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Nurses' Performance Regarding Patient Safety Goals after Open Heart Surgery

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ABSTRACT

Background: Ensuring patient safety is a crucial aspect of hospital performance. It is a goal that every organization strives to achieve. Therefore, it is imperative to prioritize the promotion of patient safety in healthcare settings, particularly after open heart surgery. **Aim of the study**: To assess nurses' performance regarding patient safety goals after open heart surgery. **Research design**: A descriptive exploratory design was utilized to conduct the study. **Setting**: This study was conducted in the cardiothoracic care unit and cardiothoracic department at Beni-Suef University Hospital. **Subjects**: A convenience sample of 60 nurses, comprising 26 nurses from the cardiothoracic department and 34 nurses from the cardiothoracic care unit were included. All participants were working in the study setting and caring for patients with open-heart surgery. **Data collection tools**: Three tools were used for data collection: **Tool I:** Self-administered questionnaire sheet. **Tool II:** Nurses' observational checklist. **Tool III:** Nurses' attitude Likert scale. **Results**: There were statistically significant positive correlations between the studied nurses' knowledge and their practice (r=0.547, p=0.000), between knowledge and attitude (r=0.449, p=0.000), and between the studied nurses' attitude and their practice (r=0.509, p=0.000). **Conclusion**: The current study concluded that, the majority of the studied nurses had total satisfactory level of knowledge, positive attitude and almost of them had incompetent levels of practice regarding patient safety goals after open heart surgery. **Recommendations**: Create and implement an educational program to improve nurses' knowledge, practice, and attitude regarding patient safety goals after open heart surgery.

***Keywords*:** Nurses' performance, Patient safety goals, Open heart surgery.

INTRODUCTION

Open-heart surgery is a crucial part of treating various cardiovascular diseases and involves providing highly specialized care to patients with severe conditions and intricate medical needs **(*Atia et al., 2023*).**

Open-heart surgery is a medical procedure in which the chest is incised or opened to perform surgery on the heart's arteries, valves, or muscles. The most common type of heart surgery performed on humans is coronary artery bypass grafting, according to the National Heart, Lung, and Blood Institute **(*Shahmoradi et al., 2022*).**

Open heart surgery is a major operation that requires close monitoring and immediate post-operative care. It is normal for a patient to require further medical care in the intensive care unit for a few days after the treatment.

The risks of infections, organ damage, and stroke are present with each type of open-heart surgery. Each individual is at a different risk level. Complications during and after surgery are more probable to occur in patients with more serious heart disorders. **(*Wenet al., 2023*)**.

In order to emphasize better patient outcomes and lower costs, the nurse should encourage care continuity while making sure that best practice standards are followed and patient safety is addressed (***Östman et al., 2021*)**.

According to the joint commission accreditation process places utmost importance on the excellence of care and patient safety. The purpose of the patient safety goals was to assist healthcare institutions in addressing certain patient safety issues. These components include accurate patient identification, enhanced communication techniques, drug safety precautions, preventing infections associated with healthcare, preventing patient falls, and ensuring safe surgical procedures ***(Joint Commission on Accreditation of Healthcare Organizations, 2023).***

In both healthcare and community settings, nurses' primary goals are to avoid injuries and help individuals who have been harmed. In a hospital, nurses need to be aware of the components that make a safe environment for patients or groups. Accidents caused by behavior among people can be prevented **(*Berman et al., 2021*)**.

The importance of patient safety on a global scale is growing, and nurses face numerous challenges every day as they work to provide patients with safe healthcare. The total quality of healthcare is improved when patient safety is improved since it can be considered as a component of quality. It is the professional duty and responsibility of nurses, both individually and collectively, to safeguard all patients from possible danger **(*Bassuni et al., 2021*)**.

