African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 5, Issue 3, 2022 (pp. 30-49)
www.abjournals.org

NURSES' KNOWLEDGE AND PRACTICE REGARDING CARE OF PATIENTS UNDERGOING CHEST TUBE

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Cite this article:

Noura E.I.E., Furat H.M., Rasha A.A.E. (2022), Nurses' Knowledge and Practice Regarding Care of Patients Undergoing Chest Tube. African Journal of Health, Nursing and Midwifery 5(3), 30-49. DOI: 10.52589/AJHNM-9WN8DVCH.

Manuscript History

Received: 17 April 2022

Accepted: 9 May 2022

Published: 4 June 2022

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ABSTRACT: *Chest tube is a postoperative therapeutic intervention widely applied to the respiratory tract and cardiothoracic care. A chest tube can be a life-saving intervention for patients with pneumothorax, effusion and hem thorax. However, it is associated with significant morbidity and mortality.* ***Aim:*** *To assess nurses' knowledge and practice regarding care of patients undergoing chest tube.* ***Design:*** *A descriptive exploratory study design was used* ***Setting:*** *Intensive Care Unit, Surgical and Operational Departments, in El-Mahalla Chest Hospital, and El-Mahalla Cardiac Center.* ***Sample:*** *A convenient sample of all available nurses (60 nurses)who work with patient undergoing chest tube.* ***Tools:*** *1) Self-administered interview questionnaire consists of two parts part 1: Nurse's demographic data characteristics, part 2: Nurse's knowledge about chest tube.* ***Tool*** *2) Observational checklist.* ***Results:*** *Findings of the present study showed that more than one third (41.7%) of the studied nurses had average knowledge regarding management of patient with chest tube drainage. While one third and less than one quarter (35% &23.3%) of them had poor and good knowledge, respectively. Moreover, nearly two-thirds (60%) of the studied nurses had incompetent practice regarding management of patient with chest tube drainage. On the other hand more than one third (40%) of them had competent practice regarding management of patient with chest tube drainage. Finally, There was a highly statistical correlation between total nurse's knowledge and their total practice regarding management of patient with chest tube drainage ($P<0.01$).* ***Conclusion:*** *the majority of the studied nurses had insufficient knowledge and practice regarding management of patient with chest tube drainage.* ***Recommendations:*** *1) Development of in-service training programs to maintain efficient performance of nurses, 2) Replication of the study on a larger sample and in different geographical areas in Egypt for generalization of findings.*

KEYWORDS: Nurse's Knowledge, Practice, Chest Tube

Article DOI: 10.52589/AJHNM-9WN8DVCH
DOI URL: https://doi.org/10.52589/AJHNM-9WN8DVCH

INTRODUCTION

The management of a critically ill patient therefore represents a continual balancing act in which the risks and benefits of diagnostic procedures and interventions must be carefully weighed. Using chest tubes and chest drainage is a complex and critical nursing function. Up to date knowledge and skill of the staff nurses in this field will be helpful to protect the patient and help them to recover from a serious pulmonary problem *(Ouellette, et al., 2017).*

A chest tube insertion is a surgical procedure in which a hollow, flexible drainage tube is inserted through the side of the chest in to the pleural space in order to drain the pleural cavity of air, blood, pus or lymph. The water seal container connected to the chest tube allows one-way movement of air and fluid from the pleural cavity. The chest tube is used to restore the intra pleural pressure and to prevent the collapse of lungs. Chest tube management includes the actions to keep the tube functioning properly, which is the prime role of nurses while caring of patients with chest tube drainage *(Kuhajda ,et al., 2021)*.

Care of chest drain and management appear complicated but a good understanding of the basic aspects related to drain insertion and system function is important to improve outcomes for patient and reduce the risk of complications. Patients with chest drains should receive care by medical or surgical teams who were experience on management and care and known what the patient needs. Nursing staff who give caring for this patient must have received training and demonstration to become competent *(Ouellette, et al., 2017)*

Post-procedural care entails monitoring vital signs, assessing and documenting drainage, caring the water seal drainage system, assisting patients during change of position and in removing of the chest tube after it has served its function. Unacceptable and sometimes life-threatening complications may be associated with inadequate nursing care and poor surgical techniques during insertion that can be classified as technical or infective *(Nydahl,et al., 2017)*.

Chest drains insertion it is responsibility of the doctor but the nurse and the doctor both they were responsible to maintain the drain and drainage system function in addition to monitor the patient. Safe practice is requiring understanding of anatomy and physiology of the respiratory system and the heart, knowledge and skills on how chest drainage functions. Therefore, this study will be done to assess nurses' knowledge and practice regarding care of patients undergoing chest tube *(Zhao, et al., 2017)*.

Significance of Study:

Chest tube insertion is a commonly performed procedure in hospital practice. Therefore, it is important that every member in the health team taking care of patients with chest tube and should have adequate understanding of the physical principles of chest tube and its drainage system. A survey in a Nigerian semi urban university hospital (2016) show that only (26.2%) respondents had a good knowledge of nursing care of chest drains *(Wuestenberg , 2016)*.

Ibrahim's, (2011) found that the majority of studied nurses at Ismailia University Hospital had statistically unsatisfactory level of practice related to chest tube.

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The total number of cases had chest tube at Elmahalla cardiac center where the study will done was (578) case from 1/1/2018 to31/12/2018 *(Elmahalla cardiac center, 2018)*.

Aim of the study

This study aimed to assess nurses' knowledge and practice regarding care of patients undergoing chest tube.

This aim was achieved through the following objectives:

1. Assess the level of nurse's knowledge regarding chest tube drainage.
2. Assess the level of nurse's practice in caring for patients undergoing chest tube.

