

Pediatric Oncology Nurses' Knowledge and Practices toward Total Implantable Port-A-Cath

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Abstract

Background Chemotherapy remains a cornerstone in the management of pediatric oncology patients. For many children, implantable port-a-Cath provides a safe and reliable route for repeated drug administration. **Aim:** To assess pediatric oncology nurses' knowledge and practices toward Total Implantable Port-A-Cath. **Design:** A descriptive research design was employed in this study. **Sample:** A convenient sample of (30) nurses who were working at the pediatric oncology department and pediatric oncology intensive care unit in the South Egypt Cancer Institute at Assiut University was included. **Tools:** Three tools were utilized, which included oncology nurses' personal characteristics form, oncology nurses' knowledge structured interview questionnaire, and observational checklist for Port-A-Cath care. **Results:** the majority of nurses (83.3%) had fair knowledge and (76.7%) had fair practices; a statistically significant positive correlation was found between knowledge and practices of the nurses toward total implantable Port-A-Cath. **Conclusion:** the study highlighted deficiencies in nurses' knowledge and practices regarding implantable port-a-Cath care, particularly in relation to infection control measures. **Recommendation:** Ongoing educational programs, regular training workshops, and strict supervision are recommended to improve nurses' knowledge and practices.

Keywords: Chemotherapy, Knowledge, Port-A-Cath & Practices.

Introduction

Pediatric cancer refers to malignancies that develop in children from birth up to 14 or 19 years of age. It has profound medical, psychological, and economic impacts on affected children and their families worldwide (Sirirungreung, 2023). The incidence of pediatric cancer continues to rise globally over time, despite significant advances in treatment and cure rates. More than 400,000 children and adolescents under 20 years are diagnosed with cancer annually. In most high-income countries, survival rates reach approximately 80%, whereas in low- and middle-income countries they remain below 30% (Banchi et al., 2022).

Cancer ranks as the second leading cause of death among children, after cardiovascular diseases in both high- and low-income countries. The GLOBOCAN 2020 database indicates that leukemia is the most prevalent childhood cancer globally among children ages 0 to 19, followed by brain and central nervous system tumors, kidney tumors, Non-Hodgkin's lymphoma (NHL), and Hodgkin's lymphoma (HL) (Lejman et al., 2022).

Multiple therapeutic modalities are available for pediatric cancer, including surgery, immunotherapy, radiotherapy, and chemotherapy (Bo et al., 2023). Chemotherapy remains the most commonly used method; it employs cytotoxic agents to destroy

malignant cells and inhibit their growth and spread. It may be administered alone or in combination with surgery or radiotherapy, either before surgery to shrink the tumor or afterward to eliminate any residual malignant cells (Mohamed et al., 2023).

Chemotherapy can be administered through various routes; the most commonly utilized route is the intravenous (IV) administration (Ancona-Lezama et al., 2020). Since the introduction of chemotherapy, much focus has been placed on developing a good venous access method that can be used for an extended period (Ghoddusi Johari et al., 2022). Many methods, including central and peripheral devices, are available for IV access. In children, peripheral devices are not the best option for long-term drug administration because of their short patency time and high first-attempt failure rate (Sanchez & Campbell, 2024).

One of the most effective long-term venous access devices is the Port-A-Cath (Escamilla, 2022). This implanted port allows repeated chemotherapy administration safely and effectively and is considered one of the most frequently used invasive procedures in pediatric oncology (Sekmen & Karaca, 2023). It offers several advantages, including comfort, minimal interference with daily activities, reduced risk of infection, and the need only monthly maintenance (AVCI et al., 2022).

However improper use and poor care of implanted ports may lead to serious complications such as bacterial infections, lumen blockage, venous thrombosis, and malfunction. To avoid these issues, nurses must be well trained and adhere to best practices when managing implanted ports (**Ocasio, 2020**). Therefore, nurses play a critical role in Port-A-Cath care which requires adequate knowledge, technical competence, and adherence to evidence-based guidelines (**Ocasio, 2020**) & (**Li et al., 2022**). Despite the widespread use of Port-A-Cath in pediatric oncology, previous studies have reported variations and deficiencies in nurses' knowledge and practices regarding port care which may contribute to complications such as catheter-related bloodstream infections (CLABSIs) and device malfunction (**Strehó, V. (2024)**). Assessing nurses' current knowledge and practices is therefore essential to identify existing gaps and guide future educational initiatives aimed at enhancing patient safety and care quality.

Significance of the study

Globally, cancer continues to pose a significant public health challenge, with nearly 20 million newly diagnosed cases and about 10 million related deaths reported in 2022. Childhood malignancies account for approximately 280,000 cases annually among individuals aged 0–19 years. Around 90% of these cases occur in low- and middle-income nations, where access to effective treatment is often restricted or unaffordable (**de Lima et al., 2023**).

Egypt, classified as a lower middle-income country, ranks second in the estimated number of incident childhood cancer cases worldwide (**Soliman et al., 2023**). According to GLOBOCAN 2020, the incidence rate of childhood cancer in Egypt was 12.1 per 100,000 children, with a total of 4,181 cases reported (**Soliman et al., 2024**). Moreover, records from the South Egypt Cancer Institute at Assiut University revealed 131 new pediatric cancer cases in 2018 alone.

