

Effect of an Educational program for nurse's working at Mansoura University Hospitals on Chest Tube Complications.

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Abstract

Background: Chest tube is an essential life saving measure for the management of pneumothorax, and hemopneumothorax developed as a consequence of chest trauma or surgery. **The aim** of this study was to assess the effect of a nurse's education program on chest tube complications.

Subjects and Method: Quasi experimental design was utilized to carry out this study.

Study Subjects: All available nurses were included in the study (44) both sexes who are working in chest department at Mansoura University Hospitals and (30) patients admitted to same sitting. **Three tools** were used for data collection; first tool included three parts sociodemographic characteristics of the studied nurses, interview questionnaire sheet about nursing chest tube knowledge and patients' demographic characteristics. Second tool is nurses' performance observational checklist about nursing management and tool three chest tube complications.

Results: Before implementing the educational 62.5% of the studied nurses had low knowledge level, and 70% of them had moderate practice level, while after education 65.0% of them had moderate knowledge level and 90% had high practice level. There were significant differences in incidence of chest complications post education. **The study concluded;** nursing management intervention guidelines significantly improved nurses' performance and decrease chest tube complications.

Keywords: chest tube, guidelines, nursing management.

I. Introduction

Chest tube placement is one of the most commonly performed procedures as it is widely used throughout medical, surgical, and critical care specialties from bedside to operating room, from life-threatening emergencies to postoperative chest drainage in elective surgery. [1] American Heart Association (AHA) reported that annually more than 448,000 patients underwent cardiothoracic surgery including Coronary Artery Bypass Grafting (CABG), valve replacement or repair, or repair of defects which are familiar rationales for chest tube insertion. [2] Every year, over one million chest tubes are inserted for patients in the U.S. alone. [3-4] Chest tubes are used to treat conditions that disturb the pleural space aschylothorax, empyema, hemopneumothorax, hemothorax, pleural effusion, pneumothorax and cardiothoracic surgeries. [5] Another indication isthoracic traumawhich accounts approximately 25% of trauma. Fortunately over 80% of injuries can be managed non-operatively using chest tube appropriate analgesia and adequate respiratory therapy. [6-7]

Unfortunately, it potentially life-saving procedure. In general, also continues to be a significant source of preventable morbidity, chest tube complications are categorized as insertional, positional or infective management and care. Complications of chest tube insertion include malposition, lung injury, diaphragmatic perforation, subcutaneous placement, intercostal artery bleeding, recurrence, empyema, injury to abdominal organs, perforation of the heart and lungs, cardiogenic shock, mediastinal perforation and local signs of infection in site of insertion as redness. Pain, tenderness and pad odor. Although, serious complications can be prevented through proper observation and expert consultation during both procedural and maintenance of thoracic procedures. [8]

Caring for patients with chest tubes is an essential part of nursing practice, especially for those nurses who care for patients with complicated respiratory problems or undergo cardiothoracic surgery. It is vital that nurses and healthcare members use the most excellent accessible evidence in making decisions concerning these patients' care. [9] So professional development should take place throughout the nurse's career. Educational programs need to be planned to promote professional growth of nurses to improve skills and knowledge. This provides high quality and effective health care for patients. [10]

Significance of the study

Rate of complications with chest tubes have been reported to be as high associated with inappropriate management of chest tube and their drainage systems may cause delayed or incomplete evacuation of the collected air or fluid in the pleural space, and delayed re-expansion of the collapsed lung. This are associated with large morbidity. It is important that health care team caring for patients with chest tube, should have acceptable understanding of the physical principles of chest tube and drainage system. Complications are more likely if the nurses caring for patients with chest tube do not have the necessary skills and training. [11–13] Furthermore, there was few national studies were done to explore and manage this problem. So this study will be done to examine the effect of an educational program for nurse's working at Mansoura University Hospitals on chest tube complications.

II. Subjects and Method

The aim of this study:

To examine the effect of an educational program for nurse's working at Mansoura University Hospitals on chest tube complications.

Research Hypothesis:-

Chest tube complications decrease after chest tube nurse's education program when compared with pre program. Subjects and method of the current study were discussed under the following four main designs:

1. Technical Design
2. Administrative Design
3. Operational Design
4. Statistical Design

1. Technical Design

Technical design of the current study included: research design, study setting, subjects, and tools for data collection

Research design:

Quasi experimental research design was used to conduct this study.

