Effect of Educational Program on Nurses' Performance for Patients Undergoing Cardiothoracic Surgery

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Abstract

Background: Cardiothoracic surgery is a branch of medicine that deals with diseases of chest organs, including the lungs and the heart. Cardiothoracic surgery patients are provided perioperative care to ensure better outcomes and minimal complications after surgery as surgical wound infection, which is considered one of the commonest healthcare-related infections that poses an impact on patients' safety. Nursing knowledge and performance play a critical part in preventing infection. **Aim**: assess the effect of an educational program on nurses' performance for patients undergoing cardiothoracic surgery. **Research design:** A Quasi-Experimental study was used. **Setting:** The study was conducted in the cardiothoracic surgery ward at New Surgical Hospital and the International Educational Hospital of Tanta University. **Subjects:** the study involved all nurses who were hired in the stated settings; 60 nurses were divided to (30) in each setting. **Tools:** the used tools were two, Tool **(I) part (I)"** Assessment Structured Questionnaire ", **Part (II)**: Nurses' knowledge assessment sheet, and **Tool (II)** "Nursing Care Observational Checklist". **Results**: nurses' knowledge improved, as (70%) had a low level before the program and improved to a good level (96.67% and 93.33%) respectively after program completion. Also, nurses' performance (61.67%) improved from expert to proficient level (100% and 98.33%), respectively, after the program. **Conclusion**: The educational program positively changed the nurses' knowledge and performance towards the care of cardiothoracic surgery patients. **Recommendation**: Conducting In-service educational programs is essential for nurses to increase knowledge and improve performance regarding patient care, to reduce complications.

Keywords: cardiothoracic surgery, educational program, nurses' knowledge, performance.

Introduction

The Cardiothoracic surgery field is a medical specialty that surgically manages lung illness, organs located within the thoracic cavity, the heart, and other thoracic or mediastinal structures. **(Caçador, 2022)** This specialty is expanding the restrictions of medical intervention, allowing for the treatment of previously untreatable heart and lung diseases. **(Grant, 2022)** However, the developments in cardiothoracic surgery are associated with challenges, especially concerning postoperative complications. Surgical site infections (SSIs) post open chest surgeries are considered a critical concern, causing significant risks to patient recovery and general health outcomes**. (Giacobbe et al., 2019).** It is considered challenging to determine the rate of infection incidence in cardiothoracic surgery patients; however, the reported incidences range from 3.5% to 26.8%. **(Wei, He, Weng, Huang, & Teng,. 2021).** Effectiveness of While in Egypt, the incidence of wound infections after cardiothoracic surgery is about 0.4-4%. **(Elgariah & Omran, 2024).** Nurses are uniquely positioned to participate in or supervise efforts intended to lower the number of cases of SSI and enhance safety for patients. Dissimilar to other medical care providers, nursing providers give the majority of their day to their clients, and they are in charge of many SSI prevention programs. By developing the provided service's quality, by addressing inappropriate provision of antibiotics prophylaxis, inadequate washing of hands, inappropriate wearing and removing of protective clothing, improper preparation of the skin procedures, as well as proper application of various Surgery safety checklists, staff nurses can play an important part in preventing infections. **(Shaheen & Hawash, 2021).** Various studies indicate that appropriate procedures for the preventing infection between nurses are influenced by certain limitations, like insufficient expertise, funds, and surgical site infection prevention recommendations, inadequate active leadership engagement, inadequate time for improvements operations, lack of time for training and education, lack of effective staff interaction, inadequate understanding of the necessity to handle issues, nonattendance or failing to comply with educating programs, lack of either local accepted protocols, or a practice guide for preventing surgical site infection. **(Leaper, Rochon, Pinkney & Edmiston, 2019)**. So the

study was carried out to improve knowledge and performance of nurses to improve patient clinical outcomes and prevent post-operative SSIs and their associated complications and problems to patients and the health care facility.

