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Assessment of Nurses' knowledge about Children Safety post Cardiac Catheterization

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Abstract

Objective: The study assessed nurses' knowledge regarding children's safety following cardiac catheterization procedures.

Methodology: A descriptive design was employed using a purposive sample of 60 nurses from the Shaheed Al-Muhrab Center for Cardiac Surgery. The study used a questionnaire to evaluate nurses' knowledge about child safety after cardiac catheterization alongside their sociodemographic data. Data collection occurred between September 7, 2022, and May 15, 2023, utilizing self-administered questionnaires and direct observation. Data analysis was performed using descriptive and inferential statistics with SPSS software.

Results: The study found that 75% of the nurses demonstrated good knowledge regarding child safety after cardiac catheterization. Additionally, there was a statistically significant association between nurses' sociodemographic characteristics and their knowledge, with a significance level of p=0.05.

Conclusion: The findings suggest that although most nurses possess good knowledge, ongoing education, and regular updates are needed to ensure that all nurses reach an adequate level of knowledge about child safety post-cardiac catheterization.

Recommendations: It is recommended that nurses undergo continuous training sessions focused on child safety after cardiac catheterization and that their knowledge be periodically evaluated.

What is already known about the topic? It is known that nurses play a critical role in ensuring children's safety post-cardiac catheterization. Proper knowledge is essential for monitoring complications such as bleeding, infection, and arrhythmias. Nurses must also be familiar with post-procedure care, including immobilization, pain management, and patient education to prevent complications and promote recovery. Inadequate knowledge can lead to increased risks for pediatric patients.

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INTRODUCTION

Cardiac catheterization is a commonly performed diagnostic and interventional procedure in cardiac care units, applicable to both adult and pediatric patients. In pediatric care, a range of therapeutic interventions are used to address various conditions, such as pulmonary valve implantation, embolization, treatment of stenotic lesions, and vessel closures, often utilizing medical devices (Al-Gersha, Haboubi, & Al-Asady, 2005). While the procedure has become more routine, a lack of adequate knowledge among nurses in cardiac care units can increase the risk of complications, including hemorrhaging (Hussein, 2022). The incidence of procedure-related mortality remains low, at approximately 0.08%, but the risk varies significantly by age (Dawood & Hassan, 2019).

Nurses are critical in ensuring the safety of children undergoing cardiac catheterization. Their responsibilities include preparing the patient before the procedure and providing post-procedural care that closely monitors and maintains hemodynamic stability. A nurse's ability to identify and manage potential post-catheterization complications, such as bleeding or clot formation, is essential for successful patient outcomes (El-Hosany et al., 2019). According to the World Health Organization, patient safety is a set of measures that prevent accidental harm from medical interventions (Mahdi & Mohammad, 2016).

Furthermore, effective therapeutic communication, both verbal and non-verbal, is critical in helping alleviate a child's fear and anxiety post-procedure, ensuring their safety and comfort (Ali et al., 2015). To deliver high-quality care, nurses must possess the necessary skills and knowledge, regularly updated through continuous training, to anticipate and address any complications that may arise after cardiac catheterization.

This study aims to assess nurses' knowledge regarding the safety of children following cardiac catheterization and identify gaps that may impact patient care outcomes.

Materials and Methods

Study Design:

A descriptive cross-sectional study design was adopted to assess nurses' knowledge regarding children's safety post-cardiac catheterization. This design was chosen to accurately portray the nurses' knowledge and identify any gaps that could be addressed through future training and education.

Study Setting:

The study was conducted at the Shaheed Al-Muhrab Center for Cardiac Surgery in Babylon City, Iraq. The center includes intensive care units (ICUs) and cardiac wards, where cardiac catheterization procedures are frequently performed. A formal request was submitted to the College of Nursing, University of Baghdad, to facilitate the study and gain access to the cardiac center.

Study Period:

The data collection process took place over eight months, from September 7, 2022, to May 15, 2023.

