Effect of educational Guidelines Application on Nurses' Performance caring for patients undergoing Chest Tube

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Abstract:

Background: The chest tube is a common therapeutic postoperative procedure used in cardiothoracic and respiratory care. Patients with hemothoraces, effusions, or pneumothoraces may benefit from a chest tube as a life-saving procedure. Nonetheless, it is linked to a high rate of morbidity and death. So, **the study aimed to** determine the effect of educational guidelines application on nurses' performance in caring for patients undergoing chest tubes. **Design:** A quasi-experimental design was used to accomplish this study (pre/post-test). **Setting**: The research was conducted at the chest intensive care unit which is affiliated to Sohag University Hospital**. Sample**: The study subjects included a convenient sample of 50 of all available nurses working in the previous setting. **Tools of data collection:** Tool I: Nurse`s knowledge questionnaire sheet and Tool II: Nurse`s practice observation checklist sheet. **Results:** The study result revealed that there was a highly statistically significant positive relation between total knowledge scores and total practice scores of the studied nurse's pre and post-educational guidelines implementation regarding chest tubes. **Conclusion**: It was concluded that educational guidelines had a positive effect on improving nurses' knowledge and practice regarding chest tubes. **Recommendations**: Continuous educational programs and in-service training programs about chest tubes should be provided to nurses to upgrade nurses knowledge and skills.

Keywords: Educational guidelines, Nurses' knowledge, and practice**.**

Introduction

Inserting a chest tube is a routine technique in hospital practice. Improper handling of chest tubes and their drainage systems can cause the collapsed lung to take longer to expand again, for tension pneumothorax to occur, or cause the collected air or fluid in the pleural space to be evacuated partially or not at all.

To enable lung reexpansion, a chest tube is utilized to provide negative pressure in the chest cavity. It aids in the removal of fluid (pleural effusion or hydrothorax), air (pneumothorax), blood (hemothorax), chyle (chylothorax), or purulence (empyema) from the intra-thoracic space. Chest tubes have other, less frequent, and infrequently recommended uses. When a patient stabilizes from decompression, chest tube insertion usually happens shortly after needle decompression for a tension pneumothorax (**Goncalves & Jabuonski, 2018*).***

Chest tubes are also utilized therapeutically for pleural illnesses, particularly pleural effusions, which are among the more frequent clinical issues that internists deal with. In these individuals, the placement of a chest tube serves both therapeutic and diagnostic purposes by removing fluid (**Held et al., 2018**).

The insertion and removal of a chest tube might provide numerous challenges. The incidence of issues with the installation and care of chest drains ranges from -.The most dangerous is tension pneumothorax, which can happen after removal or when the drainage system becomes obstructed. Additional issues include bleeding and unintentional tube removal or dislodgement, which could endanger the patient's life, raise morbidity, and prolong treatment (**Abuejheisheh** et al., **2021**).

Malposition of the tube is a type of penetrating trauma and needs to be treated as such. Organ damage: Although lung damage is the most frequent organ damage during tube thoracotomy, other possible ailments include heart, liver, spleen, and diaphragm perforations.

Extended indwelling chest tube duration may increase the risk of infection, empyema, and post-removal complications such as tension and recurrent pneumothorax (**Volmerig, (2017**).

Posttraumatic empyema is one of the complications that might arise during chest tube maintenance; it has a death rate and a frequency of. Patients with retained hemothorax typically have a higher risk of posttraumatic empyema; risk factors include the length of the ICU stay, the length of the tube thoracostomy, the requirement for a laparotomy, and any concurrent lung contusion. With tube thoracostomies, subcutaneous emphysema can develop. It typically affects the face, neck, and chest wall, but it can spread if there is significant air leakage. The "sentinel hole" migrating out of the pleural space, tube blockage, or improper tube implantation are risk factors (**Eren et al., 2018**).

Professional nurses pursue lifelong learning, which will affect their practice and, ultimately, the standard of care that patients get. To maintain an evidence-based practice, the critical nurse's technical proficiency and critical proven care at the patient's bedside are insufficient. According to **Skees (2020**), they must establish a good work atmosphere that values ongoing education.