Significance of the study: Cardiothoracic surgery affects the physiology and psychology of patients as well as postoperative recovery, complications, and possibility of surgical wound infection, which leads to significant problems for patients, including increased costs, period of hospitalization, disease prevelance, and mortality. So enhance nursing staff knowledge and performance related to preventing cardiothoracic surgery complications, which will lead to improving patient clinical outcomes, reducing the incidence of site infection post cardiothoracic surgery.

Aim of the study

Assess impact of the education program on nursing staff performance with cases undergoing cardiothoracic surgery.

Research Hypothesis

-Nursing staff knowledge and performance related to cardiothoracic surgery site infection are expected to improve after having the educational program. The

-Competency of staff nurses in performing nursing care to minimize infection post cardiothoracic surgery will be improved after the educational program.

Subjects and methods

The study is conducted using a quasi-experimental research design.

Setting

The study is conducted in the cardiothoracic surgery wards at New Surgical Hospital and Tanta University Educational Hospital, affiliated with the Minister of Higher Education and Scientific Research.

Subjects

All nurses hired in the stated settings that were present at the time of collecting data, nearly 60 nurses (30) in each setting.

Tools of data collection

Two tools were used: -

Tool I: Assessment Structured Questionnaire: - This tool was developed by the researcher after reviewing the literature **(Sickder et al., 2014)**, and it consists of two parts:

Part one: Nurses' socio-demographic data

That consists of: Sociodemographic data, including the age, sex, residence, marital status, the level of education, years of experience, previous site of working, and attendance of training sessions.

Part two: Nurses' knowledge assessment sheet

This part was developed by the researcher based on **(McDonald, 2002)** to help evaluate the knowledge of nurses related to caring of cardiothoracic surgery patients to prevent infection. The assessment sheet included 37 closed-ended multiple-choice questions (MCQ).

The Scoring system: - the score is as follows: Correct complete (2), Correct incomplete (1), and wrong answer or an incomplete answer (0).

The knowledge assessment questionnaires' scoring system were calculated also classified as follows: (60.00 – < 70 %) will be considered as low level of knowledge, (70.00 – < 80 %) will be considered as a fair level of knowledge, and (80 – 100%) will be considered as a good knowledge level

Tool (II):- Nurses' Performance Observational Checklist. the tool was developed by the researcher after the review of relevant literature **(Sickder et al .,2014; Senst et al., 2022)** used to assess nursing staff performance relating to preventing cardiothoracic surgery infection in pre and post-operative periods. The researcher completed an observational checklist pre-, post-immediate, also following two months of the program. It includes 2 main categories:

I: Preoperative care as hand washing and skin preparation, shaving, showering, oxygen supplementation, and antibiotic prophylaxis.

II: postoperative care as wound care using aseptic precaution, chest tube care, arterial line care, central line care, wound care, and monitoring of surgical site infection.

The scoring system: the score was as follows: correct practice (1) while the incorrect (zero), the overall score has been classified as (< 60.00) considered as Improper level of practice and (60 – <75) considered as Master level and (75–< 85) as Expert level and (85.00 or more) as Proficient level of practice.

Ethical considerations

-The studied nursing staff was informed that their participation was voluntary, and they were also notified that they could withdraw at any time during the study.

-Informed consent is taken from each participant nurse following the explanation of study's aim.

-Confidentiality, privacy relating to obtaining data was considered.

-The faculty's ethical committee approval was obtained prior to conducting the study.

Methods of data collection

- Each tool used in our study was tested for reliability using alpha

Cronbach's test and found to be 0.781 for tool I, 0.922 for tool II, and 0.878 for the sheet in total, which shows high reliable tools, when alpha Cronbach was >0.5.

- The study's tools were assessed for their content validity also clarity by a medical-surgical nursing faculty's five experts, as well as cardiothoracic surgery professors, and accordingly, needed modifications were made.

-A pilot study was carried out prior to the conduction of the study on about (10%)of the nurses, to help assess the feasibility, clarity, also test for the relevance and applicability of the various tool to identify barriers which could occur while collecting data; consequently, important changes were made prior to the main study.

- Study data were obtained for about 7 months, starting in November 2024 to May 2025

-The study has been done via four phases (the assessment, planning, implementation, and evaluation).

