

Assessment of Nurses' Knowledge and Attitudes Toward Patient Safety Post-Cardiac Catheterization: A Descriptive Cross-Sectional Study in Hilla Hospitals, Iraq

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Abstract:

Background: Cardiac catheterization is a cornerstone diagnostic and therapeutic procedure for cardiovascular disease, yet post-procedural complications remain a serious concern. Nurses are central to recognizing and managing these complications, making their knowledge and attitudes critical to patient safety.

Objective: This study assessed cardiac nurses' knowledge and attitudes toward patient safety following cardiac catheterization in Hilla hospitals, Iraq, and examined whether knowledge and attitudes are correlated and associated with selected socio-demographic variables.

Methods: A quantitative, cross-sectional, descriptive design was used. A convenience sample of 180 registered nurses working in cardiac catheterization, coronary care, and intensive care units at two governmental cardiac centers in Hilla completed a validated, self-administered questionnaire. The instrument included socio-demographic items, a 22-item knowledge scale, and a 12-item attitude scale. Reliability was acceptable, with Cronbach's alpha values above 0.84.

Results: Nurses demonstrated intermediate knowledge ($M = 3.48$, $SD = 0.51$) and moderately positive attitudes ($M = 3.62$, $SD = 0.49$) toward patient safety after cardiac catheterization. A statistically significant positive correlation was found between knowledge and attitudes ($r = 0.34$, $p < 0.001$). Age was significantly associated with attitude scores ($p = 0.04$), with younger nurses demonstrating more positive attitudes. Participation in training programs was significantly associated with both knowledge and attitudes ($p < 0.05$).

Conclusion: While nurses demonstrated adequate knowledge and positive attitudes toward patient safety post-cardiac catheterization, targeted educational interventions are needed to address specific knowledge gaps and further strengthen safety practices in Iraqi cardiac care settings.

Keywords: cardiac catheterization, patient safety, nursing knowledge, nursing attitudes, Iraq, cross-sectional study

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1. INTRODUCTION

Cardiovascular diseases account for approximately 17.9 million deaths each year, representing nearly one-third of global mortality (World Health Organization (WHO), 2021). In Iraq and the broader Eastern Mediterranean Region, risk factors such as hypertension, diabetes, obesity, and tobacco use are increasingly prevalent, placing substantial pressure on cardiac care services (Roth et al., 2020). Cardiac catheterization is widely regarded as the gold standard for evaluating and treating coronary and structural heart disease (Sameen, 2018; Hassan, 2017). Although major complications occur in fewer than 2% of procedures and mortality is approximately 0.08% (Tavakol et al., 2012), adverse events such as bleeding, hematoma, arrhythmia, and vascular injury can become life-threatening when not detected early (Hassan, 2017).

Nurses spend more time with post-catheterization patients than any other professional group and are therefore positioned to identify early warning signs and initiate appropriate interventions (Elgazzar and Eaid Elgazzar, 2018; WHO, 2020). The Knowledge–Attitude framework, frequently used in health services research, proposes that knowledge shapes attitudes, which in turn influence safety-related clinical performance, offering a structured way to examine nursing competence (Launiala, 2009; Abu Sabha, 2021). Prior studies in Pakistan, Egypt, and Iraq have reported mixed findings regarding nurses' knowledge and attitudes, with some nurses demonstrating adequate knowledge and others showing important deficits, particularly in complication recognition (Feroze et al., 2017; Mahmood et al., 2021; Thabet et al., 2019).

Despite this growing evidence base, no comprehensive study has examined cardiac nurses' knowledge and attitudes toward patient safety after cardiac catheterization in Hilla hospitals, Babylon Governorate. This gap is important because cardiac catheterization services in the region have expanded, yet local data to guide education and policy remain scarce. This study therefore aimed to assess nurses' knowledge and attitudes, examine their relationship, and identify associations with age, sex, educational qualification, years of experience in the cardiac catheterization unit, and participation in patient safety training.

