Effect of Palliative Care Educational Intervention on Pediatric Nurses' Performance and Self-Competence in Caring for Children with Critical Illness

Fatma Sayed Abdelaziz Mohamed [1], Eman Habib Sadek [2], Baraka Fam Mary [3]

[1,2,3] Lecturer of Pediatric Nursing, Faculty of Nursing, Beni-Suef University

Abstract: Background: Palliative care has recently become imperative in child care. Pediatric nurses need to boost their education in this area to be able to offer proper care for children with critical illnesses. **Purpose**: To determine the effect of palliative care educational intervention on pediatric nurses' performance and self-competence in caring for children with critical illness. **Design**: A quasi-experimental design (pre, post, and follow-ups). **Setting**: The study was undertaken at the pediatric intensive care unit in Beni-Suef University Hospital. **Sampling**: A convenience sample of ninety-two pediatric nurses was selected. **Instruments**: Four instruments were utilized: Structured interview questionnaire sheet, Knowledge of nurses about palliative care, Observational checklists for the pediatric nurses' practice, Nurses' attitude towards palliative care, Palliative care nursing self-competence scale. **Results**: After the application of the educational intervention, all four variables had been highly statistically improved with over two thirds of the pediatric nurses exhibited good knowledge, three-quarters had competent practice, over three-quarters displayed a positive attitude and nearly three-quarters had high self-competence. Moreover, at the follow-up all variables remained highly significantly improved. **Conclusion**: The education intervention had an effective influence on nurses' performance and self-competence in palliative care. **Recommendation:** On-going application of specialized training programs in palliative care to enrich pediatric nurses' performance and self-competence.

Keywords: *Educational Intervention, Palliative Care, Pediatric Nurses, Performance, Self-Competence.*

Introduction

As outlined by the World Health Organization (WHO), pediatric palliative care (PC) is described as "total care of a child with a life-limiting illness, including care for body, mind, and spirit, and support for the family." Pediatric PC is a critical component of healthcare, addressing the complex demands of children confronting life-threatening or life-

limiting illness. Children and families encountering issues arising from health threats with life-threatening potential necessitate a PC approach. The suffering that children and their families experience on a physical, psychological, social, and spiritual level is one of these issues. In underdeveloped nations, palliative care is still largely ignored and is typically thought of as end-of-life care (Kim, Lee, & Kim, 2020; & Radwan, Abd-Elgawad, Younis, & Abo-El-Azm, 2022).

The aim of pediatric PC is to maintain and improve the quality of life for children and their families by managing symptoms and avoiding or alleviating suffering. Despite palliative care being initially developed and implemented as end-of-life care, PC can be utilized for illnesses at any stage of progress, whether or not it is terminal (Knighting, Kirton, Silverio, & Shaw, 2019). Providing care is essential for the nursing discipline and is integral to shaping its identity. In addition, PC has not been completely offered in the pediatric critical care unit, despite notable advancements in pediatric treatment and care over the past three decades. Since it provides direct care, pediatric nurses are vital members of the PC team; nevertheless, little is known about the skills in this area (Radbruch, De Lima, & Knaul, 2020). One of the biggest barriers to better care is the lack of knowledge and training about PC among healthcare providers. PC education and training improves not only the standard of care given but also the degree to which medical staff collaborate with one another. It is imperative to combine knowledge, skills, and good attitudes, to provide PC that is both efficient and successful (Farrag, Ibrahim, Anwr, Ibrahim, & Saadoon, 2023; Radwan et al., 2022).

A key determinant of nurses' skills is their level of self-competence. Literature has confirmed that nurses who perceive as more competent than others deliver higher-quality care. However, these nurses are more devoted to their duties and less easily overcome by difficulties. Furthermore, one of the main prerequisites for behavior modification is self-competence (Cheng, Zhang, Liu, & Chen, 2021; Lafond, Perko, Fisher, Mahmood, & Hinds, 2022).

Pediatric critical illness is typically considered to be a catastrophic disease condition that can result in mortality. Even though, the concept of pediatric critical illness is outlined by the World Health Organization as "any severe problem with the airway, breathing, or circulation, or acute deterioration of the conscious state." Children who encounter critical illness frequently deliberately as a consequence of life-threatening illnesses that worsens quickly. Although pediatric critical illness is acknowledged as a significant worldwide issue, its actual burden is still unknown due to a number of difficulties (Arias et al., 2024).

Nurses assigned to the pediatric intensive care unit (PICU) serve as the main caregivers for both the child and their parents, potentially influencing parental experiences during their

child's passing and delivering high-quality PC. The experience of losing a child in the PICU can profoundly affect parents, surpassing the impact of any other family member's passing. For this reason, it is imperative to offer holistic support to parents with critically ill children (Kim et al., 2023).

Pediatric nurses are the ones who deal directly with children and families, among the essential professions of the PC team. Along with the essential duties and responsibilities, pediatric nurses serve to assist children and families to deal with the adverse effects of illness and the treatment. Also, retain confidence for the child and the family and provide both physical and spiritual care for the child (Aboshaiqah, 2019). It is the core responsibility of pediatric nurses to enhance the well-being of children and their families throughout their illness, in the final stages of their lives, and in the aftermath of death. When giving care, the PC nurse should be thorough and understanding, take legal and ethical guidelines into account, and make sure the child receives the highest level of care as possible (Menekli, Dogan, Erçe, & Toygar, 2021).

Significance of the study:

Globally, according to recent estimates, around 21 million children universally need pediatric PC annually. This figure includes neonates, infants, children, and adolescents, although only 14 percent of these children receive PC. According to reports, 170,000 children

in the WHO European region demand PC annually (WHO, 2023). Alongside PC is needed for 37.4% of all deaths worldwide, while low-and middle-income nations' account for 98% of the need for PC worldwide (Dehghani, Barkhordari-Sharifabad, Sedaghati-Kasbakhi, & Fallahzadeh, 2020). The WHO provided 10 facts about PC. Among these was the fact that access to pediatric PC is poor and inadequate, with a significant portion of affected children residing in developing regions. Because there are more children suffering from chronic or critical illnesses, there's been a rise in the demand for PC, and this trend is expected to persist in the future (García-Salvador et al., 2023). In view of the importance of the topic, The European Federation of Nurses (EFN) Organization has implemented a module on PC in the structure of the nursing curriculum and practical-clinical education and training. Also, the WHO public health plan asserts that incorporating PC into healthcare systems necessitates education and training (Guanter-Peris, Alburquerque-Medina, Solà-Pola, & Pla, 2024). In Egypt, PC is still in its developing sphere and there are no accurate statistics on this topic, especially in the pediatric field (Eltaybani, Igarashi, & Yamamoto-Mitani, 2020). The incidence rate of children with critical illnesses admitted to the PICU in 2023 was 904 (Beni-Suef University Hospital Statistics Department, 2023). Pediatric nurses are crucial in the PC process as a way to fulfill the child's demands; they must enhance their competencies through specialized

training programs (Rico-Mena et al., 2023). Previous researches indicated that although PC for children and their parents is well-deserved, most pediatric nurses are not sufficiently prepared, despite the fact that pediatric nurses play an imperative part in care as members of the PC team (Boyden et al., 2023). Thus, the present study was carried out to provide PC educational intervention to PICU nurses who are responsible for the care of critically ill children in order to upgrade their knowledge, practice, attitude, and self-competence.

Purpose

To determine the effect of palliative care educational intervention on pediatric nurses' performance and self-competence in caring for children with critical illness.

Research hypotheses

Following a palliative care educational intervention, the knowledge, practice, attitude and self-competence of pediatric nurses will be notably higher than it was before the intervention.

Operational definitions

▪ **Palliative care educational intervention:**

It is an educational intervention that is designed to improve nurses' knowledge, practice and attitudes about PC, symptoms and pain control, psychosocial and spiritual care. It will be assessed by instrument one, two and three.

▪ **Performance:**

It pertains to the pediatric nurses' practices (holistic assessment for the child with critical illness, nursing management of physical symptoms, comprehensive end-of-life care and their associated knowledge and attitudes. It will be assessed using instrument one, two and three.

▪ **Self-competence:**

Relates to the judgment of pediatric nurses regarding their own ability to provide excellent palliative care. It will be assessed using instrument four.

Methods

Design:

This study applied a pre, post, and follow-up, one-group quasi-experimental design.