I: Assessment phases

Nurses' knowledge related to prevention of cardiothoracic surgical site infection was tested three times before, immediately after, and 2 months post the educating program by utilizing Tool (1) part (2)

II: Planning Phase

The PowerPoint and a booklet were prepared by the researcher. The booklet was provided to participant nurses following each session, also the PowerPoint presentation was utilized.

III: Implementation phase

An educational program for nursing staff concerning the perioperative care for preventing cardiothoracic surgical site infection had been developed and given by the researcher, depending on predetermined needs, reviewing related literature, research, and anticipated outcomes.

Objectives: To increase nurses' knowledge and improve performance in caring for cardiothoracic surgery cases.

Educational methods and aids

The Educational aids comprise: - booklet, also PowerPoint presentations were used as teaching aids.

Educational methods include group discussion, demonstration, and re-demonstration.

Educational session: - was provided for every involved nurse, and was distributed on 5 groups (12) nurse in every group, sessions were implemented over two sessions 60 minutes for everyone, including 5-15 minutes for group discussion and giving feedback, and 35 minutes for

explaining instructions and the re-demonstration of the theoretical and the practical part.

The session's content is as follows:

The theoretical part: -

To orient the nurses regarding the significance of the program, the sessions, and the expectation of different sessions.

First session

Contents: orientation about the program, title expectation, simple explanation of the anatomy and physiology of the cardiovascular system. Definition, Causes, Risk factors, Types of complications of cardiothoracic surgical site infection and nutrition support, and prevention of cardiothoracic surgical site infection, pre-operative skin preparation.

Second session: :(practical part)

To help nurses master preoperative and postoperative nursing measures to reduce surgical site infection post cardiothoracic surgery.

Contents: hand hygiene and skin preparation, shaving, showering, antibiotic prophylaxis, surgical wound care with aseptic precaution, chest tube care, arterial line care, central line care, wound care, and monitoring of the surgical site infection.

VI: Evaluation Phase

Tool I part two and Tool II will be utilized prior to and following implementation of the program; a comparison will be made among the findings of pre- and post-immediate and two months later to examine the influence of the educational program on nursing knowledge and performance relating to cardiothoracic surgical site infection.

Statistical analysis

The analysis and the Statistical presentation of the study were done by the utilization of the standard deviation, range, and mean for quantitative data, the comparison of the groups for the qualitative data is performed through the **chi-square test**, and the correlation among the quantitative variables in one group **was found using the paired samples t-test**. The Significant level: is > 0.05, the non-significant is < 0.05, and

< 0.001* is highly significant

Results

Table (1) demonstrates the distribution of the participant nurses depending on socio–demographic characteristics. The results showed that (53.33%) of nurses are (20 - < 30) years with a mean (35.15±12. 084). In **relation to sex**, it was found that (100%) were females. **Concerning marital status**, the results indicated that about three-quarters (85%) of nurses were married, (15%) were single. **Concerning educational level**, it is

found that (40%) of nurses have graduated with a Bachelor's level of education. **In relation to experience in general nursing,** the result showed that more than one quarter (29.17%) of the sample had an experience from (5 - > 10) years, whereas about one third (38.33%) had more than 10 years' working in the cardiothoracic surgery nursing department.

Table (2): Clarify the distribution of nurses concerning the knowledge score regarding the care of cardiothoracic surgery to prevent infection throughout the periods of study. Results showed about (70%) of the nursing attained low knowledge before the program, whereas (96.67% and 93.33%) respectively, had good knowledge in the post-test periods (immediate and post two months). The study indicated a significant statistical difference at the level P<0.05.

Table (3): shows the assessment of the performance level of nurses about preventing cardiothoracic surgery infection throughout the periods of study. Concerning the total level of performance, it is noticed that (61.67%) of nurses found in the Expert range of performance before the program implementation, whereas (100% and 98.33%) respectively had a Proficient practice in the immediate and post two-month tests. A significant statistical difference was found at the level P<0.05.