A Port-A-Cath, or implanted port, is a venous access device used for patients needing frequent or continuous chemotherapy. It's an invasive procedure and one of the most common medical procedures performed in oncological patients (**Sekmen & Karaca, 2023**). Nurses play a pivotal role in ensuring proper management, reducing complications, and improving patient outcomes. Therefore, assessing nurses' knowledge and practices regarding Port-a-Cath care is essential to identify gaps, guide training programs, and ultimately enhance the quality of pediatric oncology nursing care.

Aim of the Study:

The aim of this study was to:

Assess Pediatric Oncology Nurses' Knowledge and Practices towards Total Implantable Port-A-Cath.

Theoretical definition

A Port-A-Cath is an implantable venous access device that allows repeated and safe entry into the central circulation. It consists of a small chamber (port) attached to a flexible catheter, which is surgically inserted into a subcutaneous pocket on the chest or upper arm. The catheter tip is advanced into a central vein, typically leading to the right atrium, enabling convenient and long-term administration of chemotherapeutic agents for pediatric patients with leukemia (**Galal et al., 2024**) & (**Mohamed et al., 2023**) (**Ezgu et al., 2019**).

Research questions:

1. What is the pediatric oncology nurses' knowledge level regarding total implanted Port-A-Cath care for patients undergoing chemotherapy?
2. What are the nurses' practices level regarding total implanted Port-A-Cath care for patients undergoing chemotherapy?
3. What is the relation between the knowledge and practices regarding implanted Port-A-Cath care for patients undergoing chemotherapy?

Subjects and Method:

Research design:

A descriptive research design was employed in this study to fulfill the aim of the study.

Setting:

This study was conducted in pediatric oncology department and pediatric oncology intensive care unit of the South Egypt Cancer Institute, Assiut University. The institute includes two buildings: the private building and the free building. The free building has three floors, where the pediatric oncology department and the pediatric oncology intensive care unit are located on the third floor. The pediatric oncology department consists of four rooms for pediatric patients (each room contains 8 beds). The pediatric oncology intensive care unit consists of an immunity room for children with neutropenia (containing 4 beds), an intermediate care room with 4 beds, and an isolation room containing 2 beds.

Subjects:

A convenient sample of (30) nurses who were working at the pediatric oncology department and pediatric oncology intensive care unit in the South Egypt Cancer Institute at Assiut University was included in this study.

Inclusion criteria:

The study included nurses who met the following criteria: those aged between 25 and 59 years, currently employed in the previously described study

settings, and who voluntarily consented to participate in the research.

Tools of data collection:

Three tools were used to achieve the study purpose as follows:

Tool (I): "Oncology Nurses' Personal Characteristics"

This tool was designed by a researcher to collect personal characteristics of the studied nurses. It included age, sex, marital status, level of education, department, years of experience in the oncology unit, average number of patients cared for per shift, as well as attendance at pre- or in-service training programs related to implanted Port-A-Catheter care for patients undergoing chemotherapy.

Tool (II): "Oncology Nurses' Knowledge Structured Interview Questionnaire"

This questionnaire was adapted from (Mohamed et al., 2023). It was aimed at assessing nurses' knowledge regarding implanted Port-A-Catheter care for patients undergoing chemotherapy. It included thirty-two multiple-choice questions, covering the following:

- **Eight questions** related to "General Nurses' knowledge about implanted port -A- Catheter".
- **Eleven questions** about "Catheter connection and disconnection nursing care".
- **Three questions** concerning "Catheter exit site care".
- **One question** regarding "Port-A-Catheter removal".
- **One question** about "patient documentation".
- **Eight questions** related to "Port-A-Catheter infection and complications".

Tool (II): Scoring System

Each "correct" answer was given "one" score, while "incorrect" or "don't know" answers received "zero." Thus, the total scores were "32" grades. The total nurses' knowledge score for all questions was calculated according to the following percentages: Less than 60% was considered "poor knowledge." From 60% to less than 75% was considered "Fair knowledge" 75% and more reflected "Good knowledge" (Mohamed et al., 2023).

Tool (III): "Oncology Nurses' Practices regarding Implanted Port-A-Catheter Care for Patients undergoing Chemotherapy Observational Checklist."

This tool was adapted from (Mohamed et al., 2023). It consisted of fifty-six items of nursing practices which were utilized to assess oncology nurses' practices concerning implanted Port-A-Catheter care for patients undergoing chemotherapy.

The tool included three parts as follows:

1. Nursing care for administration of chemotherapy through implanted Port-A-Catheter.
2. Nursing care for Port-A-Catheter disconnection/ de-accessing.
3. Nursing care for Port-A-Catheter exit site.

Tool (III): Scoring System

Each item was checked as "Done correctly" received "one" score, while "Not done" or "Incorrectly done" received "zero" thus the total scores were "56" grades. The total nurses' practices score was calculated as follows: Less than 60% was considered "Poor practices level" From 60% to 75% reflected "Fair practices level." More than 75% represented "Good practices level" (Mohamed et al., 2023).

Validity and reliability

Tool I was not tested for reliability as it included only demographic data. Tools II and III were tested for reliability using Cronbach's Alpha, which demonstrated good internal consistency ($\alpha = 0.725$ and 0.815 , respectively). All tools were reviewed by a panel of five pediatric nursing experts to ensure content and face validity, with a validity index ranging between 0.95 and 0.96 .

Procedures:

The research was planned to be done in three stages. lasted 9 months, starting in September 2024 and concluding in May 2025."