Setting:

The study was undertaken at the Pediatric Intensive Care Unit (PICUs) in the University Hospital situated in Beni-Suef City. Specifically, the PICUs are situated on the fourth floor and comprise three rooms with a total of 15 beds. The first room accommodates seven beds, while the second room houses three beds and the third room contains five beds. Additionally, there is a room dedicated to cardiac and chest cases with 17 beds, enabling care for a specific number of children with heart conditions. This particular setting was chosen because in Beni-Suef City, this is the largest pediatric care unit, coupled with the rising influx of children admitted to the PICU with critical illness.

Sampling:

For the study, a convenience sample was employed. The study had 92 pediatric nurses who gave their approval to join without consideration for their characteristics.

Sample size:

The sample size was determined using G*Power software (Faul, Erdfelder, Buchner, & Lang, 2009) and calculated with the formula:

Sample Size = ($\hat{Z}^2$ * P * (1-P)) / $\hat{E}^2$.

In this formula, **Z** represents the confidence interval (1.96), **P** is the anticipated prevalence (set at 50%), and **E** is the margin of error (0.05). This formula was determined [50] to be the bare minimum of participants.

Instruments:

The researchers utilized four instruments to gather data.

Instrument one: Structured interview questionnaire sheet

The researchers constructed it after investigating relevant references, and it was divided into two sections:

▪ **Section 1: Personal profile of the pediatric nurses**

The researchers developed this section, which included seven questions regarding the characteristics of nurses as age, gender, education, years of nursing experience and in PICU, heard about palliative care and prior training.

▪ **Section 2: Child personal and medical data**

Involved information related to the child's age, sex, education, diagnosis, duration of illness and presence of comorbidities.

▪ **Section 3: Palliative Care Quiz for Nursing (PCQN):**

The original developers of this quiz were Ross, McDonald and McGuiness (1996) thereafter adapted by the researchers and validated. It is a standardized instrument utilized mainly to measure nurses' knowledge about PC and entails 20 true, false questions distributed across three subscales, including philosophy and principles of PC (4 items), symptom and pain control (13 items), and psychosocial and spiritual care (3 items) .The PCQN was implemented prior to educational intervention, during the post-test and with follow-up after 3 months. Every item earned a score of one for a true reply and zero for a false or don't know reply. The sum of scores for each section's components yielded the section's overall score. The total score accumulated from all sections was used to get the total knowledge score, which falls between 0 to 20. The mean and standard deviation were multiplied and the higher score reflects a higher degree of knowledge. Furthermore, the total knowledge level of the pediatric nurses was transformed into a percentage and ranked as: Good ≥ 80%, Average 60-80 % and Low < 60%.

Instrument two: Observational checklists for the pediatric nurses' practice:

The researchers formed this part from pertinent references related to PC

practice and adapted from Bowden and Greenberg (2016). This instrument was employed to evaluate pediatric nurses' practice when caring for children with a critical illness. It was tested preceding the educational intervention, at the post-test, and after a three-month follow-up. It composed of three procedures: holistic assessment for the child with critical illness (6 steps), nursing management of physical symptoms (5 steps), and comprehensive end-of-life care (7 steps). Two points formed the scoring system for practice: one for done and zero for not done. In light of this, the level of the pediatric nurses' practices was classified into two categories: competent practices (≥85%) and incompetent practices (< 85%).

Instrument three: Pediatric nurses' attitude towards palliative care

This instrument was constructed by Frommelt (2003), which the researchers afterwards adapted and validated to assess pediatric nurses' attitudes about caring for children with critical illnesses and their families. It consisted of thirty statements on a five-point Likert scale that ranged from one strongly disagreeing to five strongly agreeing. The pediatric nurses' attitudes were divided into two domains: attitudes towards the child with critical illness, consisting of 21 statements, and attitudes towards the child's family, consisting of 9 statements. In total, there were 30 statements, with 15 negative and 15 positive statements. Scores for positive statements ranged from (1) strongly disagreeing to (5) strongly agreeing for 15 of the statements (1, 2, 4, 10, 12, 16, 18, 20, 21, 22, 23, 24, 25, 27, and 30). On the contrary, scoring was reversed for 15 negative statements (3, 5, 6, 7, 8, 9, 11, 13, 14, 15, 17, 19, 26, 28, and 29) as follows: strongly disagreeing (5), disagreeing (4), neutral (3), agreeing (2), and strongly agreeing (1). The overall attitude level fell into two categories as follows: a negative attitude < 70% and a positive attitude ≥ 70%. Before the educational intervention, during the post-test, and with a follow-up three months later, the attitude scale was executed.

Instrument four: Palliative Care Nursing Self Competence (PCNSC) scale

The PCNSC scale was formed by Desbiens and Fillion (2011) after that the researchers adapted and validated it to determine pediatric nurses' self-competence concerning PC. It is a comprehensive instrument that includes 50 items divided into ten dimensions as follows: pain management dimension (5 items), other symptoms management dimension (5 items), psychological needs dimension (5 items), social needs dimension (5 items), spiritual needs dimension (5 items), needs associated with functional status dimension (5 items), ethical and legal issues dimension (5 items), interprofessional collaboration and communication dimension (5 items), personal and professional issues related to nursing care dimension (5 items), and end-of-life care dimension (5 items). The replies were recorded using a five-point Likert scale, with 1

denoting "strongly disagreeing" and 5 denoting "strongly agreeing." The scoring system follows as: < 70% implies a lower level of self-competence, and ≥ 70% implies a higher level of self-competence. This scale was applied through the pre, post, and follow-up the educational intervention.

Validity and reliability

Study instruments were prepared and submitted to five (three professors and two associate professors) expert panels in the pediatric nursing field. Every expert on the jury was requested to review the instrument for topic coverage, overall appearance, clarity, phrasing, and format. Instruments were modified in accordance with the jury's decision. On the other side, Cronbach's alpha was used to evaluate how reliable the instrument is. The alpha test of the PCQN was 0.90, the practice was 0.87, attitude was 0.84, and the PCNSC was 0.89.

Ethical consideration

The research ethics committee of the Beni-Suef University faculty of medicine agreed to the research proposal (Approval No. 03102023). Furthermore, the participating hospital provided an official permission. Each nurse gave formal written consent, and their identity and anonymity were maintained. The pediatric nurses were free to decline from participation or to withdraw from the study at any phase.

Pilot study

A pilot study was pulled out on 10% (9) of the pediatric nurses. This enabled us to confirm the accuracy of instruments, spot any barriers and difficulties during data collection, and predict the time required to finish the questionnaires. The pediatric nurses who took part in the pilot were involved in the core sample, and no amendments were performed.

Procedure

An official letter was sent from the Dean of the Faculty of Nursing, Beni Suef University to the director of University hospital explaining the purpose and methods of data collection.

The study was conducted between the start of November 2023 and its completion in July 2024. The study setting was visited by researchers three days a week between 9 a.m. and 2 p.m. The actual study was split into four stages:

1st stage: Assessment

In this stage, the PICU nurses provided their baseline data. On the basis of availability and willingness to engage in the study, the researcher interviewed nurses at PICU. To make data collection simple, a description of the nature and purpose of the study was conducted for nurses. Instruments one, three and four were distributed between nurses to collect data about knowledge, attitude, and self-competence in PC. The researchers utilized instrument two to observe the pediatric nurses' practices. The researchers ultimately obtained the child's data from the hospital's medical records. The time required for all instrument lasted around 40- 50 minutes. This stage was extended for four consecutive weeks.

2nd stage: Planning

The researcher collected educational intervention from relevant references (e.g. European Association for Palliative Care's guidelines). Printed materials and PowerPoint slide shows were used for the education. Teaching strategies included lectures, demonstrations and re-demonstrations, problem-based learning, case studies, self-directed learning techniques, discussions, and sharing of real-world experiences. This stage took a month to construct the educational materials.

3rd stage: Implementation

The nurses under study (92) were separated into ten groups. Each group contained nine to ten nurses. Each group received fourteen sessions: six theoretical sessions and eight practical sessions. Sessions were conducted three days per week, with two sessions held each day. Each session lasted between 30 to 60 minutes. Each group received 14 hours educational intervention. It took three months to finish this step. The theoretical section of the educational program addressed various aspects of palliative care, including its definition, underlying philosophy, and guiding principles. It also discussed the appropriate timing for initiating palliative care, the composition of the palliative care team, common misconceptions surrounding palliative care, and the specific roles nurses play in this field. Additionally, the educational program covered both non-pharmacological and pharmacological approaches to pain management, as well as strategies for alleviating physical and psychological symptoms. The practical component of the educational intervention included three observational checklists as holistic assessment of the child, management of physical symptoms, and comprehensive end-of-life care. These sessions were replicated for every group as required. The sessions were applied face-to-face in the lecture hall in the PICU and in coordination with the head nurse and the training unit in the hospital.