Figure (1): Distribution of nurses according to their knowledge regarding care of cardiothoracic surgery patients to prevent infection throughout the periods of the study**.** It has been noticed that (70%) of participants had low knowledge related to care of cardiothoracic surgery patients to prevent infection in the pretest period, while (96.67% and 93.33%) respectively had good knowledge in two posttest periods (immediately and 2months) after the program completion.

Figure (2): shows the assessment of the performance level of the studied nurses concerning preventing cardiothoracic surgery wound infection throughout periods of study**.** shows (61.67%) of nursing staff showed an expert performance related to the prevention of cardiothoracic surgery site infection, and all (100% and 98.33%) respectively had a proficient level of performance in the two posttest periods (immediate and post 2 months).

Table (1): Distribution of nurses according to Socio–Demographic data.

Characteristics	The study nurses (n=60)	
	N	%
Age (in years)		
- (20-<30)	32	53.33
- (30-<40)	7	11.67
- (40-<50)	6	10.00
- (50-60)	15	25.00
Range	**(22-60)**	
Mean ± SD	**35.15±12.084**	
Gender		
- Female	60	100.00
Residence		
- Urban	26	43.33
- Rural	34	56.67
Marital status		
- Married	51	85.00
- Single	9	15.00
Educational level		
- Diplome	22	36.67
- Technical institute	14	23.33
- Bachelor	24	40.00
Previous work place		
- None	38	63.33
- Students Hospital	16	26.67
- Emergency Hospital	6	10.00
Present work place		
- New Surgery Hospital	30	50.00
- Global Teaching Hospital	30	50.00
Experience in nursing (in years)		
- < 5	25	41.67
- (5-10)	10	16.67
- >10	25	41.67
Range	**(1-40)**	
Mean ± SD	**13.60±12.922**	
Experience in cardiothoracic surgery department (in years)		
- < 5	32	53.33
- (5-10)	5	8.33
- >10	23	38.33
Range	**(1-35)**	
Mean ± SD	**10.85±10.655**	

Table (2) Distribution of nurses relating to the knowledge level regarding the care of cardiothoracic surgery to prevent infection throughout the periods of study.

Total knowledge level	The study nurses (n=60)						χ^2 P
	Pre		Immediate		After 2 months		
	N	%	N	%	N	%	
- Low	42	70.00	1	1.67	0	0.00	201.55 0.000*
- Fair	6	10.00	1	1.67	4	6.67	
- Good	12	20.00	58	96.67	56	93.33	
Range Mean ± SD	(41-51) 47.37±2.12		(50-74) 68.38±4.12		(50-73) 67.62±4.03		F=678.26 P=0.000*

Table (3) Assessment of the performance level of nurses in relation to preventing cardiothoracic surgery infection throughout the study.

Total performance level	The study nurses (n=60)						χ^2 P
	Pre		Immediate		after 2 months		
	N	%	N	%	N	%	
- Master	23	38.33	0	0.00	0	0.00	233.05 0.000*
- Expert	37	61.67	0	0.00	1	1.67	
- Proficient	0	0.00	60	100.00	59	98.33	
Range Mean ± SD	(68-89) 79.08±3.93		(103-105) 104.70±0.53		(94-105) 100.48±2.67		F=1488.34 P=0.000*