Subjects and Methods

I .Technical item:

Research design: A descriptive exploratory research design was utilized for the conduction of this study its usually provides the least control over variables. . The study was conducted at the intensive care unit, surgical and operational departments at El-Mahalla chest hospital, and El-Mahalla cardiac center, Gharbiya Governorate, Egypt. The working hours are three shifts in the morning , afternoon and night shifts.

Subjects: A Convenient sample of all available nurses (60 nurses) from both sexes who work with patients undergoing chest tube at the intensive care unit, surgical and operational departments.

Tool of data collection:

Data for this study were collected by using the following tools:

1st tool: -Nurses self-administered interview questionnaire.

Part (I): to assess the Nurse's demographic characteristics such as: - Age, sex, marital status, educational level, years of experience and training courses.

Part (II): to assess the nurse's knowledge about respiratory system and its function ,chest tube drainage and its complications and nurse's role in chest tube management .

2nd tool: - Observational checklist: - It was designed by the investigator in the Arabic language after reviewing the related literature to assess nurse's practice regarding the procedure of chest tube. It included questions from 68-73 and includes the following items: Patient assessment. It included questions from (1-13). Chest tube drainage patency, It included questions from 14-21. Changing chest tube drainage insertion site dressing. It included questions from 15-37. Changing the chest drainage bottle if broken or filled. It included questions from 38-59. Health teaching. It included questions from 60-70. Chest tube drainage removal procedure. It included questions from 71-93.

Scoring system: - Scoring system: each question was evaluated as 1 scores for done and 0 scores for not done. The total practice level was classified into:

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- Competent : > 60 %
- Incompetent : < 60 %

II. Operational item

The Preparatory phase:

The investigator reviewed the literature using textbooks, scientific journals, and the internet to develop the data collection tool, and for acquiring in-depth knowledge about the subject. The questionnaire was developed in the English language, and then translated into Arabic language.

Validity& Reliability:

The validity of the tools is whether or not the instrument measure what it is designed to measure it was done through seeking the opinions of a jury group consisting of five professors of Medical Surgical Nursing who judged their clarity, comprehensiveness, accuracy, relevance and whether it elicited the type of information sought; thus the tools were the face and content-validated. The tools were modified and rephrased based on the jury's opinions. This phase took three weeks' duration.

Reliability and validity are concepts used to evaluate the quality of research. They indicate how well a method, technique or test measures something. Reliability is the consistency of a measure the degree to which an instrument measures the same way each time it's used under the same conditions with the same subject and validity is about the accuracy of a measure.

Pilot study

It was carried out for one week to evaluate the reliability and applicability of the tools to find the possible obstacles that might be faced during data collection. 10% from the total sample (6 cases) was included and chosen randomly from the previously mentioned setting, then later included in the sample. There were no major modifications found after the pilot study. The pilot also served to assess the reliability of the scale by examining its internal consistency. It showed very high levels of reliability as indicated (0.08) and the cronbach alpha test was used.

Field Work:

Field work includes the following:-

- An official approval letter clarifying the purpose of the present study was issued from the Dean of the Faculty of Nursing at Helwan University to the General Director of Intensive Care Unit and Surgical Ward from El-Mahalla Chest Hospital and El-Mahalla Cardiac Center, and Scientific Research Ethical Committee in the Faculty of Nursing as an approval to conduct this study.
- The previously mentioned setting was attended by the investigator three days/week (Saturday, Sunday and Monday) from 8.00 a.m. to 2 p.m. This study started from beginning of January 2020, till the end of June 2020, covering six months for data collection.

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- **Firstly,** the investigator held the first meeting by interviewing each nurse individually to introduce her-self and briefly explained the nature and the purpose of the study. They were informed that participation in this study was voluntary and they had the right to withdraw at any time without giving any reason. Oral approval of nurses to share in this study was achieved.

- Then, the self-administrated interview was distributed to each nurse to assess nurse's general characteristics and their knowledge regarding nursing management of patients with chest tube drainage. The questionnaire took about 10-20 minutes to be completed.

- Then the investigator using the Observational checklist assessment to assess nurse's practice regarding chest tube procedure. It was filled in by the research in a time ranged from 10 to 20 minutes to be completed.

III. Administrative item:

An official permission was issued from the Dean of the Faculty of Nursing at Helwan University to the General Director of Intensive Care Unit and Surgical Ward from El-Mahalla Chest Hospital and El-Mahalla Cardiac Center, and Scientific Research Ethical Committee in the Faculty of Nursing as an approval to conduct this study.

Ethical considerations: The research approval was issued from the Scientific Research Ethical Committee in the Faculty of Nursing at Helwan University before starting the study.

- The researcher was clarified the importance and aim of the study to all the nurses included in the study.

- Oral consents were obtained from all the studied nurses.

- The questionnaire didn't include any immoral statements that touch nurse's beliefs, dignity, culture, tradition and religious issues.

- All nurses were informed that they are allowed to choose to participate or not in the study and that they have the right to withdraw from the study at any time without giving any reason and confidentiality of the information was assured.

- All nurses were informed that the collected data would be used only for the present study, as well as for their benefits.

IV. Statistical item:

Data were collected, coded and entered into a personal computer (P.C) IBM compatible 2.6 GHz. They were analyzed using Statistical Package for Social Science (SPSS), under windows version 24. The collected data were organized, revised, analyzed, tabulated using number and percent distribution. Proper statistical tests were used to determine whether there were statistically significant differences between the variables of the study. The statistical tests used in this study were:

1- Chi-square test (X^2) for qualitative variables.

2- Correlation coefficients (r) to find correlations between quantitative data.