4th stage: Evaluation

Once the educational intervention was finished, evaluation was immediately performed in a post-test similar to the pretest format and follow up was executed after 3 months. This stage took four months.

Statistical analysis

The data was initially entered into an Excel spread sheet and then exported to the statistical software program SPSS version 20. Numbers and percentages were applied to represent the characteristics of the nurses under study. The mean and standard deviation were computed for the quantitative variable. A student t-test was applied for normally distributed quantitative variables, to compare between the two groups under study, while an F-test (ANOVA) was applied to compare between more than two groups. The comparison before and after intervention was computed using a paired t-test. To analyze categorical variables, a chi-square test was used to compare outcomes across various groups. Meanwhile, the statistical association among the study variables was assessed using the Pearson

coefficient test. Additionally, the reliability statistic was determined via the Cronbach's alpha test, with significance determined at the 5% level, and findings considered highly significant at 0.001.

Results

Table (1) displays that 75% of the pediatric nurses were in the age group of 20 < 30 with a mean age 27.84 ± 5.63, and 52.2% were female. In terms of educational level, 63% of the pediatric nurses had a technical nursing degree. In addition, it was found that 45.7% of them had 1< 5 years of nursing experience, whereas 52.2% had <1 year of experience in the PICU. Moreover, 60.9% of them had not heard about palliative care, while 75% of them didn't attend any training in palliative care.

Table (2) shows personal and medical data for the pediatric patient. The age group 6–12 years represents the largest portion of the sample, accounting for 51.6% of the children with a mean age of 8.5 ± 3.2 years. Regarding gender distribution, males constitute 54.8% of the sample, and females comprise 45.2%. Educational levels among children vary, with the majority in primary education at 36.7%. Diagnoses are diverse, with cancer being the most common 28.2%, followed by cardiac diseases 22.3%. Of most children, 87.8% have been ill for one year or more, and a high percentage 76.1% has comorbidities.

Tables (3) summarizes before, after and follow-up intervention mean scores for various variables related to knowledge, practices, attitudes, and self-competence among pediatric nurses in PC. The total knowledge score increased from 7.74 ± 6.221 before intervention to 16.96 ± 2.086, 16.39±2.72 after and follow-up intervention respectively. Similarly, mean scores related to philosophy and principles improved from 1.52 ± 1.322 before intervention to 3.48 ± 0.538 after intervention, with a slight decline to 3.43±0.634 at follow-up. Whereas, symptom and pain management scores increased from 4.96 ± 4.049 before intervention to 10.91 ± 1.450, after intervention with a slight decrease to 10.40±2.307 at follow-up and psychological and spiritual care scores changed from 1.26 ± 1.157 before intervention to 2.57 ± 0.716, 2.55±0.701 after and follow-up intervention respectively. Even though total practice scores upgraded from 13.43 ± 2.962 before intervention to 15.76 ± 1.673, 15.40±3.43 after and follow-up intervention respectively, paired t-tests indicate highly significant improvements, with p-values of 0.000 for both after and follow-up comparisons. Total attitudes towards palliative care also exhibited highly significant enhancement, with before-intervention scores of 91.52 ± 20.919 boosted to 106.52 ± 14.076, 101.78±14.97 at after and follow-up intervention. Furthermore, attitudes towards the child revealed notable improvements, with scores rising from 63.74 ± 14.629 before intervention to 73.30 ± 12.016, 71.13±13.01 after and follow-up intervention respectively. While attitudes towards the child's family were higher from 27.78±7.323 before intervention to 33.22±4.054,

30.65±4.267 after and follow-up intervention respectively. Total self-competence scores augmented from 158.75 ± 47.002 before intervention to 178.13 ± 33.544, 170.80±34.70 after and follow-up intervention respectively. A remarkably high significant difference (p≤ 0.001) was detected for all variables between the before and after and follow-up intervention.

Figure (1) portrays that prior to educational intervention, 47.8 % of the pediatric nurses exhibited poor knowledge, while 8.7% of the pediatric nurses demonstrated good knowledge about PC. On the other hand, after the educational intervention, 69.6% of the pediatric nurses possessed good knowledge of PC. At the follow-up, 63% of participants still scored good knowledge, indicating retention of knowledge, with 8.7% of them had poor knowledge.

Figure (2) demonstrates that 75% of the pediatric nurses had a competent practice level after the educational intervention implementation, compared to 56.5% of the pediatric nurses demonstrated an incompetent level of practice before the educational intervention. While at follow-up 70.7% of them had a competent practice.

Figure (3) illustrates that 69.6 % of the pediatric nurses had a negative attitude towards PC, while 30.4 % exhibited a positive attitude prior to the educational intervention. Meanwhile, after the educational intervention, the positive attitude improved to 78.3% of the pediatric

nurses, while 21.7% had a negative attitude. During the follow-up, 72.8% of participants had a positive attitude toward PC.

Figure (4) reveals that 60.9% of the pediatric nurses had low self-competence before educational intervention implementation. Even though, 73.9% of the pediatric nurses had high self-competence after educational intervention implementation. 69.2% of them had a high self-competence at the follow-up.

Table (4) illustrates the effect size in total knowledge scores before and after the intervention, measured by Cohen's d, which was 1.31, categorizing it as a large effect and pointing to a strong impact of the intervention on knowledge gains. Similarly, for the before-intervention to follow-up interval, Cohen's d for this interval was 1.17, also indicating a large effect size. The gains were largely maintained at the follow-up, demonstrating the intervention's lasting impact on knowledge retention. While the effect size for total practice scores before and after intervention was 0.83 indicating a large effect size, before and after the follow-up interval, the effect size with Cohen's d was 0.52, classified as medium. Moreover, the effect size for total attitudes score before and after intervention was 1.09 indicating a large effect size, while before and follow-up intervention was 0.70 classified as medium. Furthermore, the effect size for the self-competence score before and after intervention was 0.96 showing a large effect size, at before and follow-up intervention was 0.53 categorized as

medium. These results confirm that the intervention had a positive effect with a p-value of 0.000, confirming the statistical significance of this change across all variables.

Table (5) this table shows bivariate analysis of the relationships between pediatric nurses' personal characteristics, knowledge, practices and attitudes Before the Educational Intervention. Sex of pediatric nurses have a significant relation with knowledge (p = 0.001), attitude (p = 0.002), and self-competence (p = 0.000). However, a statistically significant difference was observed in practices scores among education groups, with a p-value of (0.013). Years of nursing experience significantly impact on knowledge and practice (p = 0.026, p = 0.001) respectively, while years of experience in PICU significantly impact on pediatric nurses attitude and self-competence scores (p = 0.019, p = 0.006) respectively. Whereas, pediatric nurses that heard about palliative care scored significantly in practices and attitude with p-values below 0.05 and highly significantly with knowledge and self-competency with p-values below 0.001. Also, a highly significant relation was reported between attending training courses on PC before the educational intervention with practices and knowledge with (p = 0.000), and a significant one with self-competency (p = 0.014).

Table (6) illuminates that the bivariate analysis confirmed a significant relation Between pediatric nurses' total knowledge level and their age (F=4.468; P= 0.014), years of nursing experience (F= 6.128; P= 0.003), years of experience in PICU (F=3.333; p= 0.040), hearing about palliative care (t=7.334; p= 0.008), and attending training courses on palliative care (t=5.024; p= 0.027). Moreover, a highly significant relation between knowledge and education (F=25.460; p= 0.000) was found. Also, a significant relationship was found between total practice score and hearing about palliative care (t=8.036; p= 0.006), and attending training courses on palliative care (t=10.58; p= 0.002). Regarding pediatric nurses' attitudes, sex (t=11.07; p= 0.001), education (F=4.039; p=0.001), years of experience in PICU (F=16.840; p=0.000) and hearing about palliative care (t=14.95; p=0.000) were highly significantly associated with total scores of attitudes. Furthermore, there was a highly statistically significant relation between total self-competence level and their sex (t=30.02; p= 0.000), hearing about palliative care (t=15.07; p= 0.000). Also, a significant relation between total self-competence level and their education (F=4.32; p=0.007) and attending training courses on palliative care (t=5.47; p= 0.022).

Table (7) demonstrates a notably highly significant positive correlation between the pediatric nurses' total knowledge and practice both before, after the intervention with (p= 0.000) and it was significant during the follow-up (P= 0.009). The positive correlation was significant between total knowledge and self-competence before the educational intervention at (P= 0.002) and highly significant after and follow-up the intervention at (P=

0.000). A highly significant positive correlation was revealed between the nurses' attitude and knowledge after the intervention (P= 0.000), and it was significant during the follow-up (P= 0.002). There was a significant correlation between total attitude and practice before the intervention at p= 0.039; while after and follow-up the educational intervention, the correlation wasn't significant. Meanwhile, total attitude's correlation with self-competence was highly significant before after and follow-up the intervention, with (p = 0.000).