The study proceeded through three main phases:

Preparation phase

In this phase, the researcher reviewed literature and previous studies regarding Port-A-Catheter then they began to prepare research proposal, highlights, prepare and translate the study tools into Arabic, and then offer the study tools to a panel of five pediatric nursing experts who evaluated the tools for face validity, including clarity, simplicity, length, design, and general appearance. The committee suggested a few adjustments to improve the clarity and precision of the collected data. After that took the acceptance of the Ethical Committee of the Faculty of Nursing on the research proposal. Furthermore, formal approval was obtained from the director of the pediatric oncology department and pediatric oncology intensive care unit of the South Egypt Cancer Institute to gather the required data for the study from the nurses working in the pediatric oncology department and pediatric oncology intensive care unit. Finally, **A pilot study** was carried out on 10% of the sample (4 nurses) to evaluate the clarity, feasibility, and applicability of the data collection tools and to estimate the time required for completion. Findings from the pilot study indicated that no major modifications were necessary, and the pilot participants were included in the main study sample.

Implementation phase

This phase was carried out over eight months, starting at the beginning of October 2024 and concluding at the end of May 2025. In this phase the researcher conducted interviews with the studied nurses three times a week, considering their available time during the morning, evening, and afternoon shifts. To fill out

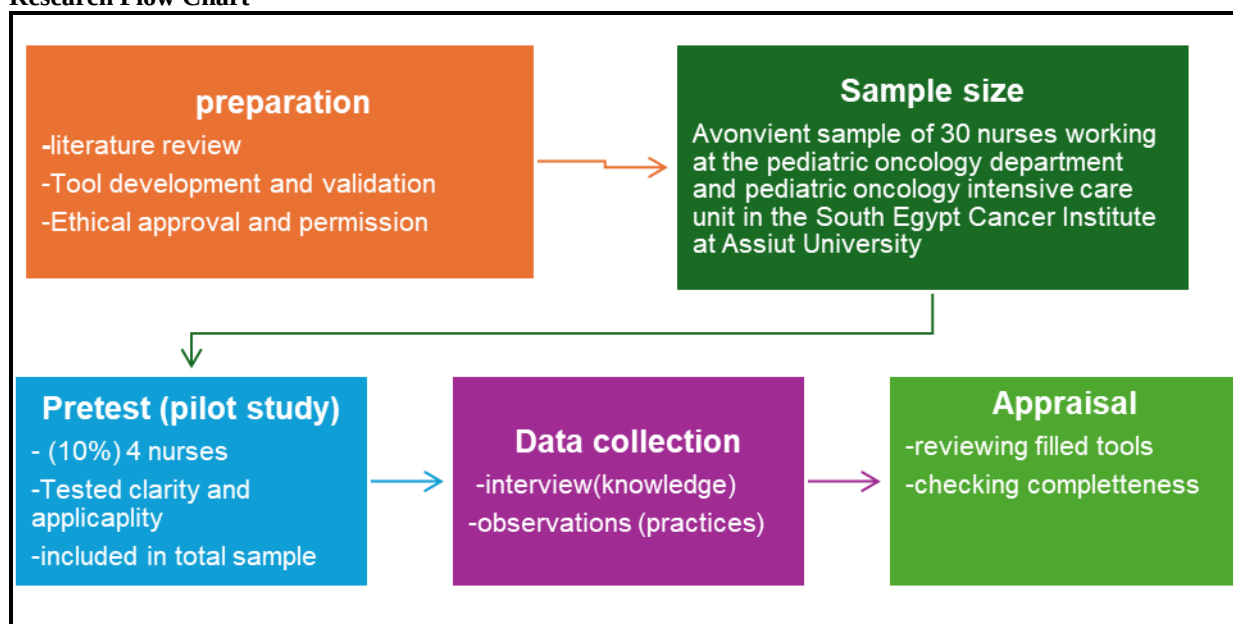
the knowledge questionnaire form five to six nurses were interviewed per day individually after a detailed explanation of the study's objectives and procedures, and the time required for each interview ranged from 30 to 40 minutes depending on the response of the participating nurses. Moreover, for this study, each nurse was individually observed twice through non-participatory observation while performing Port-A-Cath care, including connection and disconnection during chemotherapy administration and exit-site maintenance. One to two nurses were observed per day. The time required for observation of nursing care

for the administration of chemotherapy through implanted Port-A-Catheters ranged from 20 to 30 minutes, while the time required for observation of nursing care related to Port-A-Cath disconnection, de-accessing, and exit-site management ranged from 10 to 15 minutes.

Appraisal Phase

This phase was done after data collection; the researcher checked the filled tools to ensure that all questions were answered and there were no missed questions.

Research Flow Chart



Ethical considerations:

1. Research proposal was approved by the Ethical Committee in the Faculty of Nursing (IRB: 1120240916).
2. There was no risk for nurses during application of research.
3. The study followed common ethical principles in clinical research.
4. Written consent was obtained from nurses that participated in the study, after explaining the nature and purpose of the study.
5. The researcher assured the nurses that their anonymity and confidentiality would be maintained.
6. The pediatric nurses were informed that they had the option to participate in the study or not and that they could withdraw from the study at any point without providing any reasons.
7. The researcher assured the nurses that their data would only be used for research purposes and their privacy would be maintained.