Frequently, there has been minimal focus on the nursing care of patients with an in situ chest drain. Following the insertion of a chest tube, nurses are in charge of maintaining the drainage system and chest tube. They should be sufficiently knowledgeable about how to position the chest tube, manage fluid evacuation, know when to change or empty the containers, and take care of the drainage system and tube when transporting patients. It is not necessary to change or clamp the water-seal container too frequently (***Tarhan*** **et al., 2019).** The goal of nursing care for a chest tube is to keep the system sterile and intact to avoid contamination and infection entering the pleural space through the drainage system, keep the system straight, and secure all tube connections to avoid water aspiration and tension pneumothorax and monitoring the patient to prevent risk of complications (**Yilmaz et al., 2019).**

Significance of the study:

According to several authors, there is a shortage of nurses and poor nursing care, which can result in many problems among patients with chest tubes, including blockage, infection, pain, discomfort, and limited mobility (**Lit et al., 2020**).

Significant morbidity is linked to them, which can result in extended hospital stays or even death. As a result, it's critical that each member of the team caring for patients who use chest tubes understands the basic anatomy of the device and its drainage system (**Sim, 2021**). Since nurses are in charge of providing safety care, they must be educated about and proficient in the use of chest tube drainage systems when providing nursing care to patients using these devices **Mohammed et al., (2019)**. Therefore, the research was conducted to determine the effect of educational guidelines application on nurses' performance in caring for patients undergoing chest tubes.

Aim of the study:

The study aimed to determine the effect of educational guidelines application on nurses' performance caring for patients undergoing chest tube through:

Assessing nurses' knowledge pre and post-educational guidelines application.
Assessing nurses' practices pre and post-educational guidelines application.
Designing and implementing educational guidelines based on nurses' needs.
Evaluating the effect of educational guidelines application on nurses' performance caring for patients undergoing chest tube**.**

Research hypothesis:

H1: Nurses' performance will be improved post-educational guidelines application regarding chest tubes than pre-application.

Subjects and Method:

Research design:

A quasi-experimental design was used to accomplish this study (pre/post-test).

Setting:

The research was applied at the Chest Intensive Care Unit which is affiliated to Sohag University Hospital.

Subjects:
The study subjects included a convenient sample of 50 of all available nurses working in the previous setting.

Data collection tools:

Two tools were used

Tool 1: Nurse`s knowledge questionnaire sheet: This sheet was developed by the researcher based on current national and international literature (***Hinkle and Cheever, 2017 & Randelle,2019).*** It was written in simple Arabic language for assessing nurses' knowledge regarding the care of patients with chest tubes and it includes two parts:

Part 1: Demographic data for nurses as nurses' age, sex, qualification, years of experience, attended a training program for chest tube. It includes 5 items.

Part (2): Assessment of Nurses' knowledge (included 37 items)

a) Knowledge about the anatomy and physiology of the respiratory system

b) Knowledge about chest tube such as the definition of chest tube, indications, contraindications, complications, and nursing role during chest tube insertion.

c) Knowledge about pre-, during, and post-nursing care for patients who underwent chest tubes.

Scoring system:

Knowledge obtained from nurses was scored and calculated. Each question was ranged from 0 –1 grade. Whereas, the correct answer scored 1 grade and zero for incorrect answer. The total score level for the questionnaire sheet was 37 grades (equal to 100%).

- ≥ 80% (29 grads) considered satisfactory knowledge.
- ≤ 80% (28 grads) considered unsatisfactory knowledge.

Tool II: Nurse`s practice observation checklist sheet:

An observation checklist was developed by the researcher based on reviewing the literature (**Lit et al., 2013 & Skees, 2010; *Randelle, 2019*),** to assess nurses' practical aspects of chest tubes The 10 items, which totaled 119 steps, was broken down into the following categories: a. post-insertion care for patients with chest tubes (7 items, totaling 79 steps); patient assessment (5 steps); chest drainage assessment (9 steps); continuing care (14 steps); changing the chest tube (17 steps); dressing the chest tube (8 steps); post-thoracotomy care (18 steps); and documentation (8 steps). b. patient care for the removal of the chest tube (3 items, 33 steps). About the following areas: patient care before chest tube removal (7 steps), patient care during chest tube removal (17 steps), and patient care post chest tube removal (9 steps). One score was taken on a two-point Likert scale and not done took zero**.**

Each step-checked response was given a score of one for "done" about the nurse's practice, and a score of zero for "not done." The sum of the nurses' practice scores was then translated to a percentage. The following was the calculation of all nurses' practices: All values ≥85% are regarded as competent. Values below 85% are all regarded as incompetent practices.