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- P>0.05 there is a statistically insignificant difference
- P<0.05 there is a statistical significant difference
- P<0.01 there is statistical highly significant difference.

RESULTS

Table (1): Frequency and Percentage Distribution of the Studied Nurses regarding their demographic characteristics (n=60): demonstrates that 76.7% of studied nurses were female with the mean age of them was 29.75± 3.41 years and 33.3 of them with age group 30-39 years and 65% of them working at ICU. This table also shows that 31.7% of them had technical health institute with the mean years of experience of them was 6.35±2.11 and 40% of them had 5-10 years of experience.

Figure (1) Percentage distribution of studied nurses regarding their Attend training courses on nursing care for patients with chest tube (n=60) :It shows that 81.7% of them not attended training courses on nursing care for patients with chest tube .

Table (2): Frequancy and Percentage Distribution of the Studied Nurses regarding their Knowledge about the Anatomy of the Respiratory System and Its Functions (n= 60): illustrates that 60% & 83.3% of studied nurses had correct answer regarding components of the respiratory system and the main function of the respiratory system, respectively. This table also shows that 86.7% & 66.7% of them had incorrect answer regarding the pleural cavity is a closed system with pressure negative or positive and the components pleural cavity.

Table (3): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about Chest tube (n= 60): Table **(3)** demonstrates that 66.7% & 63.3% of studied nurses had correct answer regarding the chest tube has small openings used for aspiration of fluids in open heart surgery and the chest tube is placed in the middle of the lungs in the case of open heart surgery, respectively. This table also shows that 70% of them had incorrect answer regarding the goals of installing the chest tube and site of insertion to the site of drain blood from the pleural cavity.

Table (4): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about Chest tube Problems and Complication (n= 60): Table **(4)** reports that 58.3% & 56.7% of studied nurses had correct answer regarding complications of the chest tube and to avoid the risks arising while the chest tube is in place, respectively. This table also shows that 63.3% & 60% of them had incorrect answer regarding the problems with installing the chest tube and when surgical emphysema occurs in the place of insertion of chest tube.

Figure (2): Percentage distribution of studied Nurses regarding their total Knowledge about Nursing Management of Patients with Chest Tube Drainage (n= 60): illustrates that, 41.7% of studied nurses had average level regarding their knowledge about nursing management of patients with chest tube drainage. While 35% & 23.3% of them had poor and

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good level regarding their knowledge about nursing management of patients with chest tube drainage.

Table (5): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about The Nursing Care Provided to Patients with a Chest Tube (n= 60): reveals that 66.7% & 51.7% of studied nurses had correct answer regarding the patient should be given general anesthesia before the chest tube insertion and it is necessary to make ultrasound on the abdomen before insertion of the chest tube, respectively. This table also shows that 55% & 56.7% of them had incorrect answer regarding the chest tube can be inserted to the patient in the bed and one of the important procedures before insertion of the chest tube is to do a triple lipid analysis.

Table (6): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge during Insertion of the Chest Tube (n= 60): illustrates that 53.3% & 58.3% of studied nurses had correct answer regarding the patient is placed on the unaffected side of the chest during the insertion of chest tube and the amount of sterile liquid should be written in the fluid collection container. This table also shows that 65% & 70% of them had incorrect answer regarding the container to collect fluids in the chest tube is filled with normal saline solution up to one third in case of pneumothorax and nursing should not intervene when there is an air leakage from the chest tube.

Table (8): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about nurses' role in case of prescience of problems or complications in the chest tube (n= 60): reveals that 48.3% & 46.7% of studied nurses had correct answer regarding in case of breaking the fluid collection bottle, the following must be taught to the patient and in case of the chest tube is blocked. table also shows that 60% & 55% of them had incorrect answer regarding in case of the patient removing the chest tube suddenly and the chest tube is closed in the following cases.

Table (9):frequency and Percentage Distribution of the Studied Nurses Practice regarding Patients with chest tube (n= 60): illustrates that 56.7% &58.3% of studied nurses wearing clean gloves and documentation of Date, time and any abnormal findings as signs of infection. On the other hand 65% & 63.3% of them did not assess insertion site and surrounding skin for swelling and pain, respectively.

Table (10):Frequency and Percentage Distribution of the Studied Nurses Practice regarding assessment of chest tube drainage patency (n= 60): Table **(10)** reveals that 48.3% of studied nurses check that all connections are securely taped and mark and document the drainage level on the outside the drainage collection chamber hourly or every shift, respectively. While 61.7% & 60% of them did not assessing the drainage system every 2 to 4 hours and did not assess for air leaks in the system.

Table (13):Frequency and Percentage Distribution of the Studied Nurses Practice regarding Health teaching (n= 60): Table **(13)** reports that 51.7% & 55% of studied nurses avoid bronchial irritants smoke and air pollution and documentation of findings and any abnormalities, respectively. On the other hand 65% & 63.3% of them did not instruct the patient to call for help immediately if he experiences chest pain, problems with his breathing and did not instruct the patient about activity as prescribed while maintaining the drainage

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system below the level of the chest during walking, or in bed and sitting position, respectively.

Figure (3) Percentage distribution of studied nurses related their total practice level about nursing intervention for management of patients with chest tube drainage (n= 60): shows that, 60% of studied nurses had incompetent level of practice. While 40% of them had competent level of practice.

Table (15): Correlation between demographic Characteristics of the Studied Nurses and their Total Knowledge regarding Nursing Management of Patients with Chest Tube Drainage (N=60): Table **(15)** demonstrats that, there were highly significant correlation between total knowledge of studied nurses and their level of education and years of experience at (P= < 0.01). While, there were significant correlation with age and attend training courses at (P= < 0.05). But there was no significant correlation with gender at (P= > 0.05).