Patient safety is a healthcare priority that has emerged as a result of the advancement of healthcare systems and the subsequent increase in concerns about the provision of safe care for patients in healthcare facilities. The objective is to mitigate and reduce the hazards, inaccuracies, and injuries that patients experience during medical care. The fundamental concept underlying safe patient care is to improve the quality of patient care and ensure the safety of treatments by utilizing research on errors and adverse events. Therefore, healthcare services worldwide must be characterized by efficiency, safety, and a strong focus on the needs and well-being of individuals. Furthermore, to realize the benefits of high-quality healthcare, healthcare services must be delivered in a timely, fair, coordinated, and effective manner ***(Machitidze et al.,2023).***

Establishing a culture of patient safety is a key objective in clinical governance. A positive safety culture among nurses may lead to the early detection of hazards and mistakes that are unavoidable in the healthcare system. Therefore, improving healthcare personnel' perceptions of the patient safety culture in various organizations worldwide is important (***Biresaw et al., 2020).***

Significance of the study

Global cardiovascular disease (CVD) was responsible for approximately 19.1 million deaths in the year 2020. The age-standardized mortality rate per 100,000 individuals was 239.8**(*American Heart Association, 2022*)**

Based on the world health statistics of 2022, it is estimated that CVD are responsible for 28% of all deaths in Egypt **(*World Health Statistics 2022).***

According to statistics from the cardiothoracic care unit at Beni-Suef University Hospital, there were approximately

158 cases of patients admitted for open heart surgery in the years 2022 and 2023year**.**

In Egypt, various studies have been conducted in the field of patient safety. However, there has been less focus on assessing nurses' knowledge, practice, and attitude regarding patient safety goals after open heart surgery.

AIM OF THE STUDY

The study aims to assess nurses' performance regarding patient safety goals after open heart surgery through:

1. Assess the nurses' level of knowledge regarding patient safety goals after open heart surgery.
2. Assess the nurses' level of practice regarding patient safety goals after open heart surgery.
3. Assess the nurses' attitudes regarding patient safety goals after open heart surgery.

Research Questions:

1. What is the level of nurses' knowledge regarding patient safety goals after open heart surgery?
2. What is the level of nurses' practice regarding patient safety goals after open heart surgery?
3. What is the level of nurses' attitude regarding patient safety goals after open heart surgery?
4. Is there correlation between nurses' knowledge, practice and their attitude?

SUBJECTS AND METHODS

Research design:

A descriptive research design was utilized in this study.

Setting:

This study was conducted at both the cardiothoracic intensive care unit and the cardiothoracic department at Beni-Suef University Hospital. The cardiothoracic intensive care unit consisted of 3 rooms with 11 beds, while the cardiothoracic department had 3 rooms with 12 beds.

Subjects:

A convenience sample comprised of all available nurses (n=60) was included in the study. Participants included 26 nurses from the cardiothoracic department and 34 nurses from the cardiothoracic intensive care unit.

Tools of data collection:

The researcher developed three tools to gather data relevant to this study. The tools used are:

Nurses'self-administered questionnaire:

It was developed by the researchers in Arabic after reviewing the related literatures and includes the following parts:

Part one:

It was concerned with assessing the sociodemographic data of nurses, including age, gender, level of education, marital status, years of experience, and training courses).

Part two:

This tool was developed by the researchers after reviewing relevant literatures ***(Hinkle & Cheever, 2018; Berman et al., 2020)*** to assess nurses' knowledge regarding patient safety goals after open heart surgery.

It is concerned with the assessment of the following:

- Knowledge related to the anatomy of the heart and coronary arteries (4 questions).
- Knowledge about open-heart surgery, including its definition, purpose, and indications (5 questions).
- Knowledge related to instructions for patients undergoing open-heart surgery before hospital discharge (9 questions).
- Knowledge related to the preparation for open-heart surgery (4 questions).

- Knowledge related to potential complications after open-heart surgery (7 questions).
- Knowledge related to nursing care before open-heart surgery (14 questions).
- Knowledge related to nursing care after open-heart surgery (27 questions).
- Knowledge related to patient safety goals after open-heart surgery (14 questions).

Scoring system:

Each item was assigned a score of either 0 for an incorrect answer or 1 for a correct answer. The cumulative score of all items was 84, as follows

- Satisfactory knowledge (>75 %).
- Unsatisfactory knowledge (<75%).