Statistical analysis

Statistical analysis was conducted after verifying the data distribution and variance homogeneity. The normality of data was assessed using the Anderson–Darling test, and the equality of variances was confirmed before applying further tests. Categorical data were expressed as frequency and percentage (N, %), while continuous data were presented as mean and standard deviation (mean $\pm$ SD). Comparisons between categorical variables were carried out using the Chi-square or Fisher's exact test when appropriate. The Pearson correlation test was applied to determine the relationship between different scores. A p-value of less than 0.05 (two-tailed) was considered statistically significant. All statistical analyses were performed using IBM SPSS software, version 20.0.

Results

Table (1): Frequency and percentage distribution of “Pediatric Oncology Nurses related to their personal Characteristics (n=30)

Personal characteristics	No	%
Sex		
Male	3	10.0
Female	27	90.0
Age in years		
20<30	18	60.0
30<40	11	36.7
40<50	1	3.3
Mean ±SD (range)	29.14±5.84(20-46)	
Marital status		
Single	8	26.7
Married	21	70.0
Divorced	1	3.3
Level of education		
Diploma degree	5	16.7
Technical nurse	25	83.3
Department		
Inpatient unit	15	50.0
ICU	15	50.0
Years of experience in an oncology unit		
<5	10	33.3
5<10	9	30.0
10 or more	11	36.7
Mean ±SD (range)	7.27±3.98(1-15)	
Average patient caring per shift		
1-4	2	6.7
5 or more	28	93.3
Previous attendance of training program(s) related to implanted Port-A-Catheter care among patients undergoing chemotherapy		
Yes	15	50.0
No	15	50.0
If yes, when was the training program(s) taken?		
In-service (during the work)	15	100.0

Table (2): Mean ±SD scores of pediatric oncology Nurses' knowledge subdomains regarding implanted Port-A-Cath care for patients undergoing chemotherapy (n=30)

	Max Score	Mean±SD	Range	Mean%
1. General knowledge about implanted port -A Cath	8	5.07±1.36	3-8	63.3
2. Knowledge about nursing care of Port-A-Cath connection and disconnection	11	5.73±1.7	3-9	52.1
3. Knowledge about Port-A-Cath exit site care	3	1.33±0.88	0-3	44.4
4. Knowledge about Port-A-Cath removal	1	0.63±0.49	0-1	63.3
5. Knowledge about patient documentation	1	0.93±0.25	0-1	93.3
6. Knowledge related to Port-A-Cath infection and complications.	8	4.73±1.41	1-7	59.2
Total knowledge score	32	18.43±3.17	9-24	57.6

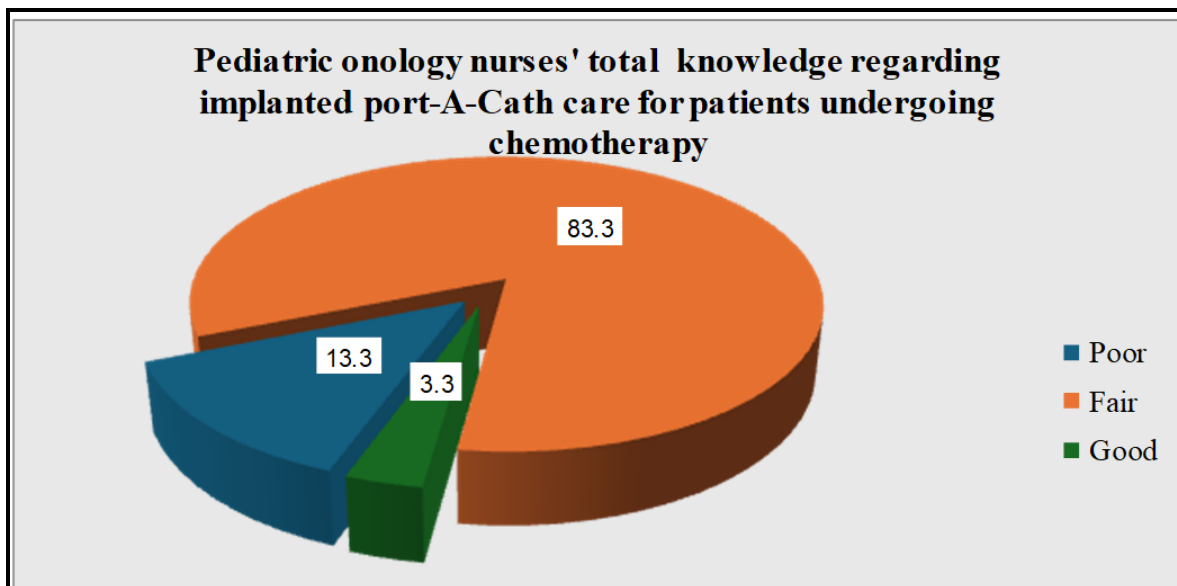


Figure (1): Distribution of pediatric oncology nurses' total knowledge regarding implanted Port-A-Cath care (n=30)

Table (3): Mean $\pm$ SD scores of pediatric oncology Nurses' Practices regarding implanted Port-A-Cath care for patients undergoing chemotherapy (n=30)

	Max Score	Mean $\pm$ SD	Range	Mean%	Level
1.Nursing care for Administration of chemotherapy through implanted Port-A-Cath	20	11.23 $\pm$ 2.08	7-15	56.2	Fair
2.Nursing care for Port-A-Cath disconnection de-accessing	16	9.73 $\pm$ 2.27	5-13	60.8	Fair
3.Nursing care for Port-A-Cath exit site	20	10.63 $\pm$ 1.71	6-13	53.2	Fair
Total practice score	56	31.6$\pm$5.2	19-41	56.4	Fair