Table (1): Distribution of the Pediatric Nurses' According to Their Personal Profile (n=92)

Pediatric nurses' personal profile	No.	%
Age/ years		
20 < 30	69	75.0
30 < 40	19	20.7
40 – 50	4	4.3
Mean ± SD 27.84 ± 5.63		
Gender		
Male	44	47.8
Female	48	52.2
Education		
Diploma	4	4.3
Technical institute	58	63.0
Bachelor of nursing	27	29.3
Master degree	3	3.3
Years of nursing experience		
1< 5	42	45.7
5< 10	33	35.9
≥ 10	17	18.5
Years of experience in the PICU		
<1	48	52.2
1-5	35	38.0
≥ 5	9	9.8
Heard about palliative care		
Yes	36	39.1
No	56	60.9
Prior training in palliative care		
Yes	23	25.0
No	69	75.0

Table (2): Distribution of Studied Children According to Their Personal and Medical Data (n=188)

| Personal and medical data	No.	%
Age in years		
< 6	63	33.5
6-12	97	51.6
>12	28	14.9
Mean ±SD	8.5±3.2	
Sex		
Male	103	54.8
Female	85	45.2
Education		
Early Childhood Education	63	33.5
Primary Education	69	36.7
Secondary Education	56	29.8
Diagnosis		
Cancer	53	28.2
Congenital Anomalies	18	9.6
Neurological Disorders	27	14.3
Respiratory Diseases	31	16.5
Cardiac Diseases	42	22.3
Severe Renal Diseases	8	4.3
Hematological Disorder	5	2.7
Organ Failure	3	1.6
Genetic and Metabolic Disorders	1	0.5
Duration of Illness		
< 1 year	23	12.2
≥1 year	165	87.8
Presence of comorbidities		
Yes	143	76.1
No	45	23.9

Table (3): Comparison mean score of the pediatric nurses' knowledge, practices, attitude and self-competence regarding palliative care before, after and follow-up the educational intervention (n=92).

Variables	Before Intervention	After Intervention	Follow-up Intervention	Paired t test	p-value (1)	Paired t test	p-value (2)
	Mean ± SD	Mean ± SD	Mean ± SD				
Total knowledge score (possible score: 0–20)	**7.74±6.221**	**16.96±2.086**	**16.39±2.72**	**12.556**	**0.000****	**11.249**	**0.000****
Philosophy and principles (possible score: 0–4)	1.52±1.322	3.48±0.538	3.43±0.634	13.986	0.000**	13.697	0.000**
Symptom and pain management (possible score: 0–13)	4.96±4.049	10.91±1.450	10.40±2.307	12.274	0.000**	10.195	0.000**
Psychological and spiritual care (possible score 0–3)	1.26±1.157	2.57±0.716	2.55±0.701	8.367	0.000**	8.431	0.000**
Total practices score (possible score: 0–18)	**13.43±2.962**	**15.76±1.673**	**15.40±3.43**	**7.942**	**0.000****	**4.991**	**0.000****
Holistic Assessment for the child with critical illness (possible score: 0–6)	3.87±2.082	5.49±0.955	5.33±1.60	8.618	0.000**	5.639	0.000**
Nursing management of physical symptoms (possible score: 0–5)	4.09±0.979	4.48±0.883	4.34±0.975	3.547	0.001**	2.012	0.047*
Comprehensive end-of-life care (possible score 0–7)	5.48±1.565	5.79±1.600	5.73±1.60	2.680	0.009*	2.146	0.035*
Total Attitudes to palliative care score (possible score: 30–150)	**91.52±20.919**	**106.52±14.076**	**101.78±14.97**	**10.485**	**0.000****	**6.740**	**0.000****
Attitudes towards child with terminal illnesses (possible score: 21–105)	63.74±14.629	73.30±12.016	71.13±13.01	9.786	0.000**	7.198	0.000**
Attitudes towards the child's family (possible score: 9–45)	27.78±7.323	33.22±4.054	30.65±4.267	8.939	0.000**	4.113	0.000**
Total self-competence score (possible score: 20–250)	**158.75±47.002**	**178.13±33.544**	**170.80±34.70**	**9.221**	**0.000****	**5.100**	**0.000****
Pain management (possible score: 5–25)	16.39±6.330	18.83±4.062	17.83±4.04	5.991	0.000**	3.185	0.002*
Other symptoms management (possible score: 5–25)	17.00±5.885	19.13±3.487	17.96±3.62	5.495	0.000**	2.242	0.027*
Psychological care (possible score: 5–25)	16.48±5.434	17.96±4.060	17.28±4.07	4.213	0.000**	2.225	0.029*
Social care (possible score: 5–25)	15.48±4.889	17.13±3.731	16.65±3.92	6.865	0.000**	4.463	0.000**
Spiritual care (possible score: 5–25)	15.78±4.890	17.43±3.299	16.83±3.44	4.847	0.000**	3.128	0.002*
Needs associated with functional status (possible score: 5–25)	15.22±4.899	17.26±4.319	16.34±4.54	6.178	0.000**	2.942	0.004*
Ethical and legal issues (possible score: 5–25) 14.6 ± 4.48	15.70±5.266	17.57±4.243	16.86±4.23	7.989	0.000**	4.603	0.000**
Inter professional collaboration and communication (possible score: 5–25)	15.61±5.260	17.22±4.863	16.68±4.79	6.020	0.000**	3.803	0.000**
Personal and professional issues related to nursing care (possible score: 5–25)	15.48±5.169	17.39±5.965	16.75±5.92	6.191	0.000**	3.694	0.000**
End-of-life care (possible score: 5–25)	15.43±4.843	18.22±5.570	17.59±5.55	7.400	0.000**	5.385	0.000**

Paired t test, * * highly statistically significance p≤ 0.001   * statistically significance p≤ 0.05

Figure (1): Percentage of Pediatric Nurses according to Their Level of Knowledge About Palliative Care Before, After and at Follow-up.
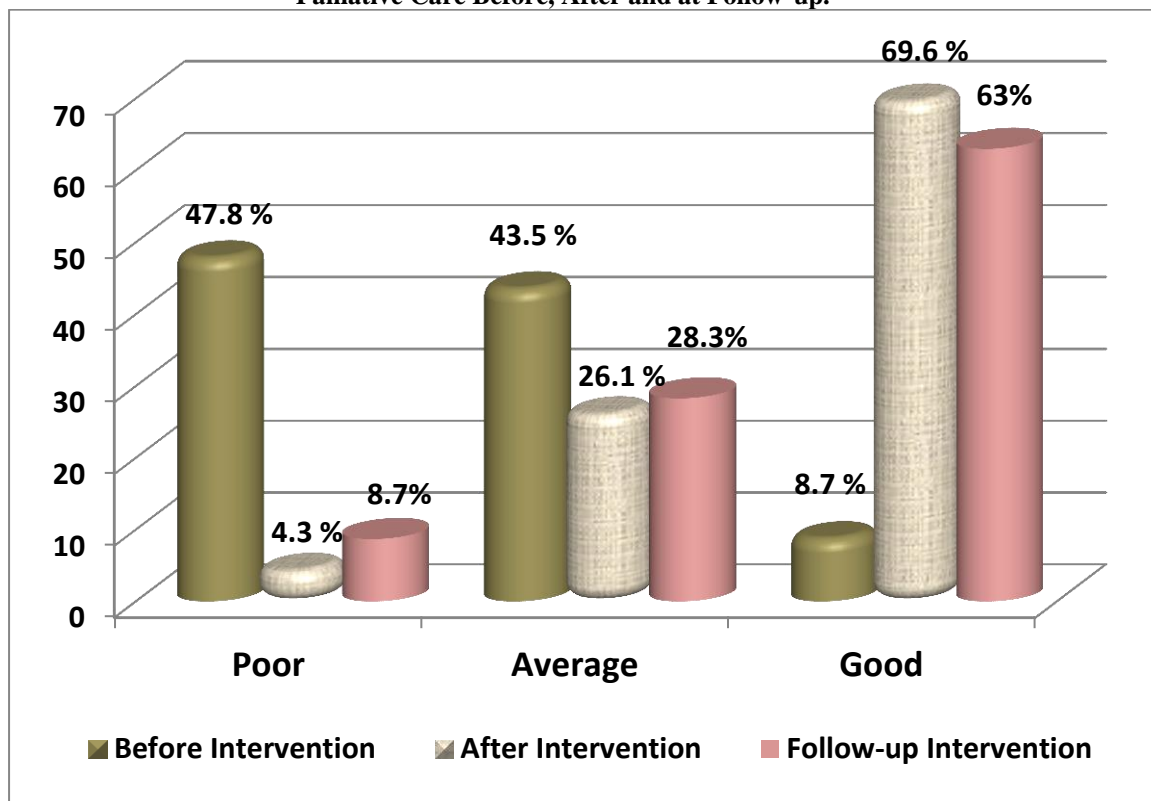
$x^2(1)$ = **Relation between before& after program (24.307),** (p=0.000**)

x^2 **(2)= Relation between before& follow-up intervention (13.943),** (p=0.007*)