Study Population:

The target population for this study consisted of nurses working in the cardiac ICUs and wards of the Shaheed Al-Muhrab Center for Cardiac Surgery. These nurses are responsible for caring for pediatric patients undergoing cardiac catheterization procedures.

Sample Size:

A purposive sample of 60 nurses was selected for the study. This non-probability sampling method was chosen

to ensure all participants had relevant experience caring for pediatric patients' post-cardiac catheterization. Inclusion criteria required nurses to have at least one year of experience in cardiac care units, and they must have been directly involved in caring for children post-cardiac catheterization.

Instrument for Data Collection:

Data were collected using a structured questionnaire based on a comprehensive literature review. The questionnaire was divided into two main sections:

1. **Section I: Sociodemographic Characteristics** This section gathered information on the nurses' age, gender, marital status, educational background, years of experience in cardiac care units, and participation in child safety training related to post-cardiac catheterization care.
2. **Section II: Knowledge Assessment** The knowledge assessment section consisted of 15 multiple-choice questions designed to evaluate the nurses' understanding of child safety post-cardiac catheterization. These questions covered infection control, monitoring for post-procedural complications, proper handling of catheter sites, and early recognition of signs and symptoms that could indicate complications. A three-point Likert scale was used to categorize knowledge levels as "Good," "Fair," or "Poor."

Data Collection Methods:

Data were collected through self-administered questionnaires distributed to the participants. The nurses completed the questionnaires during their work shifts, ensuring data were collected under real-world conditions. To enhance the reliability of the data, the researcher also conducted direct observations of nursing practices in the cardiac wards and ICUs, recording additional details about adherence to safety protocols and post-catheterization care procedures.

Ethical Considerations:

Ethical approval for the study was obtained from the College of Nursing, University of Baghdad. All participants were informed about the purpose of the study and assured of the confidentiality of their responses. Written informed consent was obtained from each participant before their involvement in the study. Participants were also informed that they could withdraw from the study without any negative consequences.

Validity and Reliability of the Instrument:

The questionnaire was reviewed by a panel of experts from pediatric nursing and cardiac care to ensure content validity. Modifications were made based on their feedback to enhance clarity and relevance. The instrument was then pilot-tested on a small sample of nurses (not included in the main study) to determine its reliability. The questionnaire demonstrated high reliability, with a Cronbach's alpha coefficient of 0.82, indicating a solid internal consistency.

Data Analysis:

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS), version 26. Both descriptive and inferential statistics were employed. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to summarize the demographic data and the nurses' knowledge scores. Inferential statistics, including chi-square tests, were used to examine associations between nurses' sociodemographic characteristics and knowledge levels. A

significance level of $p<0.05$ was considered statistically significant.

RESULTS

Sociodemographic Characteristics of Nurses:

A total of 60 nurses participated in the study. The demographic analysis revealed the following characteristics

Age: The mean age of the participants was 31 ± 7 years. Most nurses (50%) were aged between 20 and 30, while 36.7% were between 30 and 40. A smaller proportion (11.7%) were between 40 and 50 years old, and only 1.7% were above 50.

Gender: The sample was almost equally divided by gender, with 48.3% male and 51.7% female nurses.

Educational Background: Regarding the level of nursing education, 40% of the participants held a diploma in nursing, 38.3% had a bachelor's degree, 15% had completed secondary school, and 6.7% had obtained postgraduate qualifications.

Years of Experience in Cardiac Care Units (CCUs): The average years of experience in CCUs was 9 ± 7 years. The majority of nurses (40%) had between 6 and 11 years of experience, 33.3% had between 1 and 6 years, while a smaller percentage (13.3%) had 11 to 16 years of experience. Only 6.7% had over 16 years of experience.

Training in Children's Safety: A significant portion (58.3%) of nurses had not received formal training on children's safety post-cardiac catheterization, while 41.7% had participated in such training programs.