Table (16): Correlation between demographic Characteristics of the Studied Nurses and their Total Practice regarding care of patient with chest tube (N=60): shows that, there were a highly significant correlation between total practice of studied nurses and their level of education and years of experience at (P= < 0.01). While, there was significant correlation with attend training courses at (P= < 0.05). But there were no significant correlation with gender and age at (P= > 0.05).

Table (17): Correlation between Studied Variables: Table **(17)** reports that, there were highly statistical significance between total knowledge and practice of the studied nurses regarding nursing management of patients with chest tube at p. value < 0.01.

Table (1): Frequency and Percentage Distribution of the Studied Nurses regarding their demographic characteristics (n=60).

Characteristics of studied nurses	No	%
Gender		
Male	14	23.3
Female	46	76.7
Age		
<20	10	16.7
20-29	15	25
30-39	20	33.3
>40	15	25
$\bar{x}$S.D 29.75± 3.41		
Workplace		
ICU	39	65
OR	21	35
Level of education		
Nursing Diploma	21	35
Technical health institute	19	31.7
Bachelor of Nursing	15	25
Postgraduate (MSc)	5	8.3

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Years of Experience		
Less than 3 years	12	20
3 - 5 years	10	16.7
5 - 10 years	24	40
More than 10 years	14	23.3
$\bar{x}$S.D 6.35±2.11		

Table (2): Frequancy and Percentage Distribution of the Studied Nurses regarding their Knowledge about the Anatomy of the Respiratory System and Its Functions (n= 60)

Items	Correct		Incorrect	
	No	%	No	%
The components of the respiratory system	36	60	24	40
The main function of the respiratory system	50	83.3	10	16.7
The pleural cavity is a closed system with pressure negative or positive	8	13.3	52	86.7
The components of the pleural cavity	20	33.3	40	66.7

Table (3): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about Chest tube (n= 60):

Items	Correct		Incorrect	
	No	%	No	%
The Chest tube made of silicone or plastic	25	41.7	35	58.3
The chest tube has small openings used for aspiration of fluids in open heart surgery	40	66.7	20	33.3
Complications from chest and heart surgeries may be one of the reasons for inserting chest tube	30	50	30	50
Empyema is blood collection inside the lungs	19	31.7	41	68.3
The chest tube can be used in giving medication in some cases	24	40	36	60
The Chest tube is placed in the middle of the lungs in the case of open heart surgery	38	63.3	22	36.7
The chest tube can be inserted into the abdominal cavity	33	55	27	45
Care should be taken when carrying a container that collects fluid while the patient is moving	20	33.3	40	66.7
The goals of installing the chest tube	18	30	42	70
The choice of the location for insertion of the chest tube .	22	36.7	38	62.3
The site of insertion to drain the air from the pleural cavity	27	45	33	55
The site of insertion to drain blood from the pleural cavity	18	30	42	70

Table **(3)** demonstrates that 66.7% & 63.3% of studied nurses had

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African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 5, Issue 3, 2022 (pp. 30-49)
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Figure (1) Percentage distribution of studied nurses regarding their Attend training courses on nursing care for patients with chest tube (n=60)

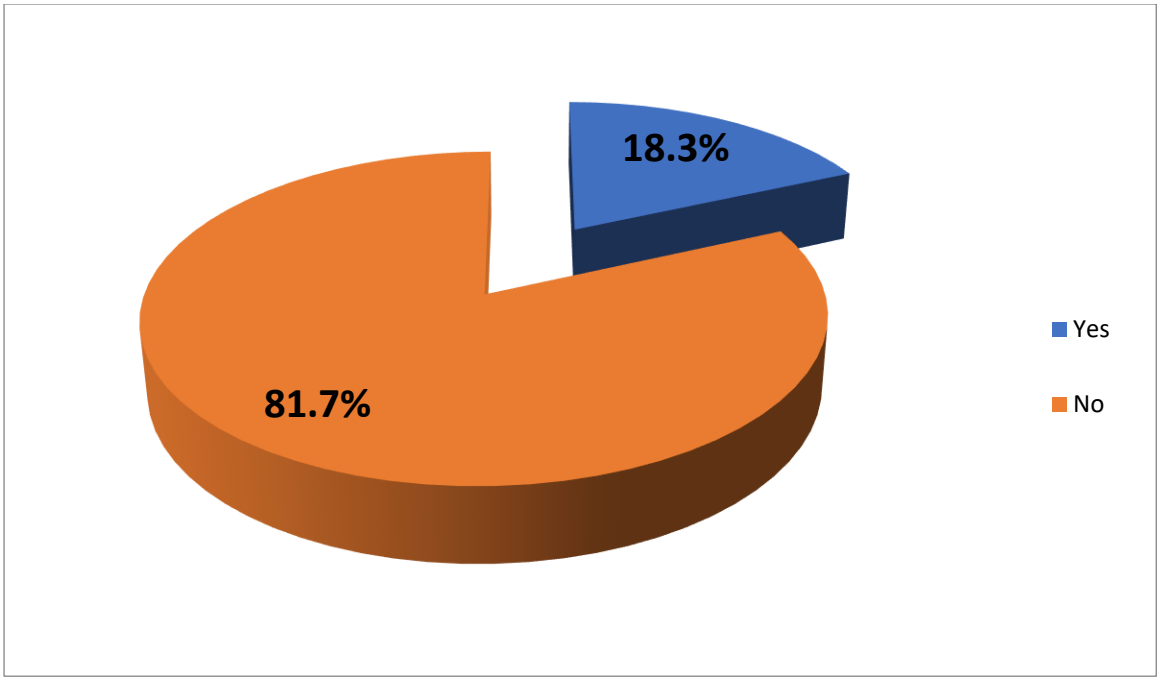

Table (4): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about Chest tube Problems and Complication (n= 60):