Tool validity and reliability:

The data collection tool was tested for validity by five experts in medical–surgical nursing, Critical Care and Emergency Nursing, and medicine for its clarity, comprehensiveness, appropriateness, and relevance. The reliability of the two tools was assessed in the current study using the internal consistency approach. Both demonstrated high reliability with Cronbach alpha coefficients of 0.954 for the first tool and 0.932 for the second tool.

Procedures:

The actual study included three phases:
A-Preparatory phase:

To create the instruments for gathering data and creating the instructional guidelines, the researchers researched the existing and previous literature that was accessible through

textbooks, journals, periodicals, and online searches. After following the instructional requirements, the brochure was distributed. It was prepared in Arabic and printed out according to the sample size.

Pilot study:

In order to assess the tools' applicability, clarity, and estimated time for each, a pilot research involving five nurses from the chosen units (10%) of the nurses was conducted. Main study subjects comprised nurses who participated in the pilot research.

Ethical consideration:

An official letter from the dean of Sohag University's faculty of nursing granting authorization to perform this study was acquired. Following an explanation of the study's purpose, the directors of the aforementioned setting provided written consent. Before beginning the study, the nurses gave their consent and were given a brief explanation of its goals. The researchers also guaranteed their anonymity and confidentiality and told the participants that participation in the study was completely voluntary and that they could withdraw at any time without providing a reason.

Implementation phase:

The researchers analyzed the recent and older literature that was available, including books, journals, magazines, and internet searches. The data were collected in 6 months, from 1st March 2023 till 30th August 2023; it was completed out of the next phases. The researchers interviewed nurses, at the beginning the nurses were informed about the aim, nature, and expected outcomes of the study.

The researchers initiated data collection by first collecting demographic. Then each participant's knowledge was assessed for chest tube as baseline data by using tool I, in addition to, practices of chest tube by using tool II. The data obtained were used as a pretest to assess the effect of instructions regarding chest tube on nurses' performance. The researchers were given verbal instructions supplemented by written materials that were presented with pictures as an illustrative guide for more clarification to patients about the study. This illustration handout was designed by the researchers based on a review of literature, results, and recommendations of previous research and opinions of health care members as well as was tested for its content. Each patient was scheduled for a minimum of 4teaching sessions in four consecutive visits; each session lasted fifteen minutes.

During this phase, instructional guidelines about the chest tube were implemented for eight weeks. Four sessions—two for theoretical content and two for practice—have been used to sequence the subject contents. The nurses who participated in the study were split up into ten groups, and each group spent roughly two hours in total. There were five nurses in each group.

To help nurses remember and demonstrate the program's steps, a copy of the handout was provided to each nurse. The curriculum was delivered understandably and succinctly utilizing a variety of instructional techniques, including lectures, demonstrations, and re-demonstrations, as well as relevant teaching materials.

It was appropriate to begin each session with a quick review of the previous material. A declaration outlining the goals of the current session came next. Because each nurse will re-demonstrate the procedure in front of the researcher and be evaluated by the researcher, nurses were asked to pay close attention to the researcher during the demonstration of care given to the patient following chest tube insertion and during chest tube removal.

In front of the nurses, the researcher went over each stage of the procedure, explaining the reasoning behind it and the precautions that should be taken. Nurses were questioned at the conclusion of the presentation about any stages that were unclear and required clarification or repetition before being demonstrated again. Since the goal of this session was instruction rather than evaluation, the researcher made it clear that errors and forgetfulness were acceptable and that they would be promptly fixed. Following a re-demonstration, each nurse received immediate feedback regarding their performance of the procedure. She requested the nurse's opinion on her performance.