II. Nurses practice observational checklist:

It was adapted from ***(Berman et al., 2020 and Lynn, 2022)*** and used to assess nurses' practice regarding patient safety goals after open heart surgery. It comprised the following:

- Patient identification. (7 items)
- Medication administration (9 items)
- Effective communication (10 items),
- Time out (before incision of skin) (4 items)
- Prevention of infection (7 items)
- Fall prevention (8 items).

Scoring system:

The scoring system for practice was assigned as follows: (0) for not done, (1) for incompletely done, and (2) for completely done. The overall score for all items was 90, as follows:

- Competent practice (>90%)
- Incompetent practice (<90%)

III. Nurses' attitude Likert scale:

It was adapted by ***Ali et al. (2018)*** it was used to assess nurses' attitudes toward patient safety goals after open heart surgery.

The scale was modified by the researchers after reviewing relevant literatures. It consisted of a 5-point Likert scale with 22 items, where responses were graded as strongly agree, agree, neutral, disagree, and strongly disagree.

Scoring system:

The scoring of attitude items was based on a five-point Likert scale.

- Strongly disagree =1
- Disagree=2
- neutral=3
- agree=4
- Strongly agree=5

The overall score of all items was 110, as follows:

- Positive attitude (≥80%).
- Negative attitude (<80%).

Administrative design:

Authorization was acquired from the medical director and nursing directors of Beni-Suef University Hospital, where the study took place.

Ethical considerations:

The scientific and ethical committee of the Beni-Suef University Faculty of Medicine gave their approval for the study. The researcher explained the study's purpose and objectives to the participating nurses. The researchers were committed to protecting the privacy of the subjects and their data. Participants were informed of their right to withdraw from the study at any time and provided written consent to participate.

Preparatory phase:

It involved gathering theoretical knowledge about the study's various aspects through literatures reviews, articles, internet searches, and magazines. This knowledge was used to

develop data collection tools. The study was implemented in the cardiothoracic intensive care unit and cardiothoracic department at Beni-Suef University Hospital after obtaining formal approval through a letter submitted from the Faculty of Nursing Beni-Suef University to the hospital administration. The researcher and the nurses met to discuss the study's goals and nature.

Tools validity and reliability:

Content validity:

The tools were revised for content validity by a jury of five assistant professors expertise in medical-surgical nursing from the Faculty of Nursing, Beni-Suef University. The tools were reviewed for clarity, relevance, comprehensiveness, simplicity, and applicability. Minor modifications were made as required.

Testing reliability:

The reliability of the data collection tools was tested using Cronbach's alpha coefficients as the self-administered questionnaire (knowledge) had an alpha coefficient of 0.935, the observational checklist (practice) had an alpha coefficient of 0.748, and the attitude scale had an alpha coefficient of 0.782. These results indicate good internal consistency of the data collection tools.

Pilot study:

A pilot study was conducted on 10% of the total number of nurses being studied to assess the suitability, clarity, and effectiveness of the tools. Minimal modifications were made based on the analysis results. Therefore, the nurses who participated in the pilot study were included in the study sample.

Fieldwork:

Consent was acquired from the hospital directors and nursing directors. The fieldwork and data collection process spanned six months, from beginning of August 2023 to end of June 2024. The study's objective was communicated to the nurses, who provided informed consent prior to data collection. The researcher collected data on a rotating basis alternating between morning and afternoon shifts. The observational checklist was done firstly to assess nurses' practice regarding patient safety goals after open heart surgery. Direct observations of each nurse 'performance were conducted for six specified procedures included in the study. As regards self-administered questionnaire it was distributed by researcher to all nurses. The time allowed to fulfilled within approximately 45minutes. Finally, the researcher distributed nurses' attitude Likert scale to all nurses participated in the study. It took about 15 minutes.

Statistical Design:

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS 22.0) to obtain descriptive statistics in the form of frequencies and percentages for categorical variables. Continuous variables were analyzed using means and standard deviations. The Pearson correlation coefficient (r) was used to measure the degree of association between numerical variables. Chi-square tests (χ^2) were employed to determine correlations between categorical variables. A significance level of $p < 0.05$ was set."