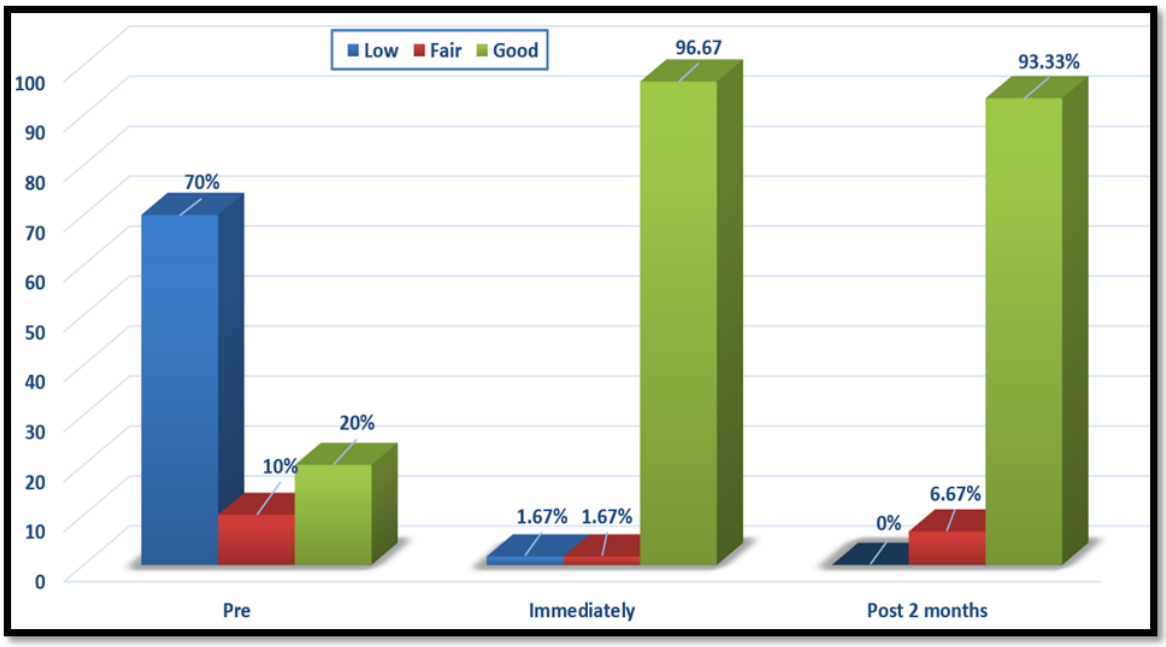

Figure (1): Distribution of nursing staff relating to the knowledge of care of cardiothoracic surgery patients to prevent infection throughout the periods of study.

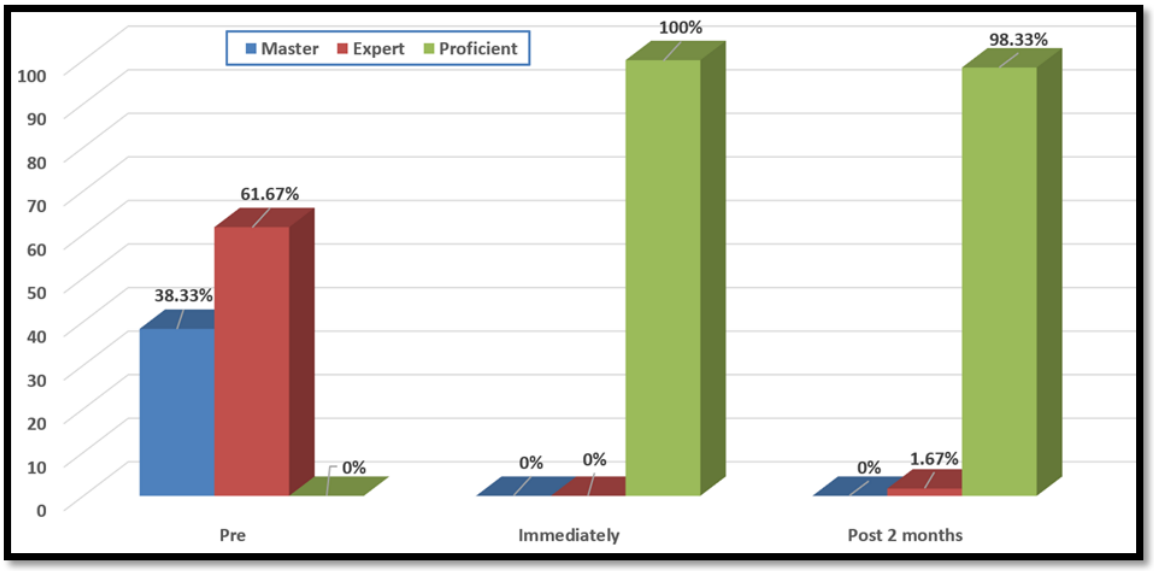

Figure (2) The assessment of the performance level of the nurses concerning preventing cardiothoracic surgical wound site infection throughout the study.