Figure (2): Distribution of the pediatric nurses' total level of practices regarding palliative care before, after and follow-up the educational intervention.
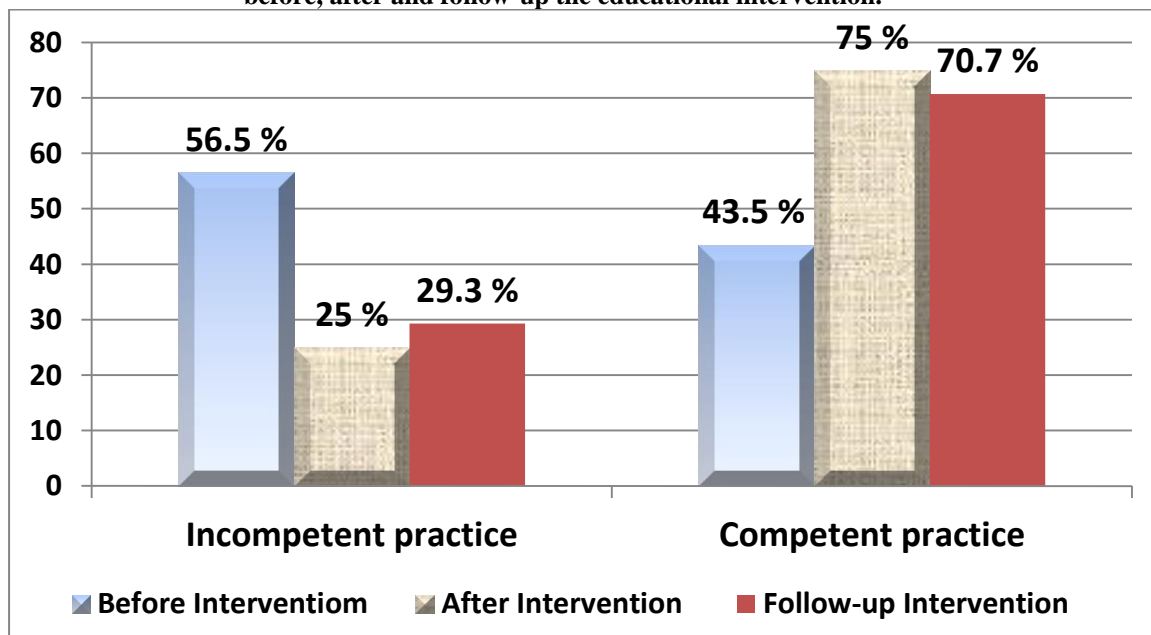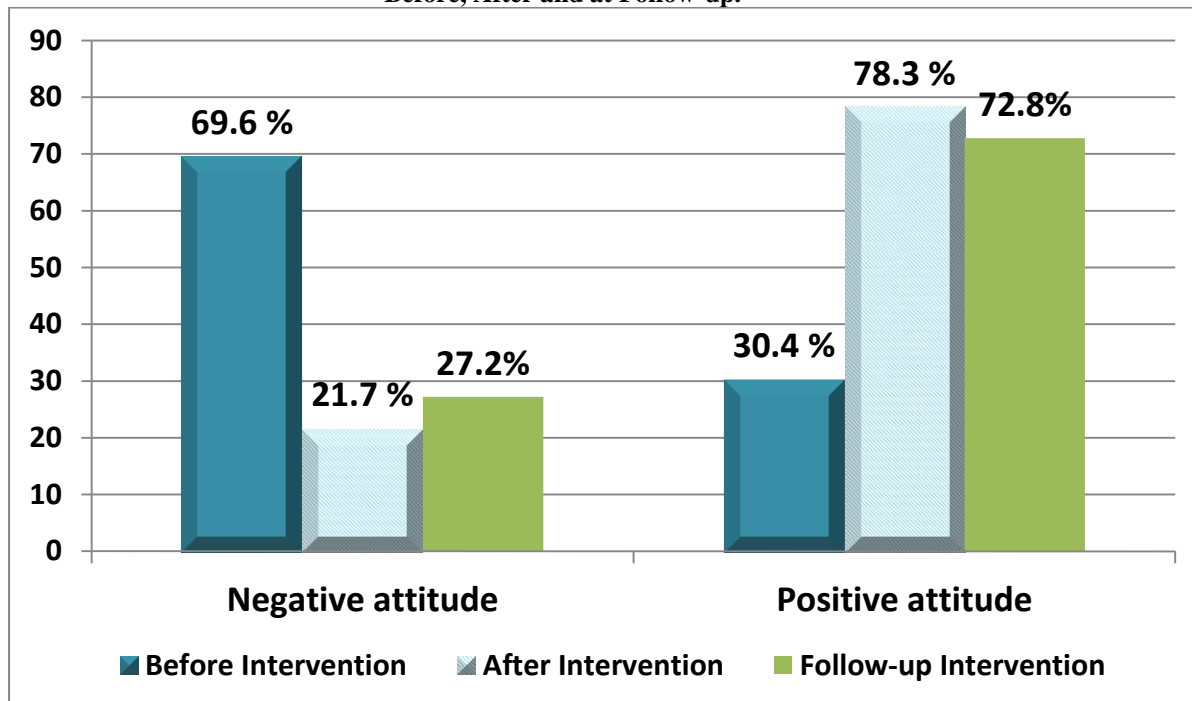

x^2 (1)= Relation between before& after intervention (8.492), (p=0.003*)

x^2(2)= Relation between before& follow-up intervention (4.791), (p= 0.024*)

Figure (3): Distribution of Pediatric Nurses According to Their Attitude Towards Palliative Care Before, After and at Follow-up.

$x^2(1)$ = **Relation between before & after intervention (11.181),** (p=0.000**)
$x^2(2)$= **Relation between before & follow-up intervention (15.019),** (p=0.000**)

Figure (4): Distribution of Pediatric Nurses According to Their Level of Self-Competence Before, After and at Follow-up.
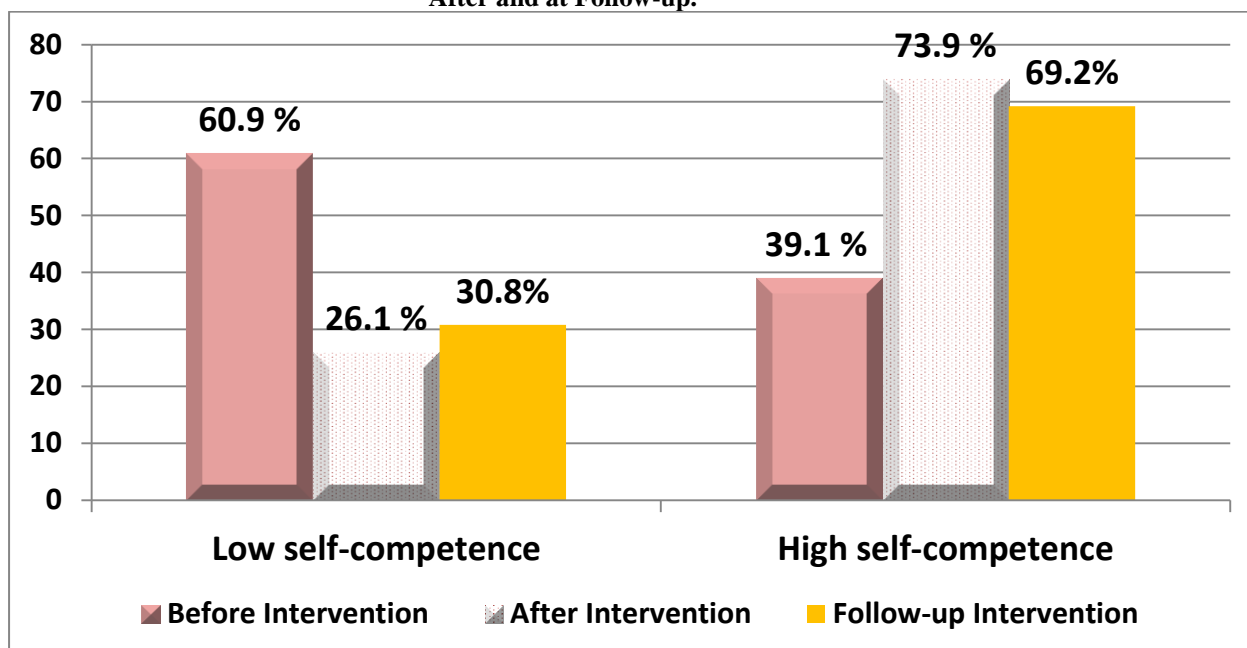
$x^2(1)$ = Relation between pre & post program (20.874), (p=0.000**)
$x^2(2)$= Relation between pre & follow program (25.875), (p=0.000**)

Table (4): Effect Size of Educational Intervention on Level of Palliative Care Knowledge, Practices, Attitude, And Perceived Self-Competence Before, After and Follow-Up Educational Intervention.