Assessment of Nurses' Knowledge:

The nurses' knowledge regarding children's safety post-cardiac catheterization was assessed across 15 essential items. The findings are presented as follows:

Overall Knowledge Levels:

75% of the nurses demonstrated good knowledge about children's safety post-cardiac catheterization (M±SD = 11.58 ± 1.739).

25% of the nurses had a **fair** level of knowledge.

None of the nurses scored at a poor knowledge level.

Knowledge of Specific Items:

Good Knowledge: Most nurses showed good knowledge on 11 out of 15 items. Notable areas of strength include:

Patient safety measures: 98.3% of nurses correctly recognized that patient safety measures are essential in delivering high-quality care.

Sterilization practices: 78.3% of nurses correctly identified the importance of washing and sterilizing hands before any procedure to prevent infection.

Post-procedural care: 96.7% of nurses correctly stated that keeping the child's leg straight for more than 4 hours post-procedure reduces the risk of bleeding.

Fair Knowledge: Three items reflected only fair knowledge among the participants:

Item 6: Fluid and food intake post-procedure: 40% of nurses answered incorrectly, demonstrating confusion about when a child can safely resume eating and drinking post-cardiac catheterization.

Item 10: Blood clot symptoms: 41.7% of nurses were unclear about the signs of blood clots post-procedure, indicating a need for further education in this area.

Item 14: Rapid breathing as a complication: 40% of nurses were unaware that rapid breathing could indicate delayed catheter sheath removal, a crucial complication that must be addressed.

Poor Knowledge: One item showed a **poor** level of knowledge:

Item 9: Stopping heparin infusion: Only 23.3% of nurses knew that heparin infusion should be stopped if signs of bleeding are observed post-catheterization. This represents a critical knowledge gap, as the improper management of anticoagulants can lead to serious complications.

Association Between Knowledge and Sociodemographic Characteristics:

Statistical analysis revealed significant associations between nurses' sociodemographic characteristics and their knowledge levels:

Educational Background: Nurses with a bachelor's degree or higher demonstrated significantly better knowledge ($p=0.05$) than those with a diploma or lower qualifications.

Years of Experience: Nurses with more than six years of experience in cardiac care units showed higher knowledge, particularly in post-procedural safety measures.

Training Participation: Nurses who had attended training sessions on children's safety post-cardiac catheterization had significantly better knowledge scores ($p<0.05$) than those who had not.

Table (1): Distribution of Nurses based on Socio-demographic Information

List	Characteristics		f	%
1	**Age (Years)**	20 – less than 30	30	50
		30 – less than 40	22	36.7
	M±SD= 31 ± 7	40 – less than 50	7	11.7
		50 and more	1	1.7
		Total	***60***	***100***
2	**Gender**	Male	29	48.3
		Female	31	51.7
		Total	***60***	***100***
3	**Nursing qualification**	Secondary school	9	15
		Diploma	24	40
		Bachelor	23	38.3
		Postgraduate	4	6.7
		Total	***60***	***100***
4	**Years of CCU experience MSD= 9 7**	1 – less than 6	**20**	33.3
		6 – less than 11	24	40
		11 – less than 16	8	13.3
		16 – less than 21	4	6.7
		21 and more	4	6.7
		Total	***60***	***100***
5	**Training in Children Safety Course**	No	35	58.3
		Yes	25	41.7
		Total	***60***	***100***

f: Frequency, %: Percentage, M: Mean, SD: Standard Deviation

Table (2): Assessment of Nurses' Knowledge about Children's Safety Post Cardiac Catheterization Procedure (N=60)