RESULTS

Table 1. showsthat70% of the studied nurses were male, aged between twenty and thirty years, with a mean age of 24.21 ± 5.94 years. Regarding marital status, 78.3% of the studied nurses were single. Concerning their qualifications, 66.7% of the studied nurses graduated from nursing technical institutes. Regarding their experience, 83.3% of the studied nurses had less than five years of

experience in nursing in work, and 61.7% had less than two years of experience in the cardiothoracic unit.

Figure 1: Illustrates that 58.3% of studied nurses had satisfactory levels of knowledge regarding patient safety goals after surgery of open heart.

Figure 2: Illustrates that 98.3% of nurses in the study had incompetent practice level related to patient identification, effective communication, prevention of infection and fall prevention. While 100% of the studied nurses had incompetent level of practice regarding medication administration and time out.

Figure 3: Illustrates that 88.3% of studied nurses had positive attitudes towards patient safety goals after open heart surgery.

Table (2):

Displays that a significant positive correlation between nurses' knowledge and practice, knowledge and attitude as well between nurses' attitude and their practice with the following r and p value (0.547 / 0.000, 0.449 /0.000 and 0.509 /0.000) respectively.

Table (3): Summarizes that is a significant statistical relation between studied nurses' knowledge and their gender (P=0.046) and between knowledge and training (P=0.024).

Table (4): Showes that is no statistically significant relation between the studied nurses' practice and their sociodemographic characteristics.

Table (5): Reveals that is statistically significant relation between studied nurses' attitude and their nursing qualification (P = 0.023).

Table (1): Frequency distribution of studied nurses' socio demographic characteristics (n=60).

Socio demographic Characteristics	No.	%
Age (years)		
– Less than 20	3	5
– 20 < 30	53	88.3
– 30 < 40	4	6.7
Mean±SD	24.21±5.94	
Gender		
– Male	42	70
– Female	18	30
Marital status		
– Single	47	78.3
– Married	13	21.7
Nursing Qualifications		
– Nursing Technical Institute	40	66.7
– Bachelor of Nursing	20	33.3
Experience in Nursing (years)		
– Less than 5	50	83.3
– 5 < 10	10	16.7
Mean±SD	3.24±2.08	
Experience in Cardio-thoracic Unit (years)		
– less than 2	37	61.7
– 2 < 4	18	30
– Four and more	5	8.3
Mean±SD	2.07±1.40	

Training courses on patient safety goals after open heart surgery		
– Yes	22	36.7
– No	38	63.3

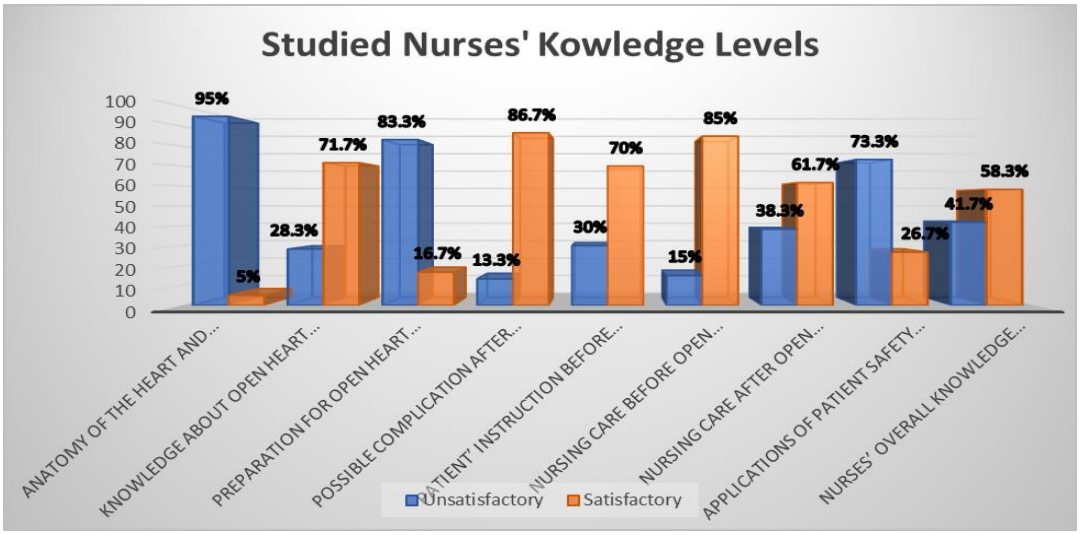

Figure 1. percentage distribution of studied nurses' knowledge regarding patient safety goals after open heart surgery (n=60).