Discussion

Cardiothoracic surgery represents the basis of the management of a wide range of cardiovascular diseases, involving not just widely recognized coronary artery bypass grafting (CABG) or valve repair or substitution, but additionally operations as aortic aneurysm restoration, arrhythmia modification, and cardiac transplantation **(Sef & Raja, 2021)**. Based on statistics, around 1.5 million individuals get cardiothoracic surgery globally every year, and the prevalence of complications following the operation, particularly surgical wound infection, is a well-known complication among cardiothoracic procedures, accounting 0.4%-8.3% incidence rate. Cardiothoracic surgery surgical site infection significantly extends recovery time and frequently causes chest infections, increasing the possibility of dying, causing patients massive grief and suffering while also placing a major burden on relatives and community **(Joshi, Hsieh & Hassan, 2020).** Patient safety is an essential priority for every healthcare worker. They are all concerned with caring for patients. However, it is very important for nurses. They deliver healthcare activities to their clients twenty-four hours a day at hospital as well as other healthcare facilities. Nursing staff is regarded as the "heart and soul" of all hospitals. Nursing' skills and attitudes improve the prevention of infections, leading to better care for clients. **(McGaw et al.,2012)**

Concerning the socio-demographic data of nurses, according to our study, exceeding half (53.33 %) of nurses range from (20-30) years. This study is consistent with **(Gad Allah & Ahmed, 2024)** who clarified that more than half (57.5%) of nursing staff ages are within the range of (21 -30) years. This was inconsistent **with (Mengesha et al., 2020)** who found that (41.8%) of study participants were (>30) years. **In relation to sex,** the study results showed that all nurses (100%) were female. which is supported by **(Shaheen & Hawash, 2021),** who reported that all of the participants (100%) in the study were females. This was conversely disagreed by **(Teshager, Engeda & Worku, 2015),** which stated that (56.5%) of the nurses were male. **Regarding experience in cardiothoracic surgery nursing in this study,** it was found that (53.33%) of the study participants exceeded 5 years' experience in cardiothoracic surgery nursing. which was similar to **(Ahmed et al.,2025**), who recorded in their study that about (62.5%**)** of

the studied sample had exceeded 5 years working in the cardiothoracic surgery wards. **Concerning the education level**, the study recorded (40%) of the participating sample had a bachelor's degree in nursing, which was in contrast with **(Naji Msc, & Moussa, 2020).** While this finding where opposed by **(Shaheen & Hawash, 2021),** who reported that no (0%) nurses had a bachelor's degree in nursing**. Concerning the total level of knowledge in our study,** it was clarified that close to three-quarters (70%) of the sample had low knowledge regarding cardiothoracic surgery site infection and perioperative patient care before the program. The study specified a significant statistical difference (P-value < 0.05), with a Mean ± SD 47.37±2.12. This result is supported by **(EL-Azab, Mostafa & Abdelraouf, 2023)**, who reported that nurses have a poor total score of knowledge about the prevention of surgery site infection following open-heart. This is also in accordance with **(Gad Allah &Ahmed, 2024).** The study findings disagreed with the findings of **(Abd Elhay et al, 2016),** which showed that nearly most of (86.7%) of the studied nurses achieved a satisfactory knowledge relating to preventing surgical wound infection. **Regarding total knowledge level in two posttest periods (immediate and after 2months)** our current study showed that most of (96.67% and 93.33%) respectively of the studied nurses had improved knowledge to had a good level of knowledge relating to cardiothoracic surgery site infection also perioperative nursing measures with increases of the Mean ± SD 68.38±4.12 immediately after program completion and Mean ± SD 67.62±4.03 after two months of program completion. These results are congruent with **(Louis, 2019).** Who stated that nearly three-quarters (72.5%) of nurses showed excellent knowledge**.** this finding also supported by **(Abdelbayen, Elsanousi & Jais, 2025),** who reported that after the education program (74.7%) of the studied nurses scored excellent, and conversely this findings disagree with **(Jaddoue, 2015).** Who noticed that there is a decrease in nursing Knowledge concerning the main concept of wound care and methods of preventing postoperative surgical infections at the follow-up test compared to the previous tests. **In relation to nurses' total performance level, the** study's results illustrated that less than two-thirds (61.67%) achieved an expert score in the pre-test period of the study. This is consistent with