Items	Correct		Incorrect	
	No	%	No	%
The problems with installing the chest tube.	22	36.7	38	63.3
When surgical emphysema occurs in the place of insertion of chest tube should be expected?	24	40	36	60
The complications of the chest tube.	35	58.3	25	41.7
Change the fluid texture in the fluid collection container from liquid to cream indicates the presence of infection.	29	48.3	31	51.7
Excessive secretions in the fluid collection container indicate an infection.	25	41.7	35	58.3
The container for fluid collection should be raised to a higher level than the patient.	30	50	30	50
To avoid the risks arising while the chest tube is in place, care must be taken to close the safety valve continuously.	34	56.7	26	43.3

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Table (5): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about The Nursing Care Provided to Patients with a Chest Tube (n= 60)

Before insertion of the chest tube	Correct		Incorrect	
	No	%	No	%
The chest tube can be inserted to the patient in the bed.	27	45	33	55
The patient should be given general anesthesia before the chest tube insertion.	40	66.7	20	33.3
One of the important procedures before insertion of the chest tube is to do a triple lipid analysis.	26	43.3	34	56.7
A normal chest x-ray should be done before insertion of the chest tube.	28	46.7	32	53.3
It is necessary to make ultrasound on the abdomen before insertion of the chest tube.	31	51.7	29	48.3

Table (6): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge during Insertion of the Chest Tube (n= 60)

Items	Correct		Incorrect	
	No	%	No	%
The patient is placed on the unaffected side of the chest during the insertion of chest tube.	32	53.3	28	46.7
The rate of water in the container of fluid collection should not be less than 10cm above the level of the chest tube; this is to prevent air from entering the pleural cavity.	30	50	30	50
In the case of fluid collection in the pleural cavity, I t appears in the chest tube fluid container as bubbles.	24	40	36	60
The container to collect fluids in the chest tube is filled with normal saline solution up to one third in case of pneumothorax.	21	35	39	65
Nurses should not intervene when there is an air leakage from the chest tube.	18	30	42	70
During insertion the chest Tube, an adhesive tape must be placed on it with the name of the doctor only.	25	41.7	35	58.3
The date and time of the chest tube insertion should be recorded.	31	51.7	29	48.3
The amount of sterile liquid should be written in the fluid collection container.	35	58.3	25	41.7

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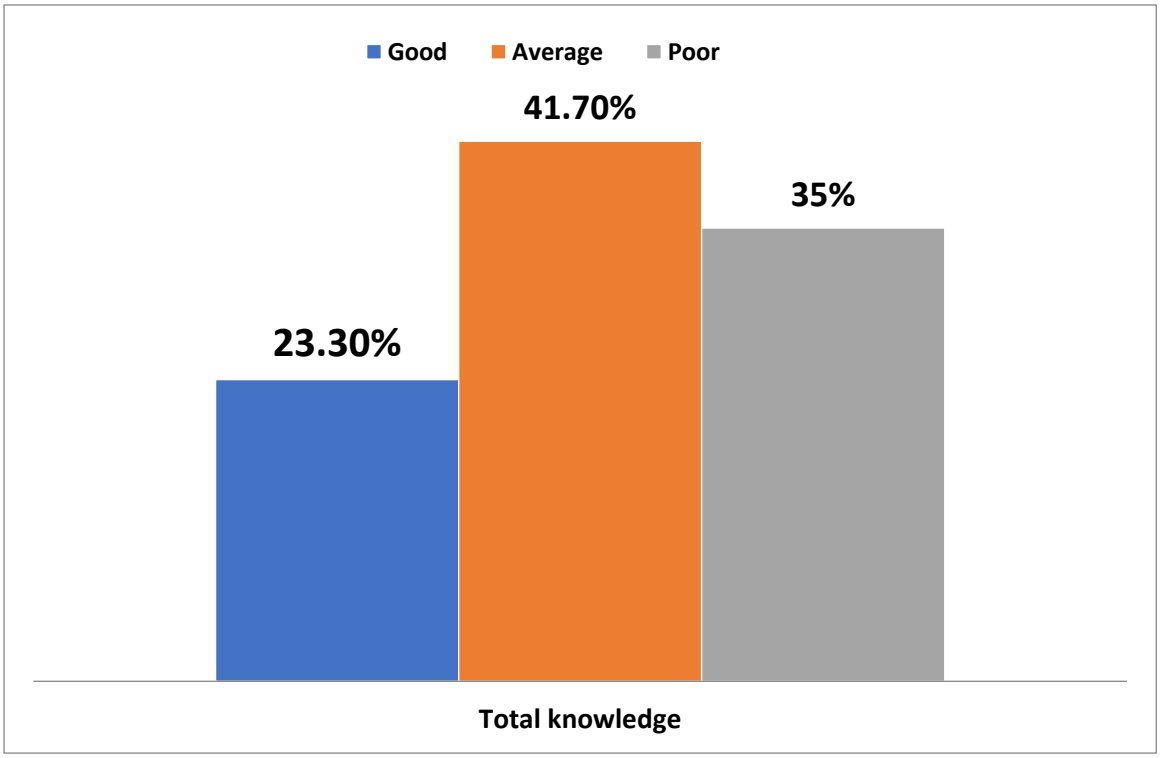
Table (8): Frequency and Percentage Distribution of the Studied Nurses regarding their Knowledge about nurses' role in case of prescience of problems or complications in the chest tube (n= 60)