Setting:

This study was conducted in the chest department at Mansoura University Hospitals. The setting affiliated to Dakhlia Governorate, Egypt.

Subjects:

- All available nurses were included in the study (44) nurses who are working in chest department at Mansoura University Hospitals, with diverse age, qualification, years of experiences, different level of education who provide nursing care for patients and willing to participate at the study.
- A purposive sample of 30 adult patients has chest tube during six months, Able and willing to participate in the study.

Tools of Data Collection:-

Tools used for data collection in this study consisted of three tools as the following

Tool I: - Nurses Knowledge assessment structure interview questionnaires.

Concerned to assessment nurses' knowledge about chest tube and nursing management of patients with chest tube. Was adopted from Shaker (2012) and modified by the researcher it was in Arabic form. [14] Included three parts.

Part (1): Sociodemographic Characteristics of the Studied Nurses

Concerned with data related to socio demographic characteristics of the nurses such as age, gender, education level, marital status, residence, occupation...etc

Part (2): Nurses' knowledge about nursing management of patients with chest tube drainage.

Concerned with nurses' knowledge about chest anatomy and chest tube nursing management, included 14 questions in the form of choosing the correct answer.

Regarding scoring system, each correct answer was given a score of one while incorrect answer or don't know was given score zero.

Score was transferred into categories as follow:

- Low: For those who had a score <50.0%
- Moderate: For those who had a score of 50.0% to 75.0%
- High: For those who had a score of >75.0%

Part (3): Sociodemographic characteristics of the studied patients

Concerned with data related to socio demographic characteristics of the patients such as age, gender, education level...etc

Tool II:-Nurses practice observational checklist.

Aimed at assessing the practice of the studied nurses regarding chest tube management, and evaluating the effect of implementing nursing management guidelines on nurses' practice. It was adopted from; Shaker (2012). [14] Regarding scoring system, for chest tube practice items, the item of assessment was scored for done one and not done was scored zero for each item,

Practice categories:

Poor: For those who had a score <50.0%

Fair: For those who had a score of 50.0% to 75.0%

Good: For those who had a score >75.0%

Tool III:- Local signs & symptom of infection and chest complications checklist.

Aimed to assess incidence of local site of chest tube in fections as, redness, tenderness, bleeding, pain, and leakage from drain site. Also it assesses chest tube complications such as, vascular injury, pneumothorax, and subsequent empyema, this tool developed by the researcher. Regarding scoring system, for chest tube local infection and complications, the item was scored for Yes one and NO was scored zero for each item,

Method

The study conducted through three phases' preparation, implementation, and evaluation phase

Phase 1: Preparation Phase

- The required official permissions to conduct the study were obtained from the ethical committee of Mansoura Nursing College, Director of Chest Department affiliated to Mansoura University Hospital. This was achieved after clear clarification of the aim and nature of the study in addition its expected outcomes.
- In this phase the researchers prepare the tools of data collection and educational material (brochures, colored booklet and educational video) after reviewing the related, scientific literatures.
- The educational program was designed and prepared by the researchers after reviewing the related literatures. A simple colored Arabic booklet was developed for nurses covering all items related to chest tube and its management. The Educational booklet includes definition of chest tube, purpose, indications, contraindications, complications and different nursing procedures related to chest tube management including patient assessment, assessing drainage system patency, changing chest tube insertion site dressing, changing the chest drainage bottle, health education for the patient, and chest tube removal procedure. It was written in simple Arabic language containing colored pictures clarifying each step in all procedures mentioned above for more understanding.
- Validity testing was done to the tools by submitting the tools to experts in the field of "medical surgical nursing and nursing education in addition to statistics ". Their recommended modifications were done.
- Reliability of tools were assured by Cronbach's Alpha (alpha= 0.882) which is very good
- A Pilot study was conducted on 10 % who were selected randomly from (3clients& 4 nurses) who were selected randomly and excluded from the studied sample to evaluate the clarity, applicability, and reliability of the research tools and to estimate the approximate time required for data collection. Accordingly the necessary modification was done, some questions were added and others were clarified or omitted.
- For ethical consideration the chest tube clients were informed about the purpose of the study and they were assured that their identities and responses to the interview would be confidential and used only for research purpose, answering was voluntary and participation (or not) would have no effect on their current or future health care

Phase (III): Implementation phase:

- The researcher started by introducing herself to clients, nurses and gave them a brief orientation about the aim and design of the study.
- Assess the level of nursing knowledge and practices concerning chest tube and nursing management of patients with chest tube drainage before starting the educational program using tool I and II (pre test).
- Assess patient's chest tube complications as baseline data education program used tool III (pre test).
- The implantations of the program run within the schedule of the nurses working hours. Separate group each group consist of eight nurses, except the last group was 4 nurses.
- The program was conducted through five sessions; each group obtained the five sessions through 2 weeks, each session took about 30- 45 minutes.
- Diverse teaching methods were used during the sessions including; interactive lectures, group discussion, demonstration & re-demonstration, data show, pictures, printed booklets, and actual nursing management on the patients.