Variables	Mean	Std. Deviation	95% Confidence Interval of the Difference		Paired t test	p-value	Effect size	
			Lower	Upper			Cohen's d	Level
Total knowledge score (Before-After)	9.217	7.041	7.759	10.68	12.56	0.000**	1.31	Large
Total knowledge score (before-follow-up)	8.65	7.38	7.12	10.18	11.249	0.000**	1.17	Large
Total practices score (Before-After)	2.326	2.809	1.744	2.908	7.942	0.000**	0.83	Large
Total practices score (before-follow-up)	1.967	3.78	1.18	2.75	4.991	0.000**	0.52	Medium
Total Attitudes score (Before-After)	15.0	13.723	12.158	17.842	10.485	0.000**	1.09	Large
Total Attitudes score (before-follow-up)	10.26	14.60	7.24	13.28	6.740	0.000**	0.70	Medium
Total self-competence score (Before-After)	19.56	20.35	15.35	23.780	9.221	0.000**	0.96	Large
Total self-competence score (before-follow-up)	12.24	23.02	7.47	17.01	5.100	0.000**	0.53	Medium

Table (5): Bivariate Analysis of the Relationships between Pediatric Nurses' Personal Characteristics Knowledge, Practices and Attitudes Before the Educational Intervention.

General characteristic	Knowledge		Practices		Attitude		Self-competence	
	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean(95%CI)	t-test/ ANOVA (p-value)
Age/ years								
20 -<30	7.77(6.29-925)	F=0.723 (0.488)	13.72(13.06-14.39)	F=1.341 (0.267)	91.20(86.64-95.77	F= 0.079 (0.924)	156.07(144.71-167.43)	F=0.510 (0.602)
30- <40	8.37(5.45-11.28)		12.53(10.88-14.17)		93.11(81.74-104.47)		168.32(148.47-188.17)	
40 -50	4.25(2.28-7.78)		12.75(6.74-18.76)		89.50(73.44-105.56)		155.25(138.41-172.09)	
Sex								
Male	5.50(3.84-7.16)	t=12280 (0.001**)	13.36(12.51-14.22)	t=0.048 (0.827)	84.61(77.26-91.97)	t=10.118 (0.002*)	133.59(121.04-146.14)	t=31.892 (0.000**)
Female	9.79(7.99-11.59)		13.50(12.59-14.41)		97.85(93.49-102.22)		181.46(169.85-193.07)	
Education								
Diploma	9.00(5.82-12.18)	F=0.434 (0.729)	13.25(10.86-15.64)	F=3.818 (0.013*)	72.00(65.64-78.36)	F=1.614 (0.192)	120.25(117.86-122.64)	F=2.009 (0.119)
Technical institute	7.93(6.42-9.45)		12.81(12.02-13.60)		9.43(87.95-96.91)		157.59(146.46-168.71)	
Bachelor of nursing	7.56(4.58-10.53)		14.96(13.96-15.97)		93.70(83.46-103.95)		170.07(148.49-191.66)	
Master	4.00(2.21-8.21)		12.00(3.39-20.61)		80.33(-26.26-186.93)		125.00(112.86-146.86)	
Years of nursing experience								
1<5	9.43(7.52-11.34)	F=3.818 (0.026*)	13.74(12.90-14.58)	F=7.146 (0.001**)	91.17(86.20-96.13)	F=0.114 (0.893)	152.05(137.58-166.51)	F=1.219 (0.300)
5-<10	7.09(5.16-9.02)		14.21(13.16-15.27)		90.85(83.10-98.60)		168.67(152.38-184.96)	
≥10	4.82(1.28-8.36)		11.18(9.85-12.50)		93.71(78.48-108.93)		155.06(129.42-180.70)	
Years of experience in PICU								
<1	7.83(5.88-9.79)	F=1.987 (0.143)	13.04(12.27-13.81)	F=2.032 (0.137)	89.08(83.65-94.52)	F=4.152 (0.019*)	152.96(138.52-167.39)	F=5.492 (0.006*)
1-5	8.57(6.75-10.39)		14.20(13.08-15.32)		98.23(91.41-105.05)		175.20(162.72-187.68)	
≥5	4.00(-0.61-8.61)		12.56(10.31-14.80)		78.44(56.42-100.47)		123.78(87.38-160.18)	
Heard about palliative care								
Yes	13.11(12.20-14.02)	t=84.633 (0.000**)	12.67(11.57-13.76)	t=4.112 (0.046*)	97.22(93.22-101.22)	t=4.564 (0.035*)	186.56(172.24-198.87)	t=26.956 (0.000)**
No	4.29(2.86-5.71)		13.93(13.21-14.65)		87.86(81.30-94.42)		140.57(128.69-152.46)	
Attending training courses on palliative care								
Yes	12.70(11.03-14.36)	t=24.493 (0.000**)	11.57(10.21-12.92)	t=13.952 (0.000**)	92.57(84.24-100.90)	t=0.076 (0.784)	179.17(160.72-197.63)	t=6.235 (0.014*)
No	6.09(4.65-7.53)		14.06(13.42-14.69)		91.17(85.99-96.35)		151.70(140.49-162.90)	

T-test/ANOVA; *p≤0.05 statistically significant; **p≤0.001 highly significant

Table (6): Bivariate Analysis of The Relationships Between Pediatric Nurses' Personal Characteristics, Knowledge, Practices and Attitudes After the Educational Intervention.

General characteristic	Knowledge		Practices		Attitude		Self-competence	
	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean (95%CI)	t-test/ ANOVA (p-value)	Mean(95%CI)	t-test/ ANOVA (p-value)
Age/ years								
20 -<30	16.61(16.08-17.14)	F=4.468 (0.014*)	15.94(15.61-16.28)	F=1.684 (0.192)	105.32(102.07-108.56)	F= 1.22 (0.299)	175.91(167.55-184.28)	F=0.611 (0.545)
30- <40	17.84(17.24-18.45)		15.26(14.14-16.39)		111.0(103.95-118.05)		184.26(170.28-198.25)	
40 -50	18.75(17.95-19.55)		15.0 (11.33-18.67)		106.0 (73.08-138.92)		187.25(133.93-240.57)	
Sex								
Male	16.66(15.92-17.40)	t=1.729 (0.192)	16.05(15.65-16.44)	T=2.480 (0.119)	101.68(97.46-105.90)	t=11.07 (0.001**)	160.70(151.56-169.85)	t=30.02 (0.000**)
Female	17.23(16.74-17.72)		15.50(14.94-16.06)		110.96(107.2-114.69)		194.10(185.86-202.35)	
Education								
Diploma	11.25 (7.27-15.23)	F=25.460 (0.000**)	17.50(15.91-19.09)	F=1.923 (0.132)	86.25(58.45-87.05)	F=4.039 (0.001**)	143.0(139.82-146.18)	F=4.32 (0.007*)
Technical institute	16.69(16.24-17.14)		15.66(15.18-16.13)		108.1 (104.92-111.25)		173.60(164.54-182.66)	
Bachelor of nursing	18.19(17.79-18.58)		16.63(15.09-16.17)		107.41(101.27-113.55)		194.0(182.99-205.01)	
Master	18.67(17.23-20.10)		16.67(15.23-18.10)		95.33(31.40-159.26)		169.67(103.18-236.15)	
Years of nursing experience								
1<5	16.43(15.63-17.23)	F=6.128 (0.003*)	15.79(15.29-16.28)	F=0.963 (0.503)	105.43(101.12-109.74)	F=1.755 (0.179)	174.12(162.85-185.39)	F=0.693 (0.503)
5-<10	16.88(16.38-17.38)		15.94(15.35-16.53)		109.91(106.05-113.76)		183.33(172.37-194.30)	
≥10	18.41(17.90-18.93)		15.35(14.38-16.33)		102.65(92.93-112.36)		177.94(161.37-194.51)	
Years of experience in PICU								
<1	16.50(15.79-17.21)	F=3.333 (0.040*)	15.54(15.06-16.03)	F=1.501 (0.228)	102.94(98.96-106.92)	F=16.840 (0.000**)	177.44(167.73-187.14)	F=2.431 (0.094)
1-5	17.26(16.75-17.76)		16.14(15.58-16.70)		115.06(112.0-118.12)		184.43(173.04-195.82)	
≥5	18.22(17.22-19.22)		15.44(14.11-16.78)		92.44(81.72-103.17)		157.33(134.32-180.35)	
Heard about palliative care								
Yes	17.67(17.44-17.90)	t=7.334 (0.008*)	15.17(14.53-15.80)	t=8.036 (0.006*)	113.11(110.29-115.93)	t=14.95 (0.000**)	193.89(182.61-205.17)	t=15.07 (0.000**)
No	16.50(15.82-17.18)		16.14(15.76-16.52)		102.29(98.16-106.41)		168.0(160.02-175.98)	
Attending training courses on palliative care								
Yes	17.78(17.44-18.13)	t=5.024 (0.027*)	14.83(13.95-15.70)	t=10.58 (0.002*)	109.83(104.70-114.95)	t=1.703 (0.195)	191.96(179.47-204.44)	t=5.47 (0.022*)
No	16.68(16.13-17.23)		16.07(15.73-16.42)		105.42(101.90-108.94)		173.52(165.38-181.67)	