Items	Correct		Incorrect	
	No	%	No	%
In case of the patient removing the chest tube suddenly.	24	4	36	60
In case of breaking the fluid collection bottle, the following must be taught to the patient.	29	48.3	31	51.7
The chest tube is closed in the following cases.	27	45	33	55
In case of the chest tube is blocked, the following should be done.	28	46.7	32	53.3

Figure (2) Percentage distribution of studied Nurses regarding their total Knowledge about Nursing Management of Patients with Chest Tube Drainage (n= 60)



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African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
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Table (9):frequency and Percentage Distribution of the Studied Nurses Practice regarding Patients with chest tube (n= 60)

Items	Done		Not done	
	No	%	No	%
Identify the patient	24	40	36	60
Wash hands	23	38.3	37	61.7
Prepare of equipment	27	45	33	55
Explain the procedure to the patient	25	41.7	35	58.3
Provide privacy	32	53.3	28	46.7
Place patient in comfortable sitting position	26	43.3	34	56.7
Wearing clean gloves	34	56.7	26	43.3
Measure vital signs	28	46.7	32	53.3
Check oxygen saturation	30	50	30	50
Assess insertion site and surrounding skin for : A- Presence of signs of infection or inflammation. B- Swelling. C- Pain	 24 21 22	 40 35 36.7	 36 39 38	 60 65 63.3
Check that the tube is still in the chest (tighted by suture)	25	41.7	35	58.3
Check connection between chest tube and system	24	40	36	60
Documentation of Date, time of assessment, and any abnormal findings as signs of infection.	35	58.3	25	41.7

Table (10): Frequency and Percentage Distribution of the Studied Nurses Practice regarding assessment of chest tube drainage patency (n= 60)

Items	Done		Not done	
	No	%	No	%
Assessing the drainage system every 2 to 4 hours.	23	38.3	37	61.7
Check that all connections are securely taped, tight and maintenance unit sterility.	29	48.3	31	51.7
Check drainage tubing to ensure that there are no dependent loops or kinks.	25	41.7	35	58.3
Adjust tubing to hang in a straight line from the chest tube to drainage chamber.	27	45	33	55
Observe the water-seal chamber for fluctuations of water level with the patient's inspiration and expiration.	28	46.7	32	53.3
Assess for air leaks in the system, as indicated by constant the bubbling in the water-seal bottle or chamber.	24	40	36	60
Milk or strip the tubing when a visible clot or other obstructing drainage present in the tubing, only if indicated.	26	43.3	34	56.7
Mark and document the drainage level on the outside the drainage collection chamber hourly or every shift.	29	48.3	31	51.7

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Figure (3) Percentage distribution of studied nurses related their total practice level about nursing intervention for management of patients with chest tube drainage (n= 60)

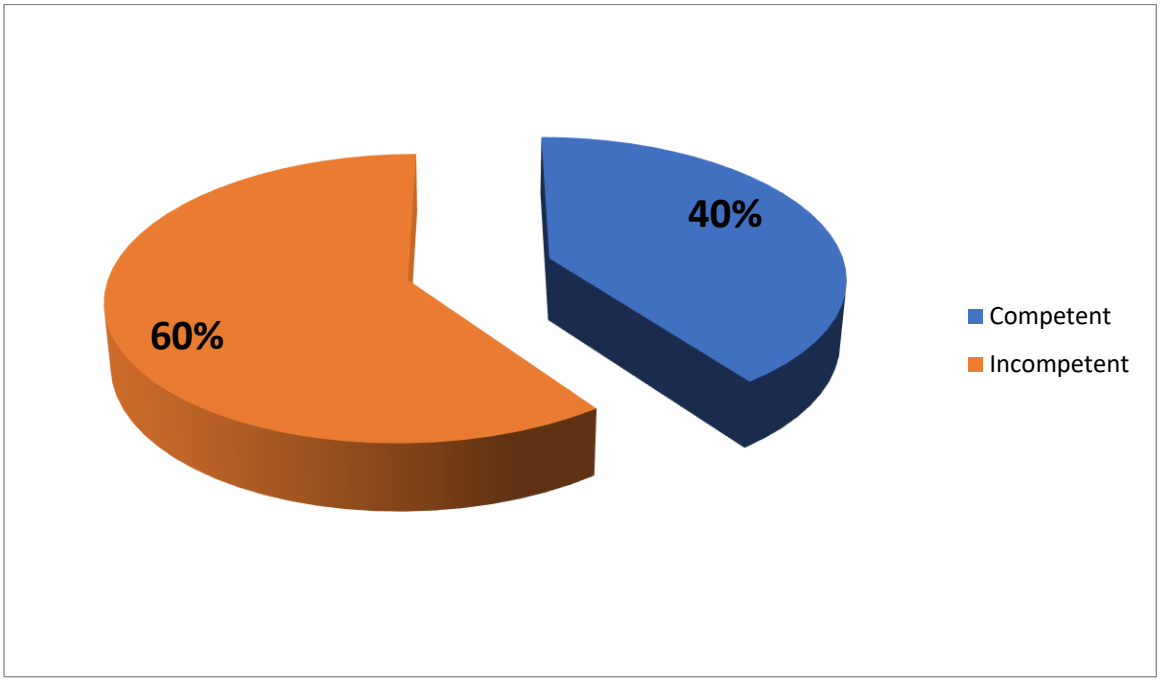

Table (15): Correlation between demographic Characteristics of the Studied Nurses and their Total Knowledge regarding Nursing Management of Patients with Chest Tube Drainage (N=60)