Phase IV: Evaluation phase:

- By the end of last session posttest were completed for evaluating participants' knowledge and practical by using knowledge questionnaire and practical checklists respectively for nurses using tool I part 2 and tool II (post test).
- For patients after complete nurses sessions assess patient's chest tube complications and local signs and symptoms of infections using tool III (post test).
- The results were compared to the pretest results to evaluate the impact of the program on knowledge, practices of the nurses and chest tube infection, complications.

Ethical Consideration:

The research ethics panel of the college of nursing, Mansoura University approved the study Protocol. Oral consents were obtained from patients and nurses who agreed to participate before his/her inclusion into the study aim of the study, Anonymity and confidentiality were assured to participants. The investigator declared that participation is voluntary and confidential.

4-Statistical analysis

- Data were sorted, coded, organized, categorized and then transferred into especially designed formats.
- Data were analyzed using SPSS (Stands for Statistical Product and Service Solutions) version 20.
- The given graphs were constructed using Microsoft excel software.

III. Results

Table (1): Revealed that, the majority of the studied nurses were females (90%). In relation to the age almost all the studied nurses were in their second and third decade (42.5% & 45%) respectively. As regard to level of education of the studied nurses it was found that, above half of them had diplom degree (52.5%), while only 5% of them are post graduate university. Above two-thirds of the studied nurses (67.5%) had less than ten years of experience. One third of studied nurses (32.5%) attended training courses and only one third of them (30.8%) had training courses from 3 to 4 times.

Table (2): represents that, as regard to questions about materials of chest tube, aims, indications and contraindications before implementing the guidelines was (55%, 60%, 40%, 45%) respectively which improved after implementing the guidelines (82.5%, 65%, 85%, 85%) respectively. This table reveals that there were statistical significant difference in regard to basic knowledge of the studied sample between pre, and post the implementation of the guidelines ($P < 0.05$) and a significant improvement in nurses knowledge about chest tube in all knowledge items.

Table (3): portrayed that, post implementing nursing guidelines; nurses in the study had a highly statistically significant improvement in total level of knowledge about (6.8 ± 1.1). Also it could be seen, change in the level of knowledge of nurses included in the study from low level (62.5%) before implementation to (2.5%) after. Also, the table clarified that, high level knowledge, increased from (2.5%) before which improved to (32.5%) after implementation of the educational guidelines. There are a highly significance difference between before and after implementing the educational guidelines.

Fig (1): Clarifies that, 22.5% of the studied nurse' score were improved to 90% after implementation of educational guidelines. The fair score percent before the guide was 70% decreased to be 10% after implementing the educational guidelines showing statistical significant difference.

Table (4): Shows distribution of the study patients according to bio-socio demographic characteristics. It was clear that more two third of participants (76.7%) were male, 63.3% of them their age ranged from 51-60 years, Finally for their education level nearly to half of participants 46.7% were secondary education.

Table (5): Represents distribution of patients according to local signs and symptom of infection pre and post education. As shown there is a significant reduction in participants' local chest infection post education in all signs and symptoms except drain dislodgement and leakage from drain site. Also the most prevalence local signs and symptom pre education were Patients lying on tubing (96.7 %), followed by Pain (90%), Redness (80%), and tenderness (60%).

Table (6): Represents distribution of patients according to chest tube complications pre and post education. It is shown that, 16.7% of the study participants had drain site skin infection, and 3.3% of them had drain blockage or accidental removal pre education. While post education there were reductions in the chest tube complications (3.3% & 0.0%) respectively.

Figs (2): Represent percentage of local signs and symptom of chest tube infection pre and post education. There were a significant difference between local signs and symptom of chest tube infections.

Table (7): Represents incidence percentage of chest tube complications pre and post education. It is shown that, 16.7% of the study participants had chest tube complications pre intervention, decreased to 3.3% post education.