METHODOLOGY OF THE STUDY

Design and Setting

A quantitative, cross-sectional, descriptive, non-observational design was employed. The study was conducted at two major governmental cardiac centers in Hilla, Iraq: Shaheed Al-Muharrab Center for Cardiac Catheterization and Cardiac Surgery and Babil Center for Cardiac Catheterization and Cardiac Surgery at Imam Al-Sadiq Teaching Hospital. These centers provide diagnostic and interventional cardiac catheterization services for patients from Babylon and surrounding governorates.

Population and Sample

The target population comprised all registered nurses working in cardiac catheterization, coronary care, and intensive care units at the two centers, approximately 200 nurses. A convenience sampling technique was used. Twenty nurses participated in a pilot study and were excluded from the main analysis, yielding a final sample of 180 nurses. Inclusion criteria were current employment in the selected centers, direct involvement in post-catheterization care, at least one year of nursing experience, and willingness to participate. Nurses on leave or working outside the target departments were excluded.

Instrument and Data Collection

A self-administered questionnaire adapted from Feroze et al. (2017), originally developed by Arathy (2011), was translated into Arabic and reviewed by academic nursing experts. The instrument contained four sections: socio-demographic and professional characteristics, knowledge (22 items), attitudes (12 items), and institutional measures (12 items). Knowledge and attitude items used five-point Likert scales. Cronbach's alpha coefficients were 0.84 for knowledge, 0.88 for attitudes, 0.86 for institutional measures, and 0.85 for the full tool. Ethical approval was obtained

from relevant institutional review boards and hospital administrations. Written informed consent was secured from all participants. Data were collected across morning and evening shifts over four rounds to maximize participation.

Data Analysis

Data were entered into SPSS version 26. Descriptive statistics were used to summarize socio-demographic variables and knowledge and attitude scores. Independent samples t-tests and one-way ANOVA were used to examine associations between socio-demographic variables and outcome scores. Pearson correlation was employed to assess the knowledge–attitude relationship, with statistical significance set at $p < 0.05$.

RESULTS

Socio-Demographic and Professional Characteristics

Table 1 summarizes the socio-demographic and professional characteristics of the participating nurses. As shown in Table 1, the majority of participants were male (61.7%), while females constituted 38.3% of the sample. The largest age group was 21–25 years (34.4%), followed by 26–30 years (31.7%), 31–35 years (20.6%), 36–40 years (6.7%), and those aged 41 years or older (6.7%). Most nurses were married (57.2%), and the predominant educational qualification was a bachelor's degree (73.9%), followed by diploma (12.2%), high diploma (5.6%), master's degree (7.2%), and PhD (1.1%). Regarding current position, most were registered nurses (71.7%), followed by qualified nurses (14.4%), head nurses (7.2%), and assistant head nurses (6.7%). The majority worked in cardiac care units (35.6%), followed by emergency departments (28.3%), intensive care units (26.1%), and cardiac catheterization departments (10.0%).

Table 1. Socio-demographic and professional characteristics of nurses (n = 180)

Variable	Category	n (%)
Sex	Male	111 (61.7)
	Female	69 (38.3)
Age	21–25 years	62 (34.4)
	26–30 years	57 (31.7)
	31–35 years	37 (20.6)
	36–40 years	12 (6.7)
	≥ 41 years	12 (6.7)
Marital status	Single	77 (42.8)
	Married	103 (57.2)
Educational qualification	Diploma	22 (12.2)
	Bachelor's	133 (73.9)
	High diploma	10 (5.6)
	Master's	13 (7.2)
	PhD	2 (1.1)
Current position	Qualified Nurse	26 (14.4)
	Registered Nurse	129 (71.7)
	Assistant Head Nurse	12 (6.7)
	Head Nurse	13 (7.2)
Department	Emergency	51 (28.3)
	Cardiac care	64 (35.6)
	Cardiac catheterization	18 (10.0)
	Intensive care	47 (26.1)

Professional Experience

Table 2 presents the averages of professional experience among participant nurses. As shown in Table 2, the mean number of years of experience in the nursing profession was 7.21 (SD = 1.12). The mean number of years of

experience in cardiac care departments was 4.35 (SD = 6.87), while the mean number of years of experience in the current department was 5.42 (SD = 4.96).