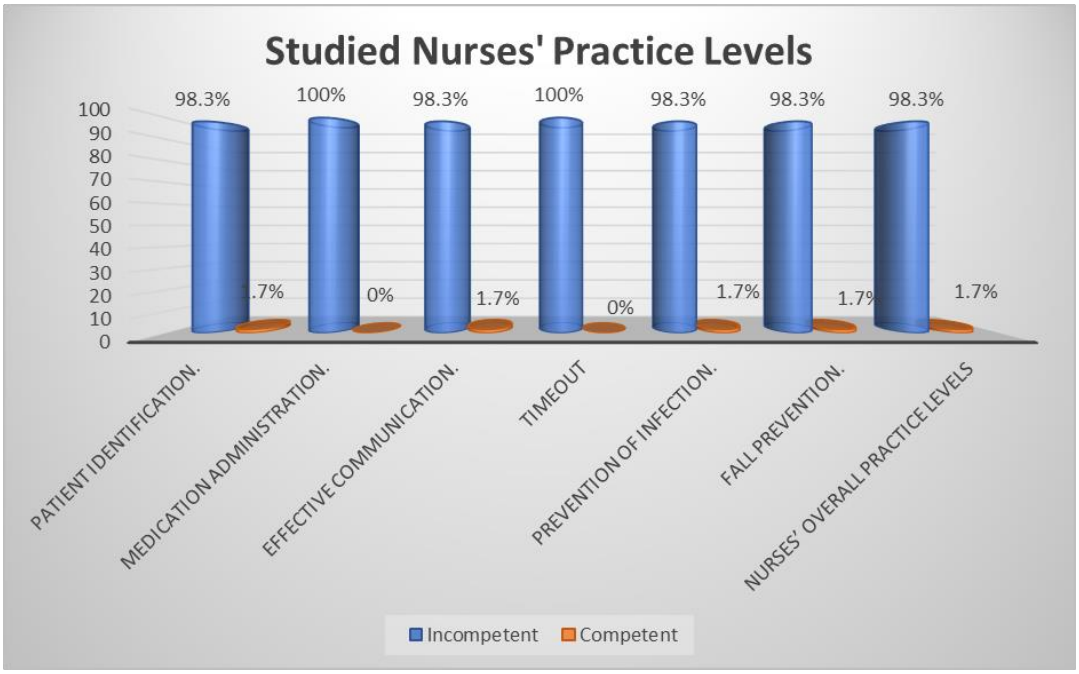

Figure (2): percentage distribution of studied nurses' practice levels regarding patient safety goals after open-heart surgery (n=60).