No.	Knowledge items	Scale	f (%)	M	Eval.
1	Patient safety measures were an essential part of providing high-quality health services	Incorrect	1(1.7)	.98	Good
		Correct	59(98.3)		
2	Washing and sterilizing hands before any nursing procedure limits the transmission of infection to the child	Incorrect	12(21.7)	.78	Good
		Correct	47(78.3)		
3	The child can be moved from the operating room to the lobby by a wheelchair	Incorrect	1(1.7)	.98	Good
		Correct	59(98.3)		
4	Staying with the child after catheterization can relieve pain and fear	Incorrect	3(5)	.95	Good
		Correct	57(95)		
5	Keeping the child's leg straight and not moving it for more than 4 hours after lifting the stool can reduce bleeding complications.	Incorrect	2(3.3)	.96	Good
		Correct	58(96.7)		
6	The child can take fluids and food after waking up	Incorrect	24(40)	.60	Fair
		Correct	36(60)		
7	The pressure dressing should be removed 24 hours after the catheterization	Incorrect	11(18.3)	.81	Good
		Correct	49(81.7)		
8	Feeling severe pain in the catheter area was evidence of bleeding	Incorrect	16(26.7)	.73	Good
		Correct	44(73.3)		
9	Stop the heparin infusion if you notice a sign of bleeding after catheterization	Incorrect	46(76.7)	.23	Poor
		Correct	14(23.3)		
10	Swelling in the area of the catheter was one of the signs of a blood clot	Incorrect	25(41.7)	.58	Fair
		Correct	35(58.3)		
11	Medication errors were a major cause of injury and harm to children	Incorrect	13(21.7)	.78	Good
		Correct	47(78.3)		
12	(Blood clots) constitute a third of the complications after cardiac catheterization	Incorrect	11(18.3)	.81	Good
		Correct	49(81.7)		
13	Stroke was one of the complications that occur to children after cardiac catheterization	Incorrect	11(18.3)	.81	Good
		Correct	49(81.7)		
14	Rapid breathing was a complication of delayed lifting of the catheter sheath	Incorrect	24(40)	.60	Fair
		Correct	36(60)		
15	Nephropathy can occur as a result of the use of catheter dye after 2-3 days	Incorrect	13(21.7)	.78	Good
		Correct	47(78.3)		

M: Mean, Eval: Evaluation \ Poor= 0 – 0.33, Fair = 0.34 – 3.67, Good= 0.68– 1

Table (3): Overall Nurses' Knowledge of Children's Safety Post Cardiac Catheterization Procedure

Knowledge	F	%	M	SD	Evaluation
Poor	0	0	11.58	1.739	Good
Fair	15	25			
Good	45	75			
Total	***60***	***100***			

f: Frequency, %: Percentage, M: Mean for total score, SD: Standard Deviation, Poor= 0 – 5, Fair= 5.1 – 10, Good= 10.1 – 15 .

DISCUSSION

The findings of this study provide valuable insights into nurses' knowledge regarding children's safety post-cardiac catheterization. Overall, the study revealed that 75% of the nurses demonstrated a good level of knowledge, indicating a generally strong understanding of essential safety protocols. However, several areas require improvement to ensure that all nurses consistently apply best practices for patient safety.

Sociodemographic Factors and Knowledge

The sociodemographic analysis indicated that the majority of participants were young, with half of the nurses aged between 20 and 30 years. This younger demographic may explain the generally good knowledge levels, as they are likely to have received more recent education and training on patient safety. Additionally, nurses with a bachelor's degree or higher demonstrated significantly better knowledge, underscoring the importance of advanced education in promoting best practices in patient care.

The gender distribution was relatively balanced, with no significant differences in knowledge levels between male and female nurses, indicating that gender did not play a role in determining nurses' proficiency in post-cardiac catheterization care. However, the study did find that experience in cardiac care units had a positive impact on knowledge. Nurses with more than 6 years of experience were more likely to demonstrate better knowledge, likely due to the cumulative learning from hands-on experience and exposure to diverse patient scenarios.