Under the guidance and support of the

researcher, each nurse was permitted to repeat the process on various patients multiple times until she became proficient. In order to keep future nurses from making the same mistakes, the researcher promptly updated any missing information or errors after providing her evaluation, which began with positive points and progressed to negative ones.

Contents of sessions

Session 1:

After providing an overview of the session's contents, each researcher went on to discuss the learning objectives. The researchers conducted the session using Arabic, which is a language that nurses can understand. The anatomy and physiology of the respiratory system were described by the researchers. The researchers begin by evaluating nurses' pretest knowledge and practices about chest tubes.

Session 2:

The theoretical part contained knowledge about the chest tube such as the definition, other general information regarding the Knowledge about chest tube, and knowledge about nursing care for patients undergoing chest tube. The average time spent by nurses completing the data collection tools was approximately 50 minutes.

Session 3:

The practical part contained information about current nurses' practices with a chest tube as pre-, during, post nursing care of chest tube patients.

Session 4:

The practical part contained information about current nurses' practices with a chest tube. Instructions before discharge; instructions about hand washing, surgical site care, managing pain, the position of the chest tube, complications, and removal of chest tube.

The Evaluation phase:

One month after implementing the educational guidelines regarding chest **tube**s, the evaluation of research sample knowledge and practice was done using the same format of tools that were used in the pre-test to evaluate the effect of the educational guidelines.

Statistical analysis:

Data entry and statistical analysis were performed using SPSS for Windows, version 20. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and mean and SDs for quantitative variables. Statistical significance was considered at P-value < 0.05.

Results:

Table (1) shows that 48% of the studied nurses were between 20 to less than 30 years old with a mean age was 33.41±6.05, and 72% of the studied nurses were female. More than two-fifths of the studied nurses (46%) have a diploma from secondary nursing school. Regarding years of experience**,** 42% of the studied nurses have >10 years of experience.

Figure 1 shows that 75% of the studied nurses reported that not attended a training program regarding chest tubes.

Table (2): Illustrates that there were highly statistically significant differences found between nurses' knowledge regarding chest tube pre/post-educational guidelines application (P<0.001).

Figure (2): Demonstrates that 16% of the studied nurses had a satisfactory knowledge level regarding **chest tube** pre-educational guidelines **application** which improved post-**application** and became 96% among them with highly statistically significant differences pre/post-educational guidelines **application**.

In **Table 4**. It was observed that a highly statistically significant difference (P=0.001) was detected between the mean score nurses' practice done regarding chest tube pre/post-educational guidelines application, where The mean score was 112.45± 5.23 post the application of the guidelines, compared to 71.33 ± 20.67 pre-application.

As regards the comparison of the studied nurses' practice regarding chest tubes **Figure (3**) illustrated that there was a significant improvement between total nurses' practices of chest tube pre and post-educational guidelines application (p<0.001), where 25% of the studied nurses had competent practice level regarding chest tube pre-educational guidelines application which improved post-application and become 92%.

Table (4): Illustrated that there was a highly statistically significant positive relation between total knowledge scores and total practice scores of the studied nurses before and after educational guidelines application regarding chest tubes (at p-value <0.000).

Table (5): illustrated that there was a statistically significant relationship between theeducational level of the study group and overall knowledge, practices regarding chest tube, and demographic data throughout the phases of the instructional guidelines at p<0.001**.**

Table (1): Percentage distribution of the studied nurses regarding their demographic data (n=50)

Variables.	The Studied Nurses (n=50)	
	N	%
Age:		
20 < 30	24	48.0
30 < 40	14	28.0
≥40	12	24.0
(X±SD): 33.41±6.05		
Gender:		
Male	14	28.0
•Female	36	72.0
Qualification:		
Nursing Diploma.	23	46.0
Bachelor of nursing.	15	30.0
Master of Nursing.	12	24.0
Years of experience:		
< 5	14	28.0
<10	21	42.0
>10	15	30.0