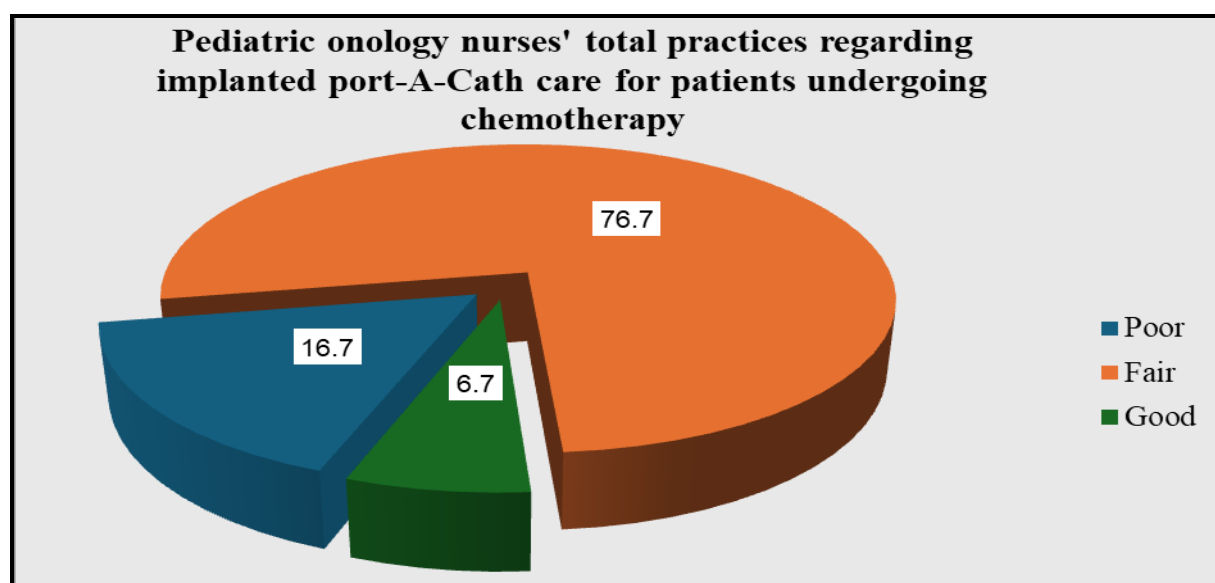
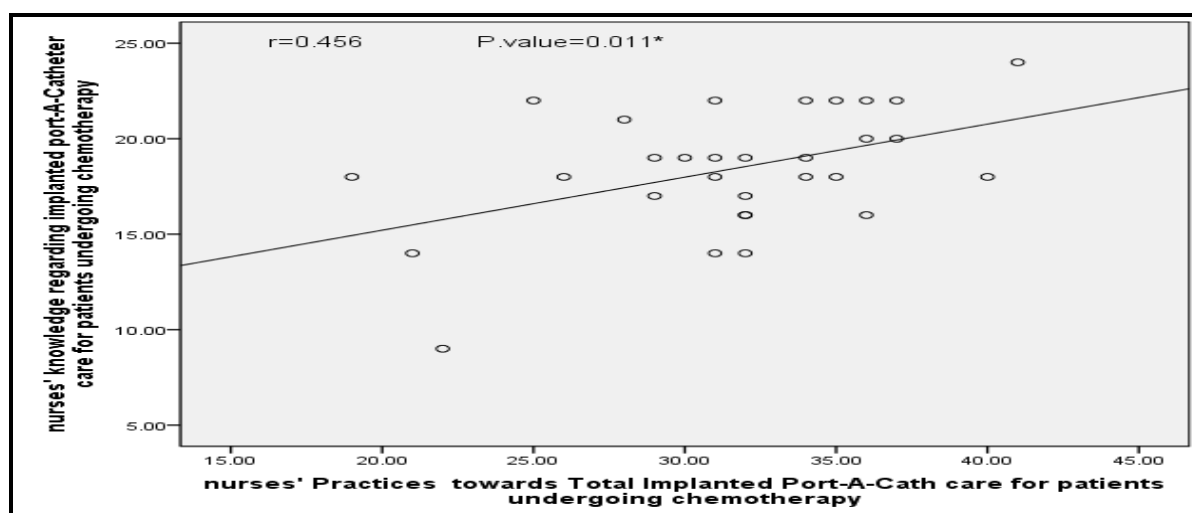


Figure (2): Distribution of pediatric oncology nurses' total practices level regarding implanted Port-A-Cath care (n=30)



* Statistically significant positive correlation

Figure (3): Relationship between nurses' knowledge and nurses' practices toward Total Implanted Port-A-Cath care for patients undergoing chemotherapy

Table (4): Relationship between pediatric oncology nurses' knowledge regarding implanted port-A-Cath care for patients undergoing chemotherapy and their personal data (n=30)

