low prior to exposure to defined training program, which considerably and quickly improved following implementation, but then dropped at follow-up.

The current study reflected the positive effect of the implementation of training program on total nurses 'knowledge about different TPN of critically ill child, immediately post implementation of training program with a statistical significant difference. This result is in accordance with **Ameri, et al., 2016**, who conducted in his study entitled "and indicated that the mean scores of nurses' knowledge before and afterward parenteral nutrition training program were significant Comparing the mean scores of the nurses' familiarity, before and after taking the training course, demonstrated a significant difference ($p \leq 0.0001$).

This results agreement with the study achieved by **Keogh, Ahmed, Abouazaid, & Elmusharaf (2015)** about awareness of Health Workers of Total Parenteral Nutrition and found that level of education, years of experience and training courses had a significant effect on nurses' awareness level about total Parenteral nutrition

The second feature investigated in this study was the state of nursing care provided to children with TPN by the studied nurses as observed by a checklist while on the job.

According to the findings of this study, only a small number of nurses had poor performance prior to the training program's introduction. As a result, the majority of nurses engaged in inappropriate TPN practice.

Nurses' performance improved statistically significantly during the previous intervention phase compared to the pre-intervention phase. In this regard, numerous researches in **Zaki (2018**) found that nurses' TPN practice improved statistically significantly after the post-test compared to the pre-test.

However, there was a modest reduction at the three-month follow-up. Nonetheless, the percentages of sufficient performance remained greater than in the pre-program phase, with statistically significant variations. Again, because acquired skills deteriorate over time, this loss is to be expected. The data revealed that nurses' knowledge and psychomotor performance improved after the program was implemented, but that both knowledge and skills deteriorated ten weeks later.

Regarding integrating knowledge into practice, the present study has demonstrated statistically significant relation between knowledge and practice with higher mean score of nurse's performance. This results agreement with the study achieved by **Aziz & Mansi (2017)** who reported a linear positive correlation between knowledge and practice scores of studied nurses and the finding is congruence with **Tuvadimbwa., (2015)**.

The present study indicated that nurses' reported practice regarding total parental nutrition and their personal characters**..** It founded that no statically significant association revealed between nurses' reported practice and their personal characteristics before, immediately and after the program implementation (three months later).. These results approved with the study performed by **Moula & Kambal (2016)** who conducted study to assess Pediatric Nurses' knowledge and Practices Regarding Nursing Management of critically ill child.

Finally, the program has achieved its objectives by improving the knowledge of nurses. Moreover, improvement in nursing practices was noticed throughout the program phases.

Conclusion

Based on the results of the present study, it was concluded that intensive care nurses at Assiut University children Hospital were lacking the necessary basic knowledge and practices related to care given to children with TPN. A training program was developed based on assessment regarding TPN. The program's implementation was linked to considerable increases in nurses' knowledge and practices. This was more noticeable after the immediate post-test, and it marginally decreased after the three-month follow-up.

Recommendations:

In the light of the study findings, the following recommendations are suggested.

- The established program should be implemented and repeated every 2-3 months in the same study setting, as well as adopted in other similar settings with the necessary changes.
- Pediatric nurses should keep their knowledge and skills up to date by continuing their nursing education, training, and attending seminars and conferences on a regular basis, as determined by their needs assessment.
- Nurses caring for children on TPN should be evaluated on a regular basis because they may lose knowledge and abilities over time.
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