Items		Total Knowledge							
		Good No=14		Average No=25		Poor No=21		X2	P-Value
		No	%	No	%	No	%		
Gender	Male	5	35.7	4	16	5	23.8	2.010	.058
	Female	9	64.3	21	84	16	76.2		
Age	<20	1	7.1	1	4	8	38.1	4.997	.014*
	20-29	1	7.1	8	32	6	28.6		
	30-39	3	21.5	11	44	6	28.6		
	>40	9	64.3	5	20	1	4.7		
Level of education	Nursing Diploma	0	0	5	20	16	76.2	7.956	.008**
	Technical heath institute	1	7.1	15	60	3	14.3		
	Bachelor of Nursing	9	64.3	4	16	2	9.5		
	Postgraduate (MSc)	4	28.6	1	4	0	0		

Article DOI: 10.52589/AJHNM-9WN8DVCH
DOI URL: https://doi.org/10.52589/AJHNM-9WN8DVCH

Years of experience	Less than 3 years	0	0	2	8	10	47.7	6.958	.009**
	3 - 5 years	1	7.1	2	8	7	33.3		
	5 - 10 years	2	14.3	19	76	3	14.3		
	More than 10 years	11	78.6	2	8	1	4.7		
Attend training courses	Yes	9	64.3	1	4	1	4.7	4.113	.038*
	No	5	35.7	24	96	20	95.3		

Table (16): Correlation between demographic Characteristics of the Studied Nurses and their Total Practice regarding care of patient with chest tube (N=50)

Items		Total Practice					
		Competent No=24		Incompetent No=36		X2	P-Value
		No	%	No	%		
Gender	Male	6	25	8	22.2	2.007	.051
	Female	18	75	28	77.8		
Age	<20	4	16.7	6	16.6	1.567	.071
	20-29	6	25	9	25		
	30-39	10	41.7	10	27.8		
	>40	4	16.6	11	30.6		
Level of education	Nursing Diploma	2	8.4	19	52.8	9.613	.003**
	Technical heath institute	5	20.8	14	38.9		
	Bachelor of Nursing	12	50	3	8.3		
	Postgraduate (MSc)	5	20.8	0	0		
Years of experience	Less than 3 years	1	4.1	11	30.6	9.038	.002**
	3 - 5 years	3	12.5	7	19.4		
	5 - 10 years	10	41.7	14	38.9		
	More than 10 years	10	41.7	4	11.1		
Attend training courses	Yes	10	41.7	1	2.8	3.997	.041*
	No	14	58.3	35	97.2		

Article DOI: 10.52589/AJHNM-9WN8DVCH
DOI URL: https://doi.org/10.52589/AJHNM-9WN8DVCH

Table (17): Correlation between Studied Variables

Items	Total knowledge
Total practice	R. .699 p. value .000**

DISCUSSION

Chest drains have remained a common, simple and effective tool for managing chest trauma and pleural pathologies. They are largely used in patients admitted with these pathologies in accident and emergency units, Intensive Care Units, adult and pediatric medical and surgical wards. Nursing care of chest drains can either be pre-procedural or post-procedural. Pre-procedural care involves ensuring that an informed consent is obtained and giving additional relevant information to the patient, gathering the correct materials for tube thoracostomy and assisting the procedure *(Kesieme, et al., 2021)* .

Post-procedural care entails monitoring vital signs, maintaining a closed system, assessing and charting drainage, protecting the water seal drainage system, assisting patients during change of position and assisting in removing tube after it has served its function. Inefficient nursing care and poor surgical techniques during insertion are associated with unacceptable and sometimes life-threatening complications that can be classified as technical or infective. So, this study aimed to determine the knowledge and practice gaps in the care of chest drains among nurses *(Caroll , 2017)*.

Regarding characteristics of the studied nurses, the results of the present study revealed that about three quarters of the studied nurses were female. This result was consistent with *Durai, (2020) & Elfeky, (2021)*, and *Kizza, (2021)*, who stated that, most of their studied samples were females. This result may be due to the old belief that nursing is a private profession to female so the majority of nurses in Egypt are females.

Concerning age of the studied nurses, the results of the present study revealed that a round one third of the studied nurses were in the age group 30-39 years, with a mean age of 29.75± 3.41.This result disagreed with that of *Mohammed, (2018)*, who conducted a study entitled "Assessment the nurses performance in providing care to patients undergoing chest tube in Suez Canal University hospitals" and mentioned that, more than three quarters of their studied nurses were less than 25 years.

Considering workplace of the studied nurses, the results of the present study revealed that two thirds of the studied nurses working at ICU. This result was agree with that of *Mathew, (2019)*, who conducted a study entitled "Effectiveness of Structured Teaching Programme on Care of Patients with Intercostal Drainage among Nurses" and found that most of the studied nurses were working in Intensive care units.

This result was also in agreement with those of *Ibrahim & Elshemy, (2020)*, who conducted a study entitled "Impact of an Educational Program on Knowledge and Practices of Nurses about Caring of Patient with Chest Tube" and revealed that more than half of the studied nurses had diploma nursing education. This result showed that the nursing staff who provided

Article DOI: 10.52589/AJHNM-9WN8DVCH
DOI URL: https://doi.org/10.52589/AJHNM-9WN8DVCH

caring to patients with chest tubes which are a serious field had a very little experience and poor knowledge, that may be causing serious complications. It was important that appropriate training in the management of chest drains should be given to the nurses to ensure that patients are cared for safely and competently.

Regarding years of experience, results of the current study indicated that more than one third of the studied nurses had a year of experience ranged between 5-10 years. This result was in agreement with those of *Bedier, et al. (2018),* who conducted a study entitled "The Impact of an Educational Program on Nurses, Practice Related to Care of Patients with Chest Tube" and illustrated that about half of them had less than 10 years' experience. This result was supported by *Lit, et al. (2021),* whose studied the need for nurses to have an in-service education of chest drain management, at Queen Elizabeth Hospital and emphasized that that more than half of the nurses had at least 5 years medical experience.