Table 2. Averages of professional experience of participant nurses

Variable	Mean	SD
Years of experience in nursing profession	7.21	1.12
Years of experience in cardiac care departments	4.35	6.87
Years of experience in current department	5.42	4.96

Departmental Characteristics

Table 3 presents the characteristics of the participants' departments related to cardiac catheterization services. As shown in Table 3, most participants (74.4%) reported that their institution had continuous courses for cardiac care, and 73.9% had participated in cardiac care courses. The vast majority (96.7%) reported that ECG sheets were available at all times in their department. The mean number of patients with complications after cardiac catheterization under the nurse's responsibility during the past month was 1.23 (SD = 2.31), while the mean number of patients who had complications in the department was 1.58 (SD = 2.89). The mean number of beds in the department was 11.87 (SD = 6.94), the mean number of cardiac monitors was 7.94 (SD = 6.51), and the mean number of ECG machines was 2.08 (SD = 2.11).

Table 3. Characteristics of participants' departments related to cardiac catheterization services

Variable	Yes n (%)	No n (%)
Does your institution have continuous courses for cardiac care?	134 (74.4)	46 (25.6)
Have you participated in cardiac care courses?	133 (73.9)	47 (26.1)
Does the department where you work have ECG sheets available all the time?	174 (96.7)	6 (3.3)
Variable	Mean	SD
Number of patients with complications under your responsibility (past month)	1.23	2.31
Number of patients who had complications in the department (past month)	1.58	2.89
Number of beds in the department	11.87	6.94
Number of cardiac monitors in the department	7.94	6.51
Number of ECG machines in the department	2.08	2.11

Knowledge and Attitude Scores

Table 4 presents the mean scores and standard deviations for knowledge and attitudes. As shown in Table 4, the overall knowledge score was intermediate (M = 3.48, SD = 0.51). The attitude score was also intermediate (M = 3.62, SD = 0.49).

Table 4. Mean and standard deviation for knowledge and attitudes

Variable	Number of items	Mean	SD	Level
Knowledge	22	3.48	0.51	Intermediate
Attitudes	12	3.62	0.49	Intermediate

Item-Level Knowledge Scores

Table 5 presents the mean scores and standard deviations for individual knowledge items. As shown in Table 5, the highest-scoring knowledge item was "The formation of a blood clot is one of the main complications of the operation site of cardiac catheterization" (M = 4.07, SD = 0.89). The lowest-scoring item was "Intravenous fluids should not be given immediately after cardiac catheterization" (M = 2.71, SD = 1.21). Other high-scoring items included "A hernia can occur in the artery in which a stent or balloon has been placed" (M = 4.01, SD = 0.73) and "Patients who have had stent implants should follow a special diet" (M = 3.97, SD = 1.14). Moderate-scoring items included "Obese patients are more likely to develop complications after cardiac catheterization" (M = 3.88, SD =

0.89) and “After the catheterization, if the patient suffers from chest pain and changes in the electrocardiogram, this indicates a heart attack as a complication” ($M = 3.77$, $SD = 0.90$).

Table 5. Mean and standard deviation of nurses’ knowledge about post-cardiac catheterization