T-test/ANOVA; *p≤0.05 statistically significant; **p≤0.001 highly significant

Table (7): Correlation Between Total Knowledge, Practice, Attitude and Self-Competence Among the Pediatric Nurses Before, After and Follow-Up the Educational Intervention.

Variables		Before intervention			After intervention			Follow-up intervention		
		Knowledge	Self-competence	Practices	Knowledge	Self-competence	Practices	Knowledge	Self-competence	Practices
Knowledge	r	-	0.316	0.420	-	0.433	0.362	-	0.335	0.269
	p- value	-	0.002*	0.000**	-	0.000**	0.000**	-	0.000**	0.009*
Attitude	r	0.035	0.736	0.216	0.359	0.469	0.048	0.322	0.479	0.016
	p- value	0.744	0.000**	0.039*	0.000**	0.000**	0.678	0.002*	0.000**	0.881
Self-competence	r	0.316	-	0.020	0.433	-	0.361	0.335	-	0.219
	p- value	0.002*	-	0.849	0.000**	-	0.000**	0.000**	-	0.036*
Practices	r	0.420	0.020	-	0.362	0.361	-	0.69	0.219	-
	p- value	0.000**	0.849	-	0.000**	0.000**	-	0.009*	0.036*	-

Pearson Correlation Coefficient, * Statistically significance p≤ 0.05, **p≤0.001 highly significant

Discussion

Palliative care holds significant importance in easing the physical and psychological distress experienced by children with critical illness. It's an integral part of comprehensive healthcare focused on the individual's needs, addressing not just physical ailments but also emotional, social, and spiritual well-being. By providing PC approach, a notable improvement in the quality of life for those facing terminal conditions can occur. The effectiveness of PC is greatly influenced by the attitudes, knowledge, and skills of nurses, not only in what know but also in how to apply that knowledge to assess and treat child (Almutairi, Alsubhi, Ghurab, Almalki, & Wazqar, 2023). So, the current study focused on determining effect of PC educational intervention on pediatric nurses' performance and self-competence in providing care for children with critical illness.

In the current study, it was found that a significant portion of pediatric nurses, specifically three-quarters, had not received any training in PC. This result confirms a deficiency in their pre-existing knowledge about PC. This finding is in agreement with results of a study by Parajuli, Hupcey, Kitko, and Birriel (2021), which also indicated that over half of the studied nurses had not undergone prior training in this area.

Diagnoses of the studied children were diverse as noted in the current study, with cancer emerging as the most frequently reported diagnosis, followed by cardiac diseases. This was in accordance with Connor and Bermedo (2014). This distribution emphasizes the pressing need for implementing specialized training programs for nurses to enhance their competency in dealing with these common conditions.

The present study highlighted a notable statistical enhancement in nurses' knowledge of PC after the educational intervention. Also, the follow-up findings showed a statistically significant enhancement in relation to before intervention data. This aligns with the findings of El-Sayad and Shaala (2021), which similarly presented a significant improvement in PC knowledge following an educational intervention in that study. Such outcomes emphasize the value of targeted educational programs in equipping pediatric nurses with the essential knowledge and comprehension required to deliver optimal care for patients facing serious illnesses.

Furthermore, Menekli et al. (2021) demonstrated a significant rise in nurses' PC knowledge following a brief educational program compared to their baseline knowledge. Similarly, Mohamed and Abdelhamed (2022) concluded that PC nursing education significantly improved the knowledge of nurses caring for chronically ill patients. These findings align with the outcomes of the present study, which demonstrates the effectiveness of the education intervention in raising knowledge concerning PC.

According to the outcomes derived from this research, over half of the pediatric nurses had incompetent

practice before the educational intervention. This can prove that the PC is a developing discipline in Egyptian health care and nursing, and there is a rising need to define its restrictions, create rules, and raise awareness of its significance, particularly for critically ill children. This finding supports the assertion presented by Altarawneh, Masa'deh, Hamaideh, Saleh, and Alhalaiqa (2023) that most of the nurses exhibited inadequate practice.

Following the educational intervention, a significant improvement was noted in the nurses' practice regarding PC when measured against pre-intervention results according to the current study. Moreover, this improvement remained significant in follow-up results. This positive change could be credited to the efficacy of the educational intervention in enhancing the nurses' knowledge, consequently leading to improvement in their practice. The sustained improvement noted in the follow-up results further underscores the enduring nature of this impact, suggesting that the skills gained were not only immediately beneficial but also retained over time. This outcome resonates with the findings of EL Sayed, Elzehiri, and Mohamady (2021).

The results of the present research revealed that prior to the educational intervention, over two thirds of pediatric nurses held a negative attitude towards PC. This finding could be linked to the pediatric nurses' limited understanding of PC due to the low related knowledge level, which is recognized as a barrier to fostering a positive attitude towards it.

This finding contrasts with those of other studies; for instance, Getie et al. (2021) noted that highest percentage of the respondents in their study exhibited a positive attitude towards PC, while Bibi, Kausar, Hussain, Kouser, and Khan (2020) found that a significant majority of nurses displayed favorable attitudes towards it. This variation may stem from differences in study settings; previous research was conducted in high-income countries where nurses potentially had greater access to PC training than those in the current study. The current study reflected a highly statistically significant enhancement in the nurses' attitudes following the educational intervention compared to before. Besides, attitude improvement remained highly significant in follow-up results. Significant improvement observed in nurses' attitudes following the educational intervention is a promising outcome of the study. It suggests that targeted educational programs can effectively influence nurses' attitude towards PC, potentially leading to more compassionate and holistic child care. This outcome aligns with the findings of Mohamed and Abdelhamed (2022) and EL Sayed et al. (2021), both of which reported similar results. This indicates a consistent pattern of positive attitude changes among nurses after educational interventions.

Addressing the self-competence of pediatric nurses, the current study indicated that over half had a low self-competence prior to intervention, but

over two-thirds had a high self-competence after intervention and in follow-up. This might be mainly because the educational sessions were executed successfully. The outcomes support the conclusions drawn by DeFusco, Lewis, and Cohn (2023), who determined that nurses who completed PC training had enhanced PC self-competence. On top of that, a variety of studies conducted by Hamre, O'Shea, Hinderer, Mosha, and Wentland (2022); Gattinger et al. (2023); and Dehghani et al. (2020) pointed out the value of PC education in enhancing nurses' self-competence.

The present study reflected a large effect size for total knowledge scores before and after the intervention. This illustrating the significant knowledge gains made through the intervention. This large effect size highlights the effectiveness of the intervention in considerably enhancing nurses' knowledge. Furthermore, the large effect size for the interval from before the intervention to the follow-up also points to a sustained and robust impact of the intervention on total knowledge indicating that the knowledge gains were not only immediate but also maintained over time.