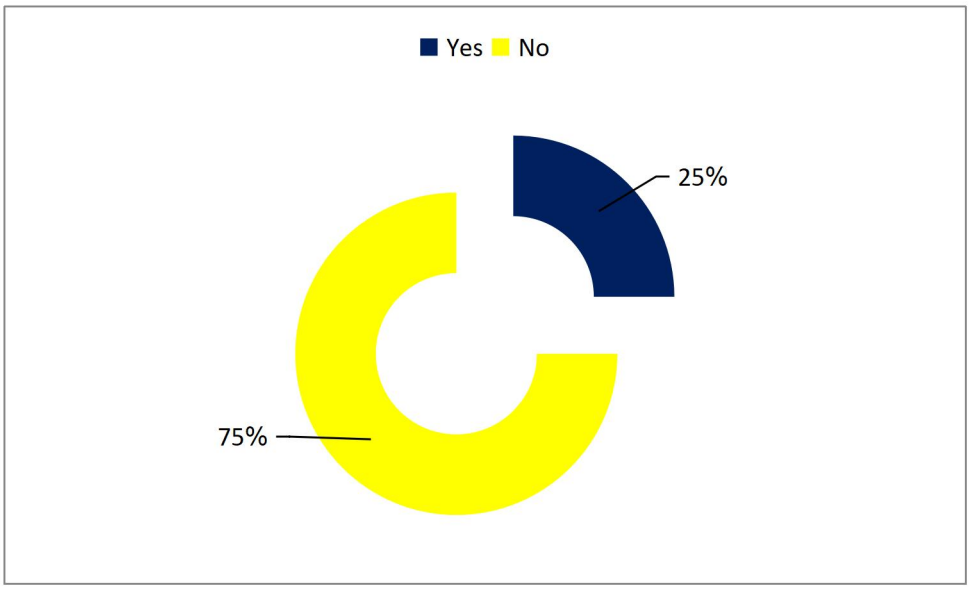

Figure 1: Percentage distribution of the studied nurses regarding their attended training program about chest tube

Table (2) Comparison between Nurses' Knowledge regarding chest tube pre and post-educational guidelines application **(N-50)**

Knowledge items	Pre- the educational guidelines		Post- the educational guidelines		X^2	P-value
	No	%	No	%		
Knowledge about the anatomy and physiology of the respiratory system	20	40	50	100	112.42	<0.001**
Knowledge about chest tube	21	42	48	96	137.24	<0.001**
Knowledge about nursing care for chest tube patients.	28	56	50	100	151.21	<0.001**

**; Highly significant at p-value < 0.001

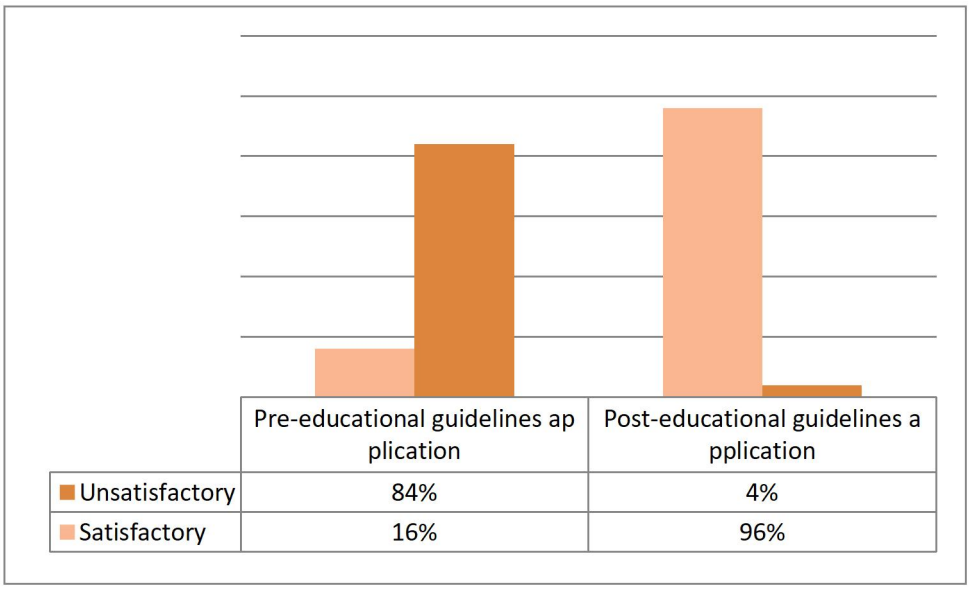

Figure (2): Total level of nurses' knowledge as regards chest tube pre/post-educational guidelines application (n-50).