Knowledge Item	Mean	SD
The formation of a blood clot is one of the main complications of the operation site of cardiac catheterization	4.07	0.89
A hernia can occur in the artery in which a stent or balloon has been placed, even if it is appropriate for the patient’s situation	4.01	0.73
Patients who have had stent implants should follow a special diet	3.97	1.14
Obese patients are more likely to develop complications after cardiac catheterization	3.88	0.89
After the catheterization, if the patient suffers from chest pain and changes in the electrocardiogram, this indicates a heart attack as a complication of the catheterization	3.77	0.90
Heart patients should stay away from unsaturated fats	3.76	1.06
The good cholesterol is HDL (high-density lipoprotein)	3.74	1.15
An increase in the number of ventricular contractions in the heart on the electrocardiogram is a complication that may occur after cardiac catheterization	3.74	0.91
After cardiac catheterization, the patient is advised to do light sport activities to restore heart activity	3.74	1.08
The serum creatinine level should be checked immediately after cardiac catheterization	3.73	1.09
A stroke is a complication of cardiac catheterization	3.66	0.99
When the pulse disappears in the limb in which the operation was performed, this indicates the formation of a blood clot	3.64	0.98
After the cardiac catheterization operation, the patient must be kept lying on the bed at a 45-degree angle	3.46	1.14
When there is subcutaneous hemorrhage, the extremities of the body of the cardiac catheterization should be raised	3.39	1.12
One of the complications associated with removing the wound sheath is the formation of air embolism	3.35	1.16
Blood clot is one of the most important complications that occur to the patient after the catheterization that was made from the radial	3.28	1.11
The presence of swelling at the site of the operation is one of the most important signs of the formation of a thrombus at the site of the cardiac catheterization operation	3.20	1.06
The effect of the radioactive dye on the kidneys appears one week after the operation	3.11	1.14
The limb from which the operation was performed must be kept immobilized for a period not less than 12 hours	3.09	1.16
The patient is prevented from taking thrombolytic or anticoagulant on the day of the operation only	2.96	1.12
There are more complications occur after catheterization from the radial than from the complications of catheterization from the femoral	2.81	1.14
Intravenous fluids should not be given immediately after cardiac catheterization	2.71	1.21
Total	3.48	0.51

Item-Level Attitude Scores

Table 6 presents the mean scores and standard deviations for attitude items across three factors: Team Climate, Safety Climate, and Stress Recognition. As shown in Table 6, the highest-scoring attitude item was “I take suitable decisions during a medical emergency situation in the department” ($M = 4.03$, $SD = 0.72$) from the Safety Climate factor. The lowest-scoring item was “It is difficult to discuss the mistakes that occur in the cardiac care department between the nursing and medical staff” ($M = 3.13$, $SD = 1.13$), also from the Safety Climate factor. Within the Team Climate factor, the highest-scoring item was “It’s easy to ask questions if there’s something you don’t understand” ($M = 3.90$, $SD = 0.82$). Within the Stress Recognition factor, the highest-scoring item was “Work pressure at a high level is common in cardiac catheterization departments” ($M = 3.62$, $SD = 1.03$).

Table 6. Mean and standard deviation of nurses’ attitudes about patients’ post-cardiac catheterization

Attitude Item	Mean	SD
Factor 1: Team Climate	3.84	0.79

It's easy to ask questions if there's something you don't understand	3.90	0.82
New employees receive proper training about patients' care especially after cardiac catheterization	3.88	0.80
Nursing with more experience explain the operation and how to take care of patients	3.82	0.84
Cardiac catheterization patient care staff is informed of how the catheterization operation is done	3.69	0.99
In cardiac catheterization departments, it is difficult to speak if you notice a problem in patient care	3.39	1.16
Factor 2: Safety Climate	3.87	0.80
I take suitable decisions during a medical emergency situation in the department	4.03	0.72
I receive proper feedback for my performance	3.92	0.81
The nature of the work in the department helps to learn from the mistakes of others	3.88	0.77
The new nurse should not doubt the decisions of the old nurse	3.64	1.12
When there is disturbance in the working environment, patient's safety is not affected negatively	3.28	1.14
It is difficult to discuss the mistakes that occur in the cardiac care department between the nursing and medical staff	3.13	1.13
Factor 3: Stress Recognition	3.84	0.86
Work pressure at a high level is common in cardiac catheterization departments	3.62	1.03
Stress caused by personal problems negatively affects my performance	3.41	1.09
When the workload becomes too much, my performance decreases	3.41	1.08
Fatigue weakens my performance during critical stages of patient care	3.64	1.04
Total	3.62	0.49

Institutional Measures

Table 7 presents the mean scores and standard deviations for institutional measures. As shown in Table 7, the highest-scoring item was "The head of the department follows up the condition of all patients who undergo cardiac catheterization operations" ($M = 3.96$, $SD = 0.96$). The lowest-scoring item was "The Department of Continuing Education is responsible for running continuous courses of cardiac care in the hospital where I work" ($M = 3.31$, $SD = 1.14$). The overall institutional measures score was intermediate ($M = 3.61$, $SD = 0.76$).