Table (8): Shows that the relationship between demographic data (sex, age, qualifications, experience years, training courses and its number) and local signs and symptom of chest tube infection. It was found that there was no significant relation between sex, age, education and the local signs and symptoms of chest tube infection (p= 0.708, 0.697, 0.327) respectively

Table (1) Distribution of nurses according socio-demographic characteristics (no. =40).

Demographic data	No	%
Gender		
▪ Female	36	90.0
▪ Male	4	10.0
Age		
▪ 18- years old	17	42.5
▪ 29-	18	45.0
▪ 39-	4	10.0
▪ 49-60	1	2.5
level of education		
▪ Diplom of Nursing	21	52.5
▪ Diplom + specialization	1	2.5
▪ Health technician Institute	8	20.0
▪ Bachelor of Nursing	8	20.0
▪ Post graduate	2	5.0
Experience years		
▪ <10	27	67.5
▪ 10-26	13	32.5
Training courses		
▪ No	27	67.5
▪ Yes	13	32.5
Number of training courses (n=13)		
▪ 1: 2	9	69.2
▪ 3: 4	4	30.8

Table (2): Distribution of nurses' according to basic knowledge concerning chest tube pre, and post the implementation of guidelines of chest tube (n =40).

Knowledge items	Phase				X ² _{mc}	P
	Before		After			
	No	%	No	%		
Pleural cavity is closed cavity with pressure					24.2	0.001*
▪ Incorrect answer	27	67.5	0	0.0		
▪ Correct Answer	13	32.5	40	100.0		
Pleural cavity pressure					18.5	0.001*
▪ Incorrect answer	32	80.0	5	12.5		
▪ Correct Answer	8	20.0	35	87.5		
Material of chest tube					7.6	0.001*
▪ Incorrect answer	22	55.0	7	17.5		
▪ Correct Answer	18	45.0	33	82.5		
Aims of Chest tube					4.2	0.025*
▪ Incorrect answer	24	60.0	14	35.0		
▪ Correct Answer	16	40.0	26	65.0		
Indications of chest tube					5.1	0.012*
▪ incorrect answer	16	40.0	6	15.0		
▪ Correct answer	24	60.0	34	85.0		
Contraindications of chest tube					6.8	0.003*
▪ Incorrect answer	18	45.0	6	15.0		
▪ Correct Answer	22	55.0	34	85.0		
Complications of chest tube insertion					4.0	0.043*
▪ Incorrect answer	32	80.0	2	5.0		
▪ Correct Answer	8	20.0	38	95.0		
When a bulge in the lung (Emphysema) in chest tube insertion site should expect					10.5	0.001*
▪ Incorrect answer	27	67.5	11	27.5		
▪ Correct Answer	13	32.5	29	72.5		

X²_{mc}: Mc-Nemar test

* P < 0.05 (significant)

Table (3): Distribution of nurses according to their total knowledge level (n =40).

Knowledge	Phase				X ² _{mc}	P
	Before		After			
	No	%	No	%		
Low	25	62.5	1	2.5	20.2	0.001*
Moderate	14	35.0	26	65.0		
High	1	2.5	13	32.5		
Range	1-8		4-9		t=3.4	0.001*
Mean ± SD	4.1 ± 1.8		6.8 ± 1.1			

Figure (1): Shows distribution of nurses according to their practice before and after implementing educational guidelines.

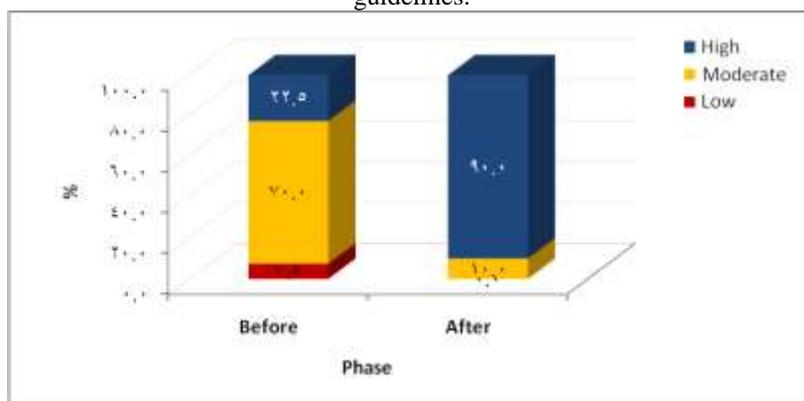


Table (4): Distribution of the study patients according to demographic characteristics N= 30.