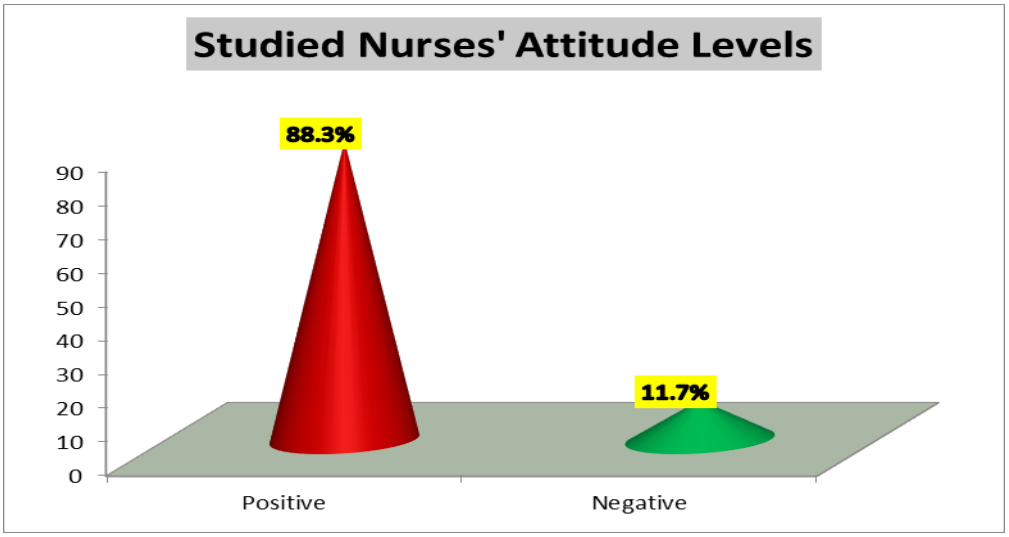

Figure 3. percentage distribution of nurses' attitudes toward patient safety goals after open heart surgery (n=60).

Table (2): Correlation between study variables (n=60).

Variables		Overall Practice	Overall Attitude
Overall Knowledge	***R***	0.547	0.449
	P-Value	0.000**	0.000**
Overall Practice	***R***		0.509
	P-Value		0.000**

***r*:** Pearson Correlation Coefficient. ** Correlation is significant at the 0.01 level

Table (3): Relationship between sociodemographic characteristics and knowledge levels of nurses (n=60).

Socio demographic Characteristics	Knowledge Levels				χ^2	P-value
	Unsatisfactory		Satisfactory			
	No.	%	No.	%		
Age (years)						
– Less than 20	1	1.7	2	3.3	3.228	0.199
– 20 < 30	24	40	29	48.3		
– 30 < 40	0	0	4	6.7		
Gender						
– Male	21	35	21	35	4.000	0.046*
– Female	4	6.7	14	23.3		
Marital status						
– Single	22	36.7	25	41.7	2.369	0.125
– Married	3	5	10	16.7		
Nursing Qualifications						
– Nursing Technical Institute	19	31.7	21	35	1.680	0.195

Socio demographic Characteristics	Knowledge Levels				χ^2	P-value
	Unsatisfactory		Satisfactory			
	No.	%	No.	%		
– Bachelor of Nursing	6	10	14	23.3		
Experience in Cardio-thoracic Unit (years)						
– Less than 2	17	28.3	20	33.3	0.799	0.671
– 2 < 4	6	10	12	20		
– Four and more	2	3.3	3	5		
Experience in Nursing (years)						
– Less than 5	22	36.7	28	46.7	0.672	0.412
– 5 < 10	3	5	7	11.7		
Training						
– Yes	5	8.3	17	28.3	5.126	0.024*
– No	20	33.3	18	30		

Table (4): Relationship between sociodemographic characteristics and practice levels of nurses (n=60).

Socio demographic Characteristics	Practice Levels				χ^2	P-value
	Incompetent		Competent			
	No.	%	No.	%		
Age (years)						
– Less than 20	3	5	0	0	0.134	0.935
– 20 < 30	52	86.7	1	1.7		
– 30 < 40	4	6.7	0	0		
Gender						
– Male	41	68.3	1	1.7	0.436	0.509
– Female	18	30	0	0		
Marital status						

Socio demographic Characteristics	Practice Levels				χ^2	P-value
	Incompetent		Competent			
	No.	%	No.	%		
– Single	46	76.6	1	1.7	0.281	0.596
– Married	13	21.7	0	0		
Nursing Qualifications						
– Nursing Technical Institute	39	65	1	1.7	0.508	0.476
– Bachelor of Nursing	20	33.3	0	0		
Experience in Cardio-thoracic Unit (years)						
– Less than 2	36	60	1	1.7	0.632	0.729
– 2 < 4	18	30	0	0		
– Four and more	5	8.3	0	0		
Experience in Nursing (years)						
– Less than 5	49	81.7	1	1.7	0.203	0.652
– 5 < 10	10	16.6	0	0		
Training						
– Yes	22	36.7	0	0	0.589	0.443
– No	37	61.6	1	1.7		