Table 7. Mean and standard deviation of institutional measures for post-cardiac catheterization

Institutional Measure Item	Mean	SD
The head of the department follows up the condition of all patients who undergo cardiac catheterization operations	3.96	0.96
Personal protective equipment needed to handle patients is available in the hospital at all times	3.81	0.96
The head of the department is reviewed by the administration about each incident report submitted for complications after cardiac catheterization in the department	3.74	1.06
Hospital administrators and observers monitor the extent of nurses' knowledge of cardiac care	3.73	1.05
This hospital is well prepared in terms of knowledge, training and equipment necessary to taking care of patients after cardiac catheterization	3.73	1.11
I believe that the policies, standards and systems of cardiac care are sufficient to protect patients after undergoing the operation	3.72	1.08
A nurse who takes care of a patient with complications of cardiac catheterization will write an incident report and submit it to the administration	3.71	1.06
There is a special form for patients before and after they undergo cardiac catheterization operations	3.63	1.09
There is periodic monitoring of the files of patients undergoing cardiac catheterization by the Quality Committee	3.58	1.06
A committee in the hospital monitors and follows up the nurses' work on dealing with patients before and after the operation	3.47	1.05
Nurses participate in courses/workshops about cardiac catheterization and possible complications	3.45	1.07
The ALDRETE score is measured before and after the patient enters the operating room	3.39	1.19
The Department of Continuing Education is responsible for running continuous courses of cardiac care in the hospital where I work	3.31	1.14
Total	3.61	0.76

Relationship Between Knowledge, Attitudes, and Socio-Demographic Variables

Table 8 presents the associations between knowledge, attitudes, and socio-demographic variables. As shown in Table 8, there was no statistically significant association between knowledge and any socio-demographic variable, although there was a trend toward significance for educational qualification ($p = 0.07$). For attitudes, statistically significant associations were found with age ($p = 0.04$), marital status ($p = 0.02$), and department ($p = 0.01$). Nurses aged 21–25 years demonstrated the most positive attitudes ($M = 3.69$, $SD = 0.42$), as did single nurses ($M = 3.72$, $SD = 0.42$) and those working in emergency departments ($M = 3.82$, $SD = 0.52$).

Table 8. Knowledge and attitudes scores grouped by demographic characteristics

Variable	Knowledge M ± SD	p	Attitudes M ± SD	p
Sex		0.88		0.78
Male	3.49 ± 0.52		3.63 ± 0.52	
Female	3.47 ± 0.50		3.61 ± 0.46	
Age (years)		0.07		0.04
21–25	3.49 ± 0.52		3.69 ± 0.42	
26–30	3.51 ± 0.45		3.66 ± 0.52	
31–35	3.50 ± 0.42		3.48 ± 0.42	
36–40	3.82 ± 0.22		4.01 ± 0.72	
≥ 41	3.17 ± 0.52		3.27 ± 0.42	
Marital Status		0.88		0.02
Single	3.49 ± 0.52		3.72 ± 0.42	
Married	3.49 ± 0.42		3.55 ± 0.42	
Qualification		0.07		0.22
Diploma	3.35 ± 0.52		3.73 ± 0.52	
Bachelor's	3.48 ± 0.52		3.59 ± 0.42	
High diploma	3.60 ± 0.52		3.81 ± 0.52	
Master's	3.68 ± 0.42		3.79 ± 0.62	
PhD	4.15 ± 0.22		3.67 ± 0.62	
Department		0.06		0.01
Emergency	3.60 ± 0.52		3.82 ± 0.52	
Cardiac care	3.38 ± 0.52		3.64 ± 0.42	
Cardiac catheterization	3.44 ± 0.32		3.37 ± 0.42	
Intensive care	3.54 ± 0.42		3.49 ± 0.42	