Characteristics	No	%
Gender		
▪ Male	23	76.7%
▪ Female	7	23.3%
Age in years		
▪ <50	11	36.7%
▪ 50+	19	63.3%
Range	35-60	
Mean ± SD	51.4 ± 7.0	
Education		
▪ Illiterate	11	36.7%
▪ secondary	14	46.7%
▪ High	5	16.7%

Table (5): distribution of patients according to local signs and symptom of infection pre and post education N= 30.

Signs & Symptoms	Phase				P
	Pre		Post		
	No	%	No	%	
Redness	24	80.0%	0	0.0%	0.001*
Tenderness	18	60.0%	0	0.0%	0.001*
Pain	27	90.0%	7	23.3%	0.001*
Bad odor at sit of insertion	4	13.3%	0	0.0%	0.038*
Drain Blockage	4	13.3%	0	0.0%	0.038*
Drain Dislodgement	1	3.3%	0	0.0%	0.313
Drain has stopped swinging	6	20.0%	0	0.0%	0.010*
Patient lying on tubing	29	96.7%	0	0.0%	0.001*
Drain tubing disconnected	5	16.7%	0	0.0%	0.020*
Leakage from drain site	2	6.7%	0	0.0%	0.150

P: Mc-Nemar test

Table (6): Distribution of patients according to chest tube complications pre and post education N= 30.

Complications	Phase				P
	Pre		Post		
	No	%	No	%	
Drain site skin infection	5	16.7%	1	3.3%	0.085
Drain blockage or accidental removal	1	3.3%	0	0.0%	0.313

P: Mc-Nemar test

Fig (2): Local signs and symptom of chest tube infection pre and post education

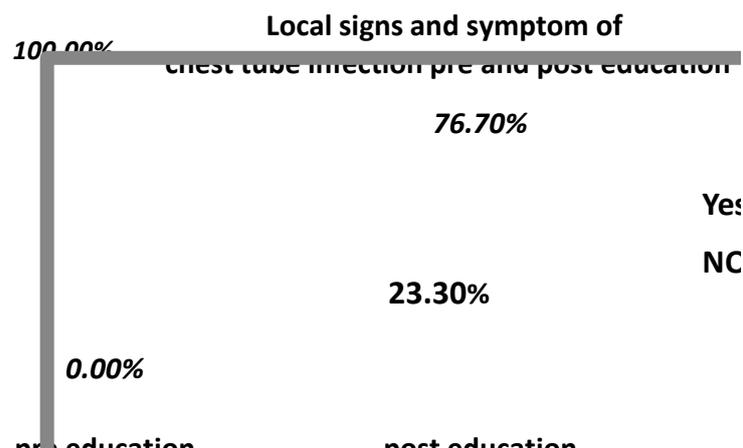


Table (7): Distribution patients according to incidence of chest tube complications.

Complications	Phase				P
	Pre		Post		
	No	%	No	%	
Complications					0.085
▪ No	25	83.3%	29	96.7%	
▪ Yes	5	16.7%	1	3.3%	

P: Mc-Nemar test

Table (8): Relation between demographic characteristics and local signs and symptom of infection.

Characteristics	Signs & symptoms				FEP
	No		Yes		
	No	%	No	%	
Gender					0.708
▪ Male	18	78.3%	5	21.7%	
▪ Female	5	71.4%	2	28.6%	
Age in years					0.697
▪ <50	8	72.7%	3	27.3%	
▪ 50+	15	78.9%	4	21.1%	
Education					0.327
▪ Illiterate	10	90.9%	1	9.1%	
▪ Middle	10	71.4%	4	28.6%	
▪ High	3	60.0%	2	40.0%	

FEP: Fisher exact probability

IV. Discussion

Chest tube insertion is the first line of treatment for variety of life threatening chest diseases and it is commonly performed throughout the world. It is safe & effective procedure associated with significant major and many minor complications. [15] Nearly all nursing management of patients with a chest tube insitu, has received little attention. Nurses are the responsible persons for managing the chest tube and drainage system after inserting a chest tube. So they should have adequate knowledge regarding the chest-tube position, observing fluid evacuation, identifying when to change or empty the drainage containers, caring for the tube and drainage system while transporting the patient. [16] This study was carried out to examine the effect of an educational program for nurse's working at Mansoura University Hospitals on chest tube complications.