Concerning Attend training courses on nursing care for patients with chest tube, results of the current study indicated that the majority of the studied nurses not attended training courses on nursing care for patients with chest tube. This result was in in the same line with that of *Bedier, et al. (2018),* who found that the majority of studied nurses did not have any undergraduate training courses about chest tube care as they graduated from secondary nursing school.

This result was in agreement with those of *Lit, et al. (2021),* whose studied the need for nurses to have an in-service education of chest drain management, at Queen Elizabeth Hospital emphasized that the majority of nurses had not attended an educational lectures or workshops concerning chest drainage management.

This result was congruent with those of *Hutton, et al., (2019),* who conducted a study entitled "Using simulation models to teach junior doctors how to insert chest tubes: a brief and effective teaching module" and stated that Mistakes in dealing with the chest tube and its system are commonly being practiced, mainly by the residents and the nurses due to insufficient knowledge and poor experience. Therefore, training courses for both the residents and the nurses should be obligatory in any hospital dealing with patients with chest tube.

Concerning nurses' knowledge about the Anatomy of the Respiratory System and Its Functions, results of the present study revealed that less than two thirds and the majority of the studied nurses had correct answer regarding components of the respiratory system and the main function of the respiratory system, respectively. While, the vast majority and around two thirds of them had incorrect answer regarding the pleural cavity is a closed system with pressure and the components of the pleural cavity, respectively.

Based on the investigator points of view, this result might be due to that there was no source for acquiring knowledge from doctors, head nurses, attending training courses and even no guidelines or any protocol of nursing intervention about care of patient with chest tube in any studied unit. This result was congruent with those of *Ibrahim (2018),* who conducted a study entitled "Assessment the nurses' performance in providing care to patients undergoing chest tube in Suez Canal University hospital" and showed that the majority of studied nurses at Ismailia University Hospital had statistically unsatisfactory level of knowledge related to chest tube. The need to develop training programs related to chest tube was suggested. Such program was expected to improve nurses' knowledge related to chest tube.

Article DOI: 10.52589/xxxxxx
DOI URL: https://doi.org/10.52589/xxxxxxxxx

Regarding nurses' knowledge about chest tube Problems and Complications, results of the present study revealed that less than two third of the studied nurses had correct answer regarding complications of the chest tube and to avoid the risks arising while the chest tube is in place, respectively. While, around two thirds of them had incorrect answer regarding among the problems with installing the chest tube and when surgical emphysema occurs in the place of insertion of chest tube should be expected, respectively.

According to *Fremlin, (2018),* who conducted a study entitled "Are nursing staff sufficiently educated and competent in managing patients with a chest drain" and pointed out to the lack of evidence-based nursing care and insufficient training has resulted in uncertainty and knowledge deficit on an important aspect of chest tube care, exposing patients to avoidable complications. Moreover, poor instructions to nurses from doctors following chest tube insertion further compromises patient care. A carefully designed and implemented care bundle to guide nurses through chest tube management could significantly lower post-insertion complications.

Findings of the present study showed that, two third of the studied nurses had correct answer regarding the patient should be given general anesthesia before the chest tube insertion and more than half replied it is necessary to make ultrasound on the abdomen before insertion of the chest tube, respectively. While, more than half of them had incorrect answer regarding the chest tube can be inserted to the patient in the bed and one of the important procedures before insertion of the chest tube is to do a triple lipid analysis, respectively. This finding shows that there is a need for training programs for nurses on the management of patients with chest tubes.

These results were in partial agreement with those of *Magner, et al. (2021),* who conducted a study in Ireland and found that around three quarters of the nurses had sufficient and moderate knowledge level regarding management of patients with chest tubes. According to *Schilling, et al. (2021),* who revealed that there is a worrying poor level of knowledge among nurses in their study.

This result was consistent with that of *Durai, (2020),* who conducted a study entitled "Managing a chest tube and drainage system" and said that majority of nurses had unsatisfactory knowledge level about all aspect of care about chest tube.

According to *Mohan, (2019),* who conducted a study entitled "Effectiveness of computer assisted teaching on knowledge regarding the nursing management of patients with chest tube drainage among the staff nurses in selected hospitals" and mentioned that, there is a lack of standard practice regarding chest tube nursing management. This inconsistency of treatment regimes, with the lack of evidence-based nursing care, creates a general difference regarding the care of patients with chest tubes

CONCLUSION

Based on the findings of the present study. More than one third of the nurses under study had poor level of total knowledge and about two thirds of nurses had incompetent level of practical skills regarding nursing intervention for management of patients with chest tube drainage. Furthermore,there was a highly significant correlation ($P<0.01$) between total

Article DOI: 10.52589/xxxxxx
DOI URL: https://doi.org/10.52589/xxxxxxxxx

nurses knowledge and their total practice regarding nursing management of patients with chest tube.

RECOMMENDATIONS

Based on the current study results, the following recommendations were suggested:

- Regular continuous educational program plan about chest tube & its management should be designed to nurses working in ICU at least every six months for enhancing nurses' knowledge and practice to achieve high quality of care.
- Developing procedure booklet by simple language for nurses who provide care for patient with chest tube.
- Conducting health educational workshops in schools, colleges and other community area with appropriate A.V. aids, mass media, posters and role-plays.

Further researches:

- Replication of the study on large subjects from different hospitals and in different geographical area in Egypt for generalization of findings and to assess and compare the knowledge and practices chest tube insertion.

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