(Ayamba et al., 2022), who presented in their study nearly more than three-quarters (77.5%) of nurses had good performance concerning surgical site infection, as well as **(Joshi, 2014).** Who recorded that (89.95%) of the studied nurses got a high level of performance regarding the prevention of surgical site infection. Conversely, the findings of the current study disagree with **(Mohsen, Riad & Badawy, 2020).**, who declared that three-quarters of nurses had a low level of practice when studied compliance and barriers that face nursing staff with SSI prevention . **Concerning the total nurses' practice level regarding cardiothoracic surgery site infection prevention in the two post-test periods (immediate and after 2 months),** the current study declared that there is a noticeable improvement demonstrated in the post-program periods, as all (100% and 98.33%) respectively of nurses had proficient practice following receiving the program content. This finding is in accordance with **(Gad Allah & Ahmed, 2024).** Who announced that almost three-quarters (75%) of nurses got satisfactory score relating to nursing care of open heart procedures after the educational program application, also **(Aziz et al.,2025)** support these findings as he assessed nursing knowledge, attitudes, and practice on surgery site infection and reported that most nurses reported adherence to basic infection control measures. Conversely, these findings disagreed with the results of **(Teshager, Engeda & Worku, 2015).** Who studied Knowledge, Practice, and Associated Factors towards Prevention of Surgical Site Infection among Nurses and reported that only (48.7%) of nurses had good practice of surgical site infection prevention activities, Also **(Woldegioris, Bantie& Getachew, 2019)** who studied Nurses' Knowledge and Practice Regarding Prevention of Surgical Site Infection in Bahir Dar, Northwest Ethiopia reported that Nursing practice related to prevention of SSIs is was not satisfactory. **Regarding the correlation between the total knowledge level of the studied nurses and their total performance scores,** the current results demonstrated a significant correlation between total knowledge of the study nurses and their total performance scores before, immediately, also after two months of the educating program, as $P<0.05$. This study finding is supported by **(Kolade et al., 2017),** who notified through his study that there is a positive moderate correlation

between knowledge and practice (r = 0.570, p = 0.000<0.01), these findings contradict with **(El-soudany, E., 2018)** who reported no significant relation between nurses knowledge and practice scores. **Regarding to correlation between the sociodemographic data and the total knowledge level of the studied nurses**, The study showed an obvious statistically significant correlation between total knowledge level and the sociodemographic data, as P<0.05. **(Yurtseven & Şişman, 2025)**, supported the results as he recorded a significant statistical correlation between the number of correct answers and their sociodemographic characteristics as ($p < 0.05$).

Regarding to correlation between sociodemographic data and the total performance level of nurses, This study revealed a significant statistical correlation between the total performance level and sociodemographic data before also in the immediate and post two-month of the educating program as ($p < 0.05$),this findings is congruent with **(Mhana, Abd El-Aziz & Hassan, 2022)** who reported a high significant statistical relation between total performance of nurses concerning precautions of controlling infection within the primary health care settings and demographic characteristics of nurses (P= < 0.01). These study results are different from **(Hassan et al. 2024),** who revealed no significant statistical relation between total performance with all items of demographic data at pre-program and immediately after the program.

Conclusion

Based on the present study results, a significant correlation was found among the total knowledge and performance levels of study participants throughout the study periods, before, immediately after, also in the post two-month period following the program, with P value = <0.05. A positive relation exists among the total knowledge, performance levels of nursing staff, and the socio-demographic characteristics immediately after, pre, and following the program (throughout the study periods)

Recommendations

-In-service educational programs must be scheduled for cardiothoracic surgery ward nursing staff to improve their knowledge and performance regarding patients, to reduce problems and complications after cardiothoracic surgery.

-Encouraging nurses to routinely attend conferences, seminars, and workshops on infection control and care of patients undergoing

cardiothoracic surgery at the national and worldwide levels

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