	Nurses' knowledge regarding implanted port-A-Catheter care for patients undergoing chemotherapy							
	Poor (n=4)		Fair (n=25)		Good (n=1)		X2	P. value
	No	%	No	%	No	%		
Sex								
Male	0	0.0	3	12.0	0	0.0	0.67	0.717
Female	4	100.0	22	88.0	1	100.0		
Age in years								
20<30	1	25.0	16	64.0	1	100.0	8.21	0.084
30<40	2	50.0	9	36.0	0	0.0		
40<50	1	25.0	0	0.0	0	0.0		
Marital status								
Single	1	25.0	7	28.0	0	0.0	0.65	0.958
Married	3	75.0	17	68.0	1	100.0		
Divorced	0	0.0	1	4.0	0	0.0		
Level of education								
Diploma degree	2	50.0	3	12.0	0	0.0	3.79	0.150
Technical nurse	2	50.0	22	88.0	1	100.0		
Department								
Inpatient unit	2	50.0	13	52.0	0	0.0	1.04	0.595
ICU	2	50.0	12	48.0	1	100.0		
Years of experience in an oncology unit								
<5	1	25.0	9	36.0	0	0.0	6.75	0.244
5<10	0	0.0	8	32.0	1	100.0		
10 or more	3	75.0	8	32.0	0	0.0		
Average patient caring per shift								
1-4	0	0.0	2	8.0	0	0.0	0.43	0.807
5 or more	4	100.0	23	92.0	1	100.0		
Previous attendance of training program(s)								
Yes	3	75.0	12	48.0	0	0.0	2.04	0.361
No	1	25.0	13	52.0	1	100.0		

Table (5): Relationship between pediatric oncology nurses' practices regarding implanted port-A-Cath care for patients undergoing chemotherapy and their personal data (n=30)

	Nurses' practices towards Total Implanted Port-A-Cath care for patients undergoing chemotherapy						X2	P. value
	Poor (n=5)		Fair (n=23)		Good (n=2)			
	No	%	No	%	No	%		
Sex								
Male	0	0.0	3	13.0	0	0.0	1.01	0.602
Female	5	100.0	20	87.0	2	100.0		
Age in years								
20<30	1	20.0	15	65.2	2	100.0	5.81	0.214
30<40	4	80.0	7	30.4	0	0.0		
40<50	0	0.0	1	4.3	0	0.0		
Marital status								
Single	1	20.0	7	30.4	0	0.0	1.45	0.836
Married	4	80.0	15	65.2	2	100.0		
Divorced	0	0.0	1	4.3	0	0.0		
Level of education								
Diploma degree	1	20.0	4	17.4	0	0.0	0.45	0.799
Technical nurse	4	80.0	19	82.6	2	100.0		
Department								
Inpatient unit	4	80.0	10	43.5	1	50.0	2.19	0.334
ICU	1	20.0	13	56.5	1	50.0		
Years of experience in an oncology unit								
<5	1	20.0	9	39.1	0	0.0	6.57	0.363
5<10	1	20.0	6	26.1	2	100.0		
>10	3	60.0	8	34.8	0	0.0		
Average patient caring per shift								
1-4	0	0.0	2	8.7	0	0.0	0.65	0.722
5 or more	5	100.0	21	91.3	2	100.0		
Previous attendance of training program(s)								
Yes	5	100.0	9	39.1	1	50.0	6.09	0.048*
No	0	0.0	14	60.9	1	50.0		

* Statistically significant difference

Table (1): Shows the distribution of the studied nurses according to their personal data. The majority were females (90%) and married (70%), with 60% aged between 20 and 30 years. Most nurses (83.8%) graduated from a technical nursing institute, while only (16.7%) held a diploma degree. Regarding experience, (36.7%) had more than ten years in the nursing field. Nearly all nurses (93.3%) cared for five or more patients per shift. Additionally, half of the participants had not received any training on caring for patients with an implanted Port-A-Cath undergoing chemotherapy.

Table (2): Shows Mean $\pm$ SD of the subdomains of nurses' knowledge regarding implanted Port-A-Cath care. The highest mean percentage was related to knowledge about patient documentation (93.3%; Mean $\pm$ SD = 0.93 $\pm$ 0.25), whereas the lowest was related to knowledge about Port-A-Cath exit site care

(44.4%; Mean $\pm$ SD = 1.33 $\pm$ 0.88). The total knowledge score was (57.6%; Mean $\pm$ SD = 18.43 $\pm$ 3.17).

Figure (1): Shows level of nurses' knowledge about implanted port-A-catheter care for patients undergoing chemotherapy. (83.3%) of nurses had fair knowledge, while 13.3% of them had poor knowledge and only 3.3% of them had good knowledge.

Table (3): Shows Mean $\pm$ SD of nurses' practices related to implanted Port-A-Cath care for patients undergoing chemotherapy. The highest mean percentage was related to nursing care for Port-A-Cath disconnection (60.8%; Mean $\pm$ SD = 9.73 $\pm$ 2.27). Whereas the lowest was related to nursing care for Port-A-Cath exit site (53.2%; Mean $\pm$ SD = 10.63 $\pm$ 1.71). The total practice score was (56.4%; Mean $\pm$ SD = 31.6 $\pm$ 5.2).

Figure (2): Demonstrated the total nurses' practices toward Total Implanted Port-A-Cath care for patients undergoing chemotherapy. It was found that (76.7%) of nurses had fair practices, (16.7%) had poor practices and only (6.7%) exhibited good levels of practice.

Figure (3): Illustrates that there is a statistically significant positive correlation: hypothetical data for the relationship between nurses' knowledge and practices regarding implanted port-A-Cath care for patients undergoing chemotherapy ($r = 0.465^*$) (P. Value = 0.011*)

Table (4): Illustrates that no statistically significant relationship was found between nurses' knowledge about implanted Port-A-Cath care for chemotherapy patients and their personal data.