I- Sociodemographic characteristics of studied nurses:

Regarding to the sex, this study reported that the majority of the nurses were females. This is going with Durai, (2010) who stated that, all the nurses of her study were females. [17] This was in the same line with Elfeky, (2013) and Kizza, (2012) who stated that most of their studied samples were females. [18, 19] 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. In relation to the age almost all the studied nurses were in their second and third decade. Similarly to Mohammed, (2011) who mentioned that, more than three quarters of their studied nurses were less than 25 years. [13] Also Elfeky, (2013) who reported that most of the studied nurses in their study were in the age group of 20-29. [18] This

in contrast with Abdullah, (2014) as the ages of their study nurses were between 26 – 45 years. [20] This may be due to the majority of work power providing direct care for the patient in nursing field in current study are young females while higher age category 'senior nurses' perform administrative role.

II- The effect of the educational guidelines on nurses' knowledge:

The present study showed that, majority of the studied nurses gave incorrect answer before implementing the educational guidelines regarding knowledge about chest tube. This lack of knowledge maybe due to large number of nurses in the present study sample had diplom nursing education, and not attending training courses about chest tube nursing management. The finding is in congruence with Durai, (2010) who said that majority of nurses had unsatisfactory knowledge level about all aspect of care about chest tube in her study. [17] Also **Maggie, (2010)** who supported these results and reported that, there was poor knowledge level affecting chest tube nursing care. This study is consistent with Schilling, (2009) who revealed that there is a poor level of knowledge among nurses in their study. [21, 22] There is a significant improvement at the post-guidelines educational program phase as more than half of nurses had high knowledge level regarding improvement in knowledge about chest tube. This shows that nurses were able to learn and get correct information about chest tube management as this is a practice of their daily work.

III- The effect of educational guidelines on nurses' practice scores:

This study revealed that, two thirds of the study sample had moderate score level before implementing the guidelines. This result is in harmony with Durai, (2010) who mentioned that, concerning total nurses' practice regarding management of patient with chest tube most of nurses had unsatisfactory practice regarding patient assessment, assessing of drainage system patency, chest tube dressing change, changing drainage bottle if broken or filled, documentation of chest tube care, health teaching, patient preparation for chest tube removal, patient assessment for signs that reveal lung expansion, chest tube removal procedure, and assessment of patient after removal. [17] The study showed that, there was a marked improvement in nurses' practice after implementing the educational guidelines in comparison with their practice level before implementing the guidelines and there was a statistical significant improvement as about one quarter of the studied nurses had high score which improved to majority of them after implementing the guidelines. This may be due to the immediate effect of explaining the correct steps of chest tube nursing procedures in the educational guidelines with colored pictures illustrating each step, using data show and implementing these steps on the patient for all study group. In addition to Kadam& Shinde, (2014) and **Anjum, (2014)** they all found that structured education program was highly effective to improve the subjects' knowledge. In agreement with current findings **Haugen, (2010)** who examined the effectiveness of an in service education program in improving nurses' knowledge, practice and attitudes. [23-25]

IV- Relation between demographic characteristics and local signs and symptom of infection

This study revealed that there is no statistical significance between all items of personal characteristics as gender, age, qualification, experience years, training courses, and no. of training courses, and nurses' basic knowledge. Similar to **Taha& Ali, (2013)** they noted that, nurses' age and experience had no influence on their knowledge and practice improvements. [26] The study found that there was no significant relation between nurses' sex, age, qualifications, experience years, training courses and its number and the baseline chest tube practice, this is may be attributed to all nursing staff providing care is encountered with the same circumstances such as large numbers of patients with shortage of staff, limited time, and lack of needed supplies regardless to their personal characteristics. In this regards, Mohan, (2010) who mentioned that, there is a lack of standard practice regarding chest tube nursing management. [10] This is inconsistency of treatment regimes, with the lack of evidence based nursing care, and creates a general difference regarding the care of patients with chest tubes.

V. Conclusion

Based on the present study findings, it can be concluded that improving nurses' knowledge and practice about chest tube nursing management illustrate appositve results with decrease incidence of chest tube complications.

VI. Recommendations

Based on our finding, we can conclude that:

- 1) Nursing Administrators should create policies and plans for providing education to the nursing staff.
- 2) In service training programs to nurses for updating their knowledge related to care of patient with chest tube drainage.
- 3) Evaluating nurses' knowledge and practice periodically to determine the effect of this program.

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