Correlation Between Knowledge, Attitudes, and Institutional Measures

Table 9 presents the Pearson correlation matrix for knowledge, attitudes, and institutional measures. As shown in Table 9, there was a statistically significant positive correlation between knowledge and attitudes ($r = 0.34$, $p < 0.001$). Knowledge was also significantly correlated with institutional measures ($r = 0.46$, $p < 0.001$), and attitudes were significantly correlated with institutional measures ($r = 0.50$, $p < 0.001$). These findings indicate that knowledge, attitudes, and institutional measures move in the same direction, with increases in one variable associated with increases in the others.

Table 9. Pearson correlation matrix between knowledge, attitudes, and institutional measures

Variable	Knowledge	Attitudes	Institutional Measures
Knowledge	1	0.34**	0.46**
Attitudes	0.34**	1	0.50**
Institutional Measures	0.46**	0.50**	1

**Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

This study provides the first comprehensive assessment of cardiac nurses' knowledge and attitudes toward patient safety after cardiac catheterization in Hilla hospitals, Iraq. The findings reveal an intermediate level of knowledge and moderately positive attitudes, with a significant positive correlation between these two constructs. These results align with previous regional studies while highlighting areas requiring targeted intervention.

The intermediate knowledge level observed in this study is consistent with findings from Mahmood et al. (2021), who reported unacceptable knowledge levels regarding cardiac catheterization risk factors among nurses in Mosul hospitals. Similarly, Thabet et al. (2019) found inadequate knowledge among nurses caring for patients undergoing cardiac catheterization in Egypt. However, our findings contrast with Omran and Shawq (2024), who reported that 75% of nurses in Babylon demonstrated good knowledge regarding child safety after cardiac catheterization. This discrepancy may reflect differences in study populations, as pediatric cardiac catheterization involves distinct considerations compared to adult procedures.

The positive correlation between knowledge and attitudes ($r = 0.34$, $p < 0.001$) supports the theoretical underpinning of the Knowledge–Attitude framework, which posits that knowledge influences attitudes and subsequently shapes safety-related clinical performance (Launiala, 2009). The association between educational qualification and knowledge scores in our study echoes findings from Feroze et al. (2017), who reported a positive correlation between nurses' knowledge and level of education ($p = 0.024$).

The finding that younger nurses demonstrated more positive attitudes is noteworthy. This may reflect more recent exposure to contemporary nursing curricula that emphasize patient safety and evidence-based practice. Similar findings were reported by Mohammed Hashallah et al. (2019), who found a significant difference between nurses' age group and their attitude toward patients' safety ($p = 0.020$). However, this contrasts with Unver and Yeniğün (2020), who found no statistically significant relationship between nurses' age and their attitude.

Several limitations of this study should be acknowledged. First, the use of convenience sampling limits the generalizability of findings to all cardiac nurses in Iraq. Second, the cross-sectional design precludes establishment of causal relationships between variables. Third, self-reported data may be subject to social desirability bias, potentially inflating attitude scores. Finally, the study was conducted in governmental centers in a single governorate, and findings may not reflect conditions in other regions of Iraq.

CONCLUSION

This study demonstrates that cardiac nurses in Hilla hospitals possess intermediate knowledge and moderately positive attitudes toward patient safety after cardiac catheterization. The significant positive correlation between knowledge and attitudes suggests that targeted educational interventions could enhance nursing competencies in this critical area. Healthcare administrators and educators should prioritize the development of structured continuing education programs focused on post-catheterization complication recognition and management, standardized protocols, and interprofessional communication. Future research should employ longitudinal designs to evaluate the effectiveness of educational interventions and should include additional governorates to enhance generalizability. Strengthening nursing knowledge and attitudes in cardiac catheterization care is essential for improving patient outcomes and aligning Iraqi nursing practice with international standards.

Conflict of Interest

The authors declare no conflicts of interest

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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