Table (5): Illustrates that no statistically significant relationship was identified between nurses' practices related to implanted Port-A-Cath care for patients receiving chemotherapy and most of their personal data. Nevertheless, a statistically significant association was detected with previous participation in training programs (P-value = 0.048*).

Discussion

A Port-A-Cath is an implanted central venous access device that provides long-term vascular access for pediatric patients requiring extended intravenous treatment (Tom et al., 2022). The care and maintenance of such devices demand consistent vigilance to preserve catheter patency and avoid complications, and they should be performed exclusively by competent and well-trained chemotherapy nurses (Li et al., 2021). Oncology nurses have a crucial role in the management of patients with port catheters. They are responsible for carrying out interventions safely, early detecting and preventing complications, and educating patients and their families about proper port catheter care (Rady Sobh et al., 2023). So, the current study aimed to assess pediatric oncology nurses' knowledge and practices toward Total Implantable Port-A-Cath.

Regarding the relationship between nurses' knowledge of implanted Port-A-Cath care for patients receiving chemotherapy and their personal data, the findings of the present study indicated no statistically significant differences across variables such as age, gender, marital status, educational level, department, years of experience, average number of patients per shift, or attendance at pre-service or in-service training programs related to Port-A-Cath care.

This finding aligns with the results of Abd El-fadel et al., (2022) who demonstrated that nurses' knowledge levels concerning vascular access devices (VADs) were not influenced by variables such as age,

gender, qualification, years of experience, or attendance at relevant training programs. In the same context, Khudair & Khadur (2021) highlighted that nurses' knowledge scores after training showed no observable variation in relation to their demographic factors. Their study confirmed that variables such as age, gender, level of education, total years of nursing experience, and specific experience at Al-Nasiriyah Cardiac Center had no measurable impact on nurses' knowledge regarding vascular access care.

Concerning the relationship between nurses' practices regarding implanted port-A-Cath care for patients undergoing chemotherapy and their personal data, the current study revealed that there was no statistically significant association with most of the personal data, such as age, sex, marital status, level of education, department, years of experience, and average number of patients cared for per shift. However, a significant association was found with previous attendance of training programs, as nurses who had received prior training demonstrated better practice compared to those without such training.

This finding is partially consistent with Zakaria et al., (2022) who reported that there is no significant association between nurses' practice mean scores and their sex, educational level, or years of experience. However, unlike the current study, their results demonstrated a statistically significant relationship between practice and both age and working department. In line with the present study, they also confirmed that previous attendance of training workshops had a significant positive impact on practice scores, emphasizing the crucial role of continuous education in improving nursing performance.

From a researcher's perspective, oncology nursing requires specialized skills, especially when it comes to managing complex procedures like implanted port care in vulnerable groups like pediatric patients. Without regular and comprehensive training, nurses may not have the hands-on experience necessary to perform these tasks safely and efficiently. This finding highlights the critical role of structure training in enhancing the quality of nursing practice.

As regard as the nurse's overall knowledge about Port-a-Cath care for patients undergoing chemotherapy, the current study revealed that most nurses demonstrated fair level of knowledge while smaller proportion had good knowledge and a few showed poor knowledge. Although a considerable proportion of nurses demonstrated fair knowledge, this level remains inadequate, particularly because they care for a highly vulnerable group (children with cancer). These findings align with those of Mohamed et al., (2023) who reported in their study about "Assessment of Nurses' Knowledge and Practice

Regarding Implanted Port-A-Catheter Care for Patients Undergoing Chemotherapy" that more than half of the studied nurses had a fair overall knowledge level. And **Hammam et al., (2024)** found that more than three-quarters of the studied nurses had average knowledge about preventing vascular access complications among children.

Moreover, the present findings are also aligned with **Rady Sobh et al., (2023)** who reported that the preliminary assessment of the studied nurses' level of knowledge of port-Cath care before applying simulation-based training indicated that nearly three-quarters of nurses had unsatisfactory pre-training knowledge regarding the definition, indications, advantages, precautions, and complications of Port-A-Cath.

In contrast, the findings of the current study were inconsistent with those of **Khalil et al. (2017)** in their study "Oncology Critical Care Nurse's Knowledge about Insertion, Care and Complications of Venous Port Catheters in Egypt," conducted at Children's Cancer Hospital Egypt (57357). The authors reported that most nurses had a satisfactory level of knowledge regarding port-a-Cath care; however, this level was considered inadequate, as many participants had previously attended training programs. This interpretation suggests that the reported "satisfactory" level may not necessarily indicate an optimal level of knowledge but rather reflect limitations in knowledge retention or the effectiveness of training interventions.

Possible explanations for the low knowledge level in the current study may be related to the limited access to formal training programs, as only about half of the nurses reported receiving training on Port-a-Cath care; the predominance of a young nursing workforce with limited clinical experience; and workload pressure, as the majority of participants reported caring for more than five patients per shift. These high patient loads can limit the time available for nurses to update their knowledge, attend training sessions, and consistently apply best practices. It may also be related to the fact that education about implantable port catheter care does not exist in the curricula of all undergraduate nursing programs in Egypt.

From the researcher's perspective Such insufficient knowledge may have serious implications for patient safety and the quality of care. These findings highlight the urgent need for structured, evidence-based training programs, especially considering that only about half of the participants had previously received training on Port-a-Catheter care.

In relation to overall nurses' practices level regarding implanted Port-A-Cath care for patients undergoing chemotherapy, the current study revealed

that most nurses had fair practices levels, while a very small proportion of them had good practices, and a minority had poor practices.