Training and Knowledge Gaps

One of the most important findings was the significant association between participation in child safety training and knowledge levels. Nurses who had undergone formal training on children's safety post-cardiac catheterization performed better in knowledge assessments than those who had not. This highlights the critical role of ongoing education and training programs in maintaining high standards of care, especially in specialized procedures like cardiac catheterization.

Despite the overall good performance, several key areas revealed knowledge gaps. For example, only 60% of the nurses knew the correct time to allow fluid and food intake after the procedure, and 58.3% were aware that swelling at the catheter site could indicate a blood clot. These findings suggest that even though nurses may have a general understanding of safety protocols, there

are specific nuances related to post-procedural care that need further clarification and emphasis in training sessions.

Most concerning was the finding that only 23.3% of nurses correctly identified the need to stop heparin infusion if signs of bleeding were observed. This represents a critical gap in knowledge that could have severe consequences for patient outcomes, as improper management of anticoagulants can lead to life-threatening complications. Immediate corrective action, including targeted training on anticoagulant management, is necessary to mitigate this risk.

Comparison with Previous Studies

The results of this study are consistent with findings from previous research conducted in similar settings. For instance, a study conducted in Egypt assessing nurses' knowledge and practices regarding patient safety post-cardiac catheterization found that a significant portion of nurses exhibited only moderate knowledge levels (Henedy & El-Sayad, 2019). Similarly, a study conducted in Sulaimania reported that 67.3% of nurses had a good level of knowledge about pediatric safety post-cardiac catheterization (Hasballah, 2019). However, the current study's findings exceed those reported in Basrah, where only 54% of nurses demonstrated good knowledge (Sayed, 2021). This variation may be attributed to differences in training programs, resources, and institutional support across these regions.

Implications for Practice and Recommendations

The results of this study underscore the need for continuous education and professional development to address the knowledge gaps identified. Regular training sessions on specific aspects of post-cardiac catheterization care, particularly focusing on anticoagulant management and recognition of post-procedural complications, should be prioritized. Moreover, ongoing evaluations and refresher courses are essential to ensure that all nursing staff remain updated with the latest evidence-based practices.

Furthermore, the inclusion of practical, hands-on training could help bridge the gap between theoretical knowledge and clinical practice. Simulated scenarios that replicate post-cardiac catheterization complications, such as bleeding and blood clot formation, would provide nurses with the opportunity to apply their knowledge in a controlled environment, enhancing their preparedness for real-world situations.

Limitations of the Study

While the study provides significant insights, it is not without limitations. The use of a purposive sample from a single cardiac center may limit the generalizability of the findings to other healthcare institutions. Additionally, the reliance on self-reported questionnaires may introduce bias, as nurses might overestimate their knowledge or provide socially desirable responses. Future studies should aim to include more extensive, more diverse samples and incorporate objective measures of knowledge, such as practical assessments or direct clinical observations.

Conclusion

This study highlights nurses' overall good knowledge levels regarding children's safety post-cardiac catheterization while identifying critical areas for improvement. The findings reinforce the importance of continuous training and professional development, particularly in anticoagulant management and post-procedural care. By addressing these gaps through targeted interventions,

healthcare institutions can further enhance patient safety and improve outcomes for pediatric patients undergoing cardiac catheterization.

DECLARATION SECTION

Ethical Approval and Consent to Participate: Ethical approval for this study was obtained from the Ethics Committee of the College of Nursing, University of Baghdad. All participants were informed about the purpose of the study and provided written consent to participate. Participants were assured that their responses would remain confidential and that they could withdraw from the study at any time without any repercussions.

Consent for Publication: Not applicable, as this study does not contain any identifiable individual person's data.

Availability of Data and Materials: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Authors' Contributions:

- **Ibrahim Kadhim Omran** contributed to the study's conception, data collection, and manuscript writing.
- **Adraa Hussein Shawq** supervised the study, contributed to the design and methodology, and assisted in reviewing and editing the final manuscript.

Both authors read and approved the final manuscript.

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