Table (3) Comparison between nurses' practice done regarding chest tube pre/post-educational guidelines application **(n-50)**

Total nurses' practice	Pre- Pre-educational guidelines application	Post-educational guidelines application	P -value
Mean ± SD	71.33 ± 20.67	112.45± 5.23	276.23 - 0.001**

** Highly statistically significant difference at (P<0.001)

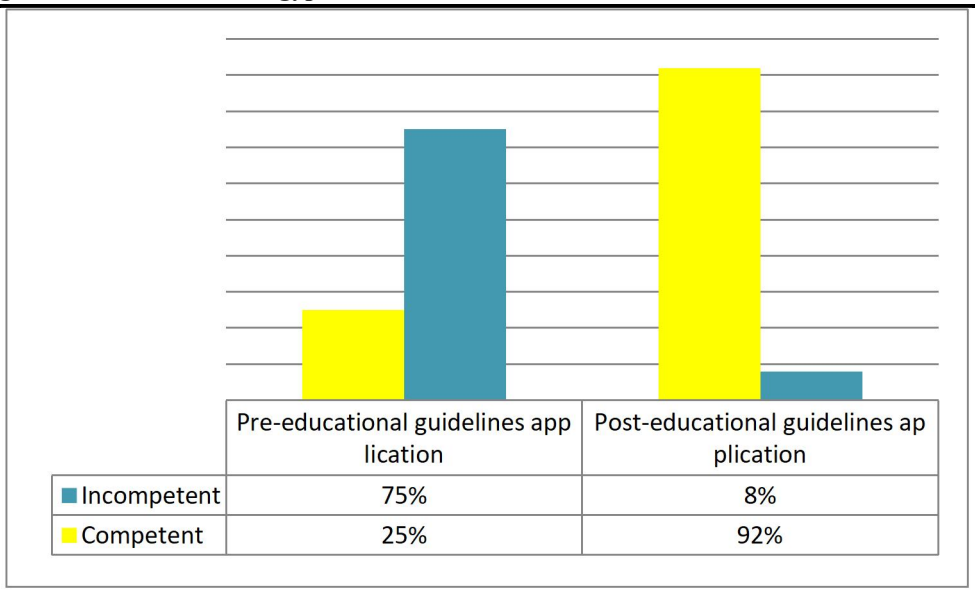

Figure (3) Differences between nurses' total practice pre and post-educational guidelines application regarding chest tube (n=50)

Table (4): Correlation between total knowledge and total practices pre and post-educational guidelines application (n=50)

Items	Total Knowledge scores			
	Pre-educational guidelines application		Post educational guidelines application	
	R	p-value	r	p-value
Total Practices scores	0.79	0.000**	0.43	0.003**

**** Correlation is significant at the< 0.01 level**

Table (5): Correlations between nurses' knowledge, practices regarding chest tube, and demographic data (n=50).

Scores	Spearman's rank correlation coefficient (r)	
	Knowledge	Practices
Pre-intervention		
Age	-.122	.072
Education	.144	.188
Residence	-.105	-.158
Post-intervention		
Age	-.206	-.262*
Education	.307**	.363**
Residence	-.145	-.044

(*) Statistically significant at p<0.05 (**) statistically significant at p<0.01

Limitation of the Study

It was challenging to get all of the nurses from the same department to attend the program session at the same time. This issue was resolved by splitting the nurses under study into two groups for each shift in each department.