The current study demonstrated that the effect size for total practice scores before and after the intervention was classified as large. This highlights the significant improvement in participants' practical skills immediately following the intervention. This demonstrates the program's effectiveness in enhancing the participants' ability to apply their knowledge in practice. However, the total practice effect size for the interval from before the intervention to the follow-up, categorized as medium, suggests that while the initial gains were substantial, there was a slight decline over time. This implies that continuous educational opportunities could be beneficial in ensuring the durability of these practice improvements.

Furthermore, the large effect size of both attitude and self-competency in the current study regarding before and after the intervention demonstrates a marked improvement in participants' attitude and self-competence immediately following the program. This indicates that the intervention was highly effective in boosting the nurses' attitude and self-competency. However, the effect size of both variables for the interval from before the intervention to the follow-up was classified as medium. This indicates that while there was still a significant improvement in both items, some of the positive changes diminished over time. This medium effect size underscores the need for ongoing reinforcement and support to sustain these positive attitudinal and self-competency changes.

The present study identified a significant relation between total knowledge scores of pediatric nurses and their age in only after intervention results, demonstrating that older nurses tend to possess greater knowledge. This might suggest that possibly due to their extensive clinical experience and better contextual understanding, older nurses were able to surpass younger nurses' knowledge. This finding

corresponds to results of El-Sayad and Shaala (2021), indicating a notable relation between age and the level of knowledge. This suggests that older nurses may accumulate more knowledge and expertise in PC, highlighting the importance of considering nurses' age in educational interventions and workforce planning.

The findings of this study provide intriguing insights into the dynamics of knowledge acquisition in PC among nurses. While after intervention results indicated no statistically significant relationship between nurses' knowledge and gender, the pre-intervention results revealed a significant relation between knowledge and gender, with females exhibiting higher knowledge scores. This implies that, at first, female nurses might have been more familiar with or trained in PC than their male counterparts. The absence of notable gender disparities after the intervention, however, suggests that the educational program successfully closed any early knowledge gaps between male and female nurses. This highlights the importance of such interventions in ensuring equitable knowledge enhancement across genders, reinforcing the need for inclusive and comprehensive educational strategies in the field of PC.

The analysis of our educational intervention on PC among nurses underscores the critical role of advanced education in enhancing knowledge levels. Before intervention, there was no statistically significant relationship between nurses' PC

knowledge and their educational level, suggesting homogeneous baseline knowledge across different educational backgrounds. However, the after-intervention results revealed a significant correlation between PC knowledge and educational level, with nurses holding master's degrees achieving higher knowledge scores than other qualifications. This suggests that with higher academic qualifications gained more knowledge after intervention, possibly due to their enhanced critical thinking skills and familiarity with complex concepts.

The current study is supported by results of Gedamu, Berhane, Dires, Anteneh, and Goshiye (2019), who similarly reported a significant correlation between pediatric nurses' knowledge of PC and their educational level. These findings underscore the importance of advanced education in preparing nurses with the essential knowledge and skills for delivering high-quality PC.

The present before intervention data showed that nurses with fewer years of experience possessed higher knowledge, possibly indicating more recent training or a closer connection to their initial education. After intervention, however, the data reflected a shift, with nurses boasting extensive experience showing higher knowledge scores. This could imply that experienced nurses absorbed the intervention more effectively benefiting from their practical wisdom. This finding is supported by the outcomes of EL Sayed et al. (2021), which also demonstrated a significant positive correlation between nurses'

total knowledge scores in PC and experience years. This may suggest that nurses with more extensive experience tend to possess better knowledge.

Moreover, hearing about PC was significantly associated with higher knowledge before and after intervention in the current study. This signifies that when the pediatric nurses have some background understanding of PC, their knowledge regarding PC also tends to improve correspondingly. This result complied with Hao et al. (2021) declared that PC knowledge scores were noticeably higher among nurses who were heard or employed at PC departments.

Initially, attitudes toward PC were similar regardless of the nurses' educational background as there was no significant relation between attitude and educational level before the intervention. However, after intervention results revealed a significant relationship, with technical institute graduates displaying more positive attitudes. This shift highlights the efficacy of the educational program in transforming attitudes, particularly among technical institute graduates who perhaps gained a greater appreciation for PC through the intervention. Comparable finding had been documented by Abuhammad and Almasri (2022) demonstrating a significant relationship between nurses' attitude and education.

The present results showed that females are highly statistically significantly associated with positive attitude and self-competence. This result suggests potential gender differences in how healthcare professionals perceive and approach PC. Further exploration of the underlying reasons for these differences could provide valuable insights into how to better support and empower healthcare professionals, regardless of gender, in providing compassionate and effective PC. Understanding these gender-related dynamics can ultimately contribute to improving the quality of care provided for children facing serious illnesses. This study confirmed the findings of Nguyen, Yates, and Osborne (2024) with female gender demonstrating a notable relation with PC attitudes.

The consistent finding that hearing about PC was significantly associated with a higher attitude across before and after intervention results, underscores the profound impact of awareness on nurses' perspectives. This highlights the critical role that initial exposure to PC concepts plays in shaping positive attitudes toward palliative care. This result complied with Hao et al. (2021) declared that attitude regarding PC scores were noticeably higher among nurses who had heard about PC departments.

The current study identified a statistically significant relation between nurses with a bachelor's degree and elevated levels of self-competence regarding PC in after intervention. From the researchers' point of view, it could imply that these nurses were better equipped to absorb and apply the training, possibly due to their advanced academic preparation. This finding lines up with a prior study by El Sayed et al. (2021), which

verified that a strong relationship was found between education and self-competence among participants.

Furthermore, the current findings clarified a notable influence of attending training courses about PC particularly on self-competence across before and after intervention phases. This displays the positive impact that participating in such training courses can have on enhancing nurses' self-competence in PC. Elrefaey, Eldin, Yousef, and Nageeb (2022) concluded that conducting education courses on PC, in particular, enhances nurses' self- competence.

In our investigation, we identified a statistically significant positive correlation between nurses' knowledge and self-competence across all of the intervention phases. This indicates that improving knowledge levels can potentially enhance nurses' confidence and competence in fulfilling their roles effectively. These findings resonate with the research conducted by Lin, Chen, Lu, Lin, and Huang (2021), which similarly highlighted the importance of knowledge in shaping nurses' self-competency. Additionally, Shen, Nilmanat, and Promnoi (2019) reported similar results.

In the current study, we observed a highly significant positive correlation between nurses' knowledge and practice across all of the intervention phases. This pivotal finding highlights the importance of continuous education, suggesting that a deeper understanding directly enhances clinical performance. This observation aligns with the results obtained by Mohamed and Ibrahim (2021),

identifying a highly significant positive correlation between knowledge and practice, both pre and post the educational program. Additionally, Metwaly and Hamad (2019) also reported a strong positive correlation between overall knowledge score and practice score following the program, further supporting the notion that enhanced knowledge translates to improved clinical practice.

The current post intervention results revealed a highly significant positive correlation between nurses' attitude and knowledge after the educational intervention and in follow-up results, highlighting the profound impact of educational intervention on shaping nurses' attitude and approach to child care. This finding resonates with the study conducted by El Sayed et al. (2021), which similarly identified a strong positive correlation between post-program knowledge and attitude.

The results of the current study showed a highly statistically significant positive correlation between nurses' attitude and self-competence across all of the intervention phases. This finding emphasizes the substantial influence that educational interventions have, not solely on knowledge acquisitions but also on the development of their confidence and proficiency in delivering patient care. Similar findings of Dehghani et al. (2020) verified a strong correlation between total attitude scores and nurse's self-competence.

In conclusion, the results of this research offer strong evidence indicating the positive impact of

educational interventions on various aspects of nurses' proficiency in PC. The statistically significant increase observed in the nurses' knowledge, practice, attitude, and self-competence following the educational intervention and in follow-up results reveals the effectiveness of targeted educational programs in enhancing PC delivery. These improvements are indicative of the transformative potential of ongoing education and training programs of equipping nurses with required skills, knowledge, and attitudes to provide comprehensive and compassionate care for children with life-limiting illnesses.

Conclusion:

Based on the study findings, the education intervention had an effective influence on nurses' performance in terms of knowledge, practice, and attitude, as well as their self-competence in palliative care. As a consequence, the study aim was accomplished, and the research hypotheses were confirmed.

Recommendations:

- On-going application of specialized training programs in PC to enrich pediatric nurses' performance and self-competence.
- Nurses should be trained to provide effective communication strategies to facilitate discussions with children and families about prognosis, treatment options, and end-of-life preferences.
- Subjects such as pain management, symptom control, ethical decision-making, communication skills, and end-of-life care should be included

in pediatric nursing courses in the pediatric nursing syllabus.

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