Table (5): Relationship between sociodemographic characteristics and nurses' attitudes

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Socio demographic Characteristics	Attitude Levels				χ^2	P-value
	Positive		Negative			
	No.	%	No.	%		
Age (years)						
– Less than 20	3	5	0	0	1.047	0.593
– 20 < 30	46	76.7	7	11.7		
– 30 < 40	4	6.7	0	0		
Gender						
– Male	38	63.3	4	6.7	0.624	0.430
– Female	15	25	3	5		
Marital status						
– Single	13	21.7	0	0	2.192	0.139
– Married	40	66.6	7	11.7		
Nursing Qualifications						
– Nursing Technical Institute	38	63.3	2	3.3	5.175	0.023*
– Bachelor of Nursing	15	25	5	8.3		
Experience in Cardio-thoracic Unit (years)						
– Less than 2	30	50	7	11.7	4.926	0.085
– 2 < 4	18	30	0	0		
– 4 and more	5	8.3	0	0		
Experience in Nursing (years)						

– Less than 5	43	71.7	7	11.7	1.585	0.208
– 5 < 10	10	16.6	0	0		
Training						
– Yes	19	31.7	3	5	0.131	0.718
– No	34	56.6	4	6.7		

DISCUSSION

Nurses play a vital role in providing care for patients who have undergone open-heart surgery. The global significance of patient safety is increasing, and nurses encounter numerous obstacles daily in ensuring the provision of secure healthcare for their patients. Both as a group and as individuals, nurses have a professional obligation and responsibility to safeguard all patients from any potential harm **(*Sani et al., 2024*).**

Part I: Socio demographic characteristics of the studied nurses

The present study revealed that the majority of studied nurses were in the age group of twenty to thirty years. This might be because newly graduated nurses are appointed in coronary care units, which can tolerate the nature of work in this area. These results agree with ***Mamdouh et al (2020)*** who stated that three-quarters of nurses in the intensive care unit were aged between twenty and thirty years old. However, they disagree with ***Soliman et al (2020)*** who stated that half of the studied nurses were aged from 30 to 40 years old.

This study indicated that more than half of the nurses in the study were male. This might be because male nurses tend to have greater influence on career advancement and often work in more specialized fields like in operating room, the emergency department, and critical care unit. In line with ***Khoram et al (2020)*** who found that most of their study group was male, these findings contrast with ***Shahin et al (2020)*** who revealed that nearly two-thirds of the nursing staff were female, reflecting the traditionally feminine character of the nursing profession.

Regarding educational level, the present study indicated that two-thirds of nurses held a technical nursing degree, consistent with ***Twagirayezu et al (2021)*** who found that more than half of nurses working in intensive care units held a technical nursing degree. These findings contrast with ***Hamed et al (2023)*** who reported that half of the nurses held a bachelor of Nursing Science.

Concerning years of experience, the present study revealed that the majority of nurses had less than five years of experience. This finding is supported by ***Attia et al (2021)*** who found that more than half of the staff nurses studied had less than five years of experience. However, it contradicts the findings of ***Ahmed et al (2022)*** and ***Hamed et al (2023)*** who reported that more than half of the studied nurses had more than five years of experience.

Regarding training programs, the present study found that two-thirds of nurses had not participated in any training program. This might be due to un availability of training

courses regarding patient safety goals after open heart surgery.

This finding is supported by ***Abd Elglil et al (2019)*** who reported that the majority of nurses did not attend training courses.

Part II: Nurses' knowledge regarding patient safety goals after open heart surgery.

Regarding nurses' level of knowledge about caring for patients post open-heart surgery, the current study revealed that more than two-thirds of nurses had a satisfactory level of knowledge regarding the structure and function of the heart, coronary artery, and patient safety. this might be related to the age of participants, as they are fresh graduates and still refreshed with information. This finding was supported by ***Solima et al (2020)*** who found that more than two-thirds of the nurses in their study had a satisfactory level of knowledge. However, it is inconsistent with ***Abd Elgalil et al (2019)*** found that majority of studied nurses had an unsatisfactory level of knowledge regarding patient safety. Additionally**,** ***El Desouky et al (2020)*** who showed that nurses' understanding of cardiac anatomy and care for patients who had coronary artery bypass graft surgery was unsatisfactory.