Discussion:

The nurse's ability to practice nursing effectively must be maintained and improved. There are numerous ways to address the demand for ongoing professional development. Academic education, research endeavors, staff development, and continuous education are examples of formal methods. The goal is to assist the nurses in maintaining and enhancing the competences necessary for providing high-quality care. Interventions include nursing compliance programs that are specifically created for wards, where nurses perceive gaps in their expertise and would welcome the chance to receive regular updates **(Bastable, 2023).**

In both trauma and non-traumatic cases, a chest tube is a safe and effective way to drain pleural collections, which include blood, air, pus, and lymphatic fluid. Competent nurses whose knowledge, abilities, attitudes, and performance align with evidence-based practice protocols and standards of care are more likely to enhance patient safety **(Chege et al., 2018).** Thus, the study sought to **determine the effect of educational guidelines application on nurses' performance in caring for patients undergoing chest tube.**

According to the study's findings, most of the nurses who were the subject of the study were between the ages of twenty and under twenty-five and had completed secondary nursing school. This outcome supported **Ahmed's (2023)** assertion that the majority of Egypt's nursing workforce was educated at diploma programs, and it is anticipated that they are currently engaged across all nursing services. But at the time, they noted, the trend was for nursing graduates working in fields that were prepared to provide high-tech care to patients.

This finding runs counter to that of **Sabry et al. (2020),** who found that most of the research participants had bachelor's degrees. The majority of nurses who work in intensive care units and anesthesia are between the ages of 30 and 40, according to **Saha (2020),** who reported this fact.

This outcome is consistent with the findings of **Ramya and Jose (2019**) which found that over half of the nurses in the study were between the ages of 20 and 30. However, this finding was in contrast to that of **Kesieme et al. (2019),** who showed that over two-thirds of the nurses in their study were between the ages of 31 and 40 (9).

According to the results of the current survey, the majority of nurses were female. This may reflect the preponderance of women in nursing and the fact that there are more women than men working in the nursing industry. This might be because women made up a larger percentage of nurses in Egypt, and it may also be related to the fact that, until recently, only women were allowed to pursue nursing education in Egypt. According to **Mehrabi et al. (2023),** the majority of their study group was female, which may be because there were more female nurses. This conclusion is in line with their findings.

Kaur et al. (2019) found that the majority of the nurses they studied were female, and this result was consistent with **Kesieme et al. (2019)**, who also found that the majority of the nurses they studied were female. However, this finding was in contrast to that of Jassim et al. (2019), who found that over half of the nurses in their study were men in their study.

More than two-fifths of the nurses in the current study had five to ten years of experience in nursing, according to their qualifications and years of experience. This could be because half of the nurses in the study were between the ages of 25 and 30. These findings are consistent with **Bedier et al. (2019)** who found that over half of the nurses in the study had a nursing diploma and around half had five to ten years of experience. In contrast, **Ramya and Jose (2023)** discovered that two-thirds of the nurses in the study had a bachelor's degree in nursing. This conclusion was in conflict with Zhou et al. (2018), who found that almost two-thirds of the study participants had between one and five years of ICU experience.

Regarding nurses' attendance at chest tube training programs, the current study revealed that three-quarters of nurses had never attended a chest tube training session. According to the researcher, a lack of training programs may result from nurses' ignorance of the significance of chest tub care, the priority of nursing interventions, and anticipated complications. Additionally, an increase in workload may leave nurses with insufficient time to attend training sessions. **Mohammed et al. (2019)** support this finding by stating that most nurses had never taken a chest tube training course.

Kwekkeboom et al. (2021) affirmed this conclusion, emphasizing that training programs needed to be tailored to the unique requirements of nursing personnel employed in various care environments. According to **Clinton et al. (2020), Levett-Jones et al. (2020), and Jarrett et al. (2017),** educational programs should equip nurses with the attitude and behavior skills essential to performing their jobs effectively. This study was in agreement with these findings.

Nurses' awareness of chest tubes before and after applying educational guidelines differed in highly statistically significant ways, according to the study's findings. From the perspective of the researcher, it validated the benefits of applying educational guidelines to raise the level of awareness about chest tubes. This finding was in line with **Bedier et al.'s (2019)** which found that all nurses' knowledge scores improved immediately following the program intervention, but that overall knowledge decreased three months later. Nevertheless, nurses' practice improved significantly in comparison to pre-educational guidelines. These findings support the second research hypothesis.