The subdomain analysis revealed that the lowest percentage of items that have been performed correctly was observed in relation to essential infection control measures such as hand washing and disinfecting the needle-free device before syringe reattachment during chemotherapy administration, as well as hand hygiene and cleaning the injection cap with an alcohol swab during de-accessing. Similarly, in port-a-Cath exit site care, several critical steps were completely neglected, including hand washing, removing gloves, performing hand hygiene, wearing sterile gloves and a mask, and labeling the dressing with the date, time, and nurse signature.

Based on the researcher's analysis, it appears that the lowest practices scores were mainly related to basic, routine infection control measures rather than technically complex steps. And these may be related to several factors, such as heavy workload, shortage of nursing staff in relation to the number of patients, lack of supplies, and nurses' limited awareness of the critical role of infection control measures. Another possible reason is the misconception among some nurses that wearing gloves can substitute proper hand hygiene. Moreover, the absence of sinks inside patients' rooms, with sinks being located only in the nursing room away from the bedside, further hinders nurses from performing hand hygiene consistently between patients and before each nursing procedure.

These deficiencies are alarming, as neglecting infection control practices can significantly increase the risk of port-related infections and hinder patient safety. Therefore, it is strongly recommended to provide continuous training programs focusing on infection prevention measures, ensure availability of necessary supplies, improve infrastructure, such as installing sinks within patient care areas, and improve staffing ratios to allow nurses to follow standard precautions properly. Moreover, reinforcing a culture of patient safety and implementing regular supervision may help in minimizing these errors and enhancing the overall quality of care.

These findings align with those of **Galal et al., (2024)**, who reported in their study that the first assessment of the studied nurse's level of performance regarding port-Cath care before applying evidence-based guidelines indicated an incompetent level of practice pre the evidence-based guidelines sessions of training regarding port-a-Cath care. In the same context, **Elsayed et al. (2019)** found that the majority of nurses demonstrated an unsatisfactory level of practice when providing care for patients with implanted ports receiving chemotherapy.

In contrast a study done by **Abd El-fadel et al.,**

(2022) titled “Nurses’ Knowledge and Practices Regarding Care of Children Undergoing Vascular Access and its Related Complications” revealed that the majority of the studied nurses had competent practices towards caring for children undergoing VAD. Likewise, **Saltah & Abusaad (2021)** reported that 53.3% of nurses achieved a competent level of practice regarding peripherally inserted central catheter care in neonatal intensive care units.

Possible explanations for the predominance of the fair level in the current study may be attributed to several interrelated factors. A heavy workload and time constraints, as reported by 93.3% of participants who cared for more than five patients per shift, may have pressured nurses to omit certain procedural steps. Moreover, the predominance of a young nursing workforce with limited clinical experience, coupled with low knowledge levels and restricted access to formal training programs, could negatively influence practice quality. And limited availability of necessary supplies and equipment may have further hindered the consistent application of best practices.

From the researcher’s perspective, these findings highlight a potential risk for port-A-Cath-related complications, such as infection, catheter occlusion, or device malfunction. Fair or inconsistent practice levels can compromise the sterility of the device and ultimately affect treatment outcomes, particularly in pediatric oncology patients who are highly vulnerable to infections. Ensuring high-quality, standardized practice is therefore critical to maintaining device integrity, reducing morbidity, and improving overall quality of care.

According the correlation between nurses’ overall knowledge and overall practices, the findings of the current study revealed a statistically significant positive relationship between nurses’ knowledge about implanted port-a-cath care and their corresponding practices. This result is consistent with that of **Moustafa et al. (2024)**, who also reported a significant positive correlation between the total mean scores of nurses’ knowledge and practice related to central venous catheter care. Conversely, **Zakaria et al. (2022)** found no statistically significant association between nurses’ knowledge levels and their practice mean scores.

From the researcher’s perspective, the observed correlation may be explained by the fact that nurses who are well-informed about port-a-Cath management are more likely to understand the rationale behind each procedural step, adhere to evidence-based guidelines, and perform tasks with greater confidence and precision. These findings highlight the need for ongoing training programs to strengthen both knowledge and skills, thereby improving the quality of care and patient safety.

Conclusion:

Based on the results it can be concluded that the majority of pediatric oncology nurses had only fair levels of knowledge and practice regarding Port-A-Cath care, with very few demonstrating good performance. Critical gaps were particularly noted in basic infection control measures, which may place children at higher risk of complications. Despite the predominance of a young, motivated nursing workforce, limited clinical experience, insufficient formal training, and high workloads were major contributing factors to these deficiencies. A notable positive association between nurses’ knowledge and their clinical practices highlights the importance of strengthening educational and training programs to ensure safe and effective care.

Recommendations:

1. Regular programs should be implemented for oncology nurses about Port-A-Cath care, with emphasis on infection control to enhance and refresh nurses’ understanding and clinical performance related to implanted Port-A-Cath management.
2. Central venous access and Port-A-Cath care should be integrated into nursing curricula and continuing education programs. Ensure adequate staffing and workload distribution to allow proper adherence to standard nursing practices.
3. Workload should be distributed between staff members to allow proper adherence to standard nursing practices.
4. Future studies are recommended to assess the impact of well-organized instructional and training programs on enhancing nurses’ knowledge and practices regarding Port-A-Cath care, as well as to investigate patient outcomes associated with these programs.

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