Part III: Nurses' practice regarding patient safety goals after open heart surgery.

The study revealed that almost all studied nurses demonstrated incompetent levels of practice regarding patient safety goals after surgery oh open heart. This might be attributed to a lack of experience, as they had not attended any training program on patient safety goals and absence of safety guidelines or patient safety goals checklist and low level of education in addition to un availability of training courses regarding patient safety goals after open heart surgery.

This finding aligns with to that of ***Ahmed et al (2022)*** who reported that two-thirds of the studied nurses exhibited incompetent levels of practical skills related to patient safety goals. Moreover, this result contradicts the study by ***Ayyad et al (2024)*** which showed that most nurses displayed good patient safety practices, potentially due to their positive levels of knowledge and attitudes.

Part IV: Nurses' Attitude regarding patient safety goals after open heart surgery.

The current study revealed studied nurses' attitudes towards patient safety goals after open heart surgery; most of the studied nurses had positive attitudes. This might be due to knowledge and experience sharing among them as teamwork among professionals plays an important role in ensuring patient safety and creating a positive culture.

This finding was supported by ***Ayyad et al (2024)*** who found that majority of the participants demonstrated a positive attitude towards patient safety.

Part (V): Relation and Correlation between study variables

Regarding correlation between nurses' knowledge, practice and attitude. The current study revealed that there were significant statistic positive correlations between nurses' knowledge and their practice, between knowledge and attitude, and between nurses' attitude and their practice. This might be due to a natural progression from increased technical competence to increased cognitive ability. The finding aligns with ***Soliman et al (2020)*** who found that there was a statistically significant positive correlation between the total level of knowledge between nurses in the current study and their total level of practice and attitude.

Regarding to the relation between demographic characteristics and studied nursing knowledge. The current study revealed a statistically significant relation between the gender of the studied nurses and their level of knowledge, as well as between knowledge and training. These findings support those of ***Mamdouh et al (2020)*** who reported similar results. However, they contradict the findings of ***Abd elgalil et al (2019)*** who found no statistically significant relation between nurses' knowledge and their demographic characteristics.

Regarding to the relation between demographic characteristics and studied nursing practice, the current study revealed no statistically significant relation between studied nurses' practice and their demographic characteristics. This is consistent with the findings of ***Fathy et al(2022)*** who reported no statistically significant relation between the total nurses' practice level regarding patients' safety measures in the operating theater and their demographic characteristics. These findings contradict those of ***Mamdouh et al (2022)*** who reported a high statistically significant relation between nurses' practice and their demographic characteristics.

Regarding to the relation between demographic characteristics and attitude of nurse, the current study revealed a statistically significant relationship between nurses' attitude and their nursing qualification. This finding supports by ***Soliman et al (2020)*** who found the same result and disagreed with ***Ali et al (2018)*** findings that reported no significant relation between nurses' characteristics and attitude.

CONCLUSION

According to the results of the present study, it has been found that the majority of studied nurses demonstrated a satisfactory level of knowledge and positive attitudes toward patient safety goals after open heart surgery. However, almost all exhibited incompetent levels of practice regarding patient safety goals in this context. Moreover, a statistically significant positive correlation was found between nurses' overall knowledge, practice, and attitude levels.

RECOMMENDATIONS

Based on the current study's findings, the following recommendations are suggested:

- Continuous in-service training programs to enhance nurses' performance in the critical management of post-operative care for patients undergoing open-heart surgery.
- Development of standard nursing procedures booklets addressing patient safety goals after open-heart surgery.
- Replication of the study on a larger sample selected from different geographical areas of Egypt.
- Continuous evaluation of nurses' knowledge and practice to identify their needs in cardiothoracic care units regarding patient safety after open-heart surgery.
- Creation and implementation of an educational program to improve nurses' knowledge, practice, and attitude regarding patient safety after open-heart surgery.
- Continuous supervision for nurses in the critical care unit who are responsible for caring for patients who have undergone open-heart surgery.

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