This finding aligns with the findings of **Mathew (2019),** who found that nurses' mean score on knowledge of chest tube insertion had improved. Knowledge in post-test compared to pretest about the treatment of patients with chest tube drainage. Additionally, this conclusion was corroborated by **Patidar et al. (2021),** who conducted research and showed that the majority of nurses had inadequate pre-test knowledge regarding the management of patients with chest tube drainage but had improved somewhat after intervention which was revealed in the post-test. These findings were also in line with those of **Hamel and Ahmed (2020)** who found that nurses' knowledge had improved following the implementation of the educational program.

According to the current study's findings, there was a notable improvement in the overall practices of nurses with regard to the application of chest tube pre-educational guidelines compared to pre-application. Specifically, 25% of the nurses in the study demonstrated competent practice in this area, which improved after application and became the majority. This outcome may be the result of a lack of supervision, an unprecedented method for evaluating nurses' performance, a lack of postgraduate or undergraduate training in chest tube care, or a lack of staff workload.

Furthermore, this finding is consistent with **Ibrahim's (2021**) findings that the majority of the nurses in the study performed unsatisfactorily when it came to caring for patients receiving chest tubes. Therefore, he suggested creating a system for evaluating nurses on a regular basis to identify ways to improve their practice and expertise, creating a procedure book specifically for patients with chest tubes. In order to sustain the effective performance of individuals who have previously received training in the care of patients with chest tubes, in-service training programs should be implemented. These programs should emphasize the importance of monitoring and supervision to improve services. According to the results of this study, there was a highly significant difference between the mean score of nurses' practice with regard to chest tubes before and after the educational guidelines were applied. The mean score was 71.33 ± 20.67 before the guidelines were applied, and it was 112.45 ± 5.23 after.

This high statistically significant improvement following the implementation of educational guidelines could be the consequence of the in-service training program, which placed a strong emphasis on learning about chest tubes as well as hands-on training to acquire new skills and modify work procedures through appropriate sessions, various teaching strategies like lectures, discussions, and demonstrations and

re-demonstrations, the use of media as handouts with pictures and information, and the availability of enough materials and supplies needed to complete the work. These factors may have encouraged the nurses under study to meet the goals through rewards.

This outcome was consistent with the findings of **the Elsayed et al. (2019)** study, which found that nurses' overall practice about managing patients with chest tubes had significantly improved following the implementation of the educational guidelines compared to their level of practice prior to the guidelines.

The results of this study showed that the total knowledge and total practice scores of the nurses under study before and after the application of educational guidelines for chest tubes had a highly statistically significant favorable relationship. This result shows that the guidelines' implementation was a successful intervention that influenced nurses' knowledge, which enhanced their practice. **Mohammed et al. (2019**) found no statistically significant correlation between nurses' knowledge and practice, which was in contrast to this result.

According to the current study's findings, the study group's educational attainment was statistically significantly correlated with their general knowledge, chest tube practices, and demographic information across all stages of the instructional guidelines.

These findings were corroborated by **Mohammed et al. (2019**), who discovered a substantial correlation between nurses' educational attainment, knowledge, and practices. However, these findings contradict those of **Bedier et al. (2019**). They found no statistically significant correlation between nurses' sociodemographic traits and their knowledge and practice. This result contradicts that of **Ramya and Jose (2023**) who found no significant correlation between nurses' pre-test knowledge scores and demographic factors.

Conclusion:

Based on the results of this study, It was concluded that educational guidelines had a positive effect on improving nurses' knowledge and practice regarding chest tubes.

Recommendations:

Based on the results of this study, the following recommendations are suggested:

- Continuous educational programs and in-service training programs about chest tubes should be provided to nurses to upgrade nurses knowledge and skills.
- It is thought to be beneficial to encourage nurses to regularly attend national and international congresses, seminars, symposia, and workshops about chest tubes and patient care;
- nurses who provide patient care should hold a current certification in chest tube care and renew it at least annually;
- nursing school curricula must cover all topics related to chest tube care, such as definition, indications, insertion, drainage systems, issues with drainage systems, complications of chest tubes, nurses' roles toward patients with chest tubes, and removal of chest tubes; and research the effects of educational programs on chest tubes continuously using a broad probability sample in various areas to track improvements in nurses' performance.

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