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ASSESSMENT OF KNOWLEDGE REGARDING CHEST TUBE MANAGEMENT AMONG INTENSIVE CARE NURSES IN A TERTIARY CARE PUBLIC SECTOR HOSPITAL, KARACHI

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Abstract

Chest tube management is an important responsibility of ICU nurses, as proper care is necessary to prevent complications such as infection, tube obstruction, air leakage, accidental dislodgement, and respiratory distress. This study aimed to assess the knowledge regarding chest tube management among ICU nurses in a tertiary care public sector hospital. A quantitative descriptive cross-sectional research design was used. The sample consisted of 37 ICU nurses, selected through a non-probability convenience sampling technique. Data were collected using a structured questionnaire consisting of demographic variables and 8 true/false knowledge-based items related to chest tube management. Each correct response was scored as 1, while each incorrect response was scored as 0. The reliability of the questionnaire was assessed through Cronbach's Alpha, which showed a value of .832, indicating good internal consistency. Descriptive statistics were used to summarize demographic characteristics, while an independent samples t-test was applied to compare knowledge scores between male and female ICU nurses. The results showed that male nurses had a slightly higher mean knowledge score (M = 8.74, SD = 1.63) than female nurses (M = 8.30, SD = 0.67). However, the independent samples t-test showed that this difference was not statistically significant, t(35) = .823, p = .416. Therefore, the null hypothesis was retained, indicating that gender did not significantly affect knowledge scores regarding chest tube management. The study concluded that the knowledge questionnaire was reliable and that gender had no significant influence on ICU nurses' knowledge. Regular training, refresher courses, evidence-based guidelines, and simulation-based learning are recommended to improve nurses' knowledge and clinical competency in chest tube management.

Introduction

Despite the significance of managing a chest tube, nurses' understanding is still lacking, according to recent studies. According to Pradhan and Gurung (2025), 42.7% of nurses had inadequate understanding of chest tube drainage, compared to 57.3% who had adequate knowledge. Significant correlations between nurses' knowledge and a few other variables, such their workplace and experience, were also found in their study. In a similar vein, Rahim et al. (2025) discovered that over half of nurses had a moderate level of knowledge, while a smaller percentage showed poor knowledge, suggesting the existence of knowledge gaps that could have an impact on patient outcomes. Since many nurses may not have enough training opportunities, Shrestha et al. (2025) further emphasized the significance of evaluating nurses' expertise regarding chest tube treatment in tertiary care institutions. According to these research, nurses may have different degrees of expertise, and evaluation is needed to pinpoint areas that need more training.

Because ICU nurses frequently work in extremely demanding circumstances with large workloads, limited resources, and inconsistent access to ongoing professional education, the issue becomes more significant in Pakistan and other resource-constrained contexts. According to Ahmad et al. (2024), chest drain management is an essential component of critical care nursing, and in settings with limited resources like Pakistan, nursing competency gaps can pose problems for patient safety and results. There is a need for organized and thorough training programs because evidence from Karachi also revealed that many critical care nurses had only a moderate level of understanding regarding chest tube treatment. Similar to this, a recent ICU-based study conducted in a tertiary care public sector hospital in Karachi highlighted that nurses play a crucial role in the efficient administration of chest tubes since they help control intrapleural pressure and avert major problems including lung collapse. These results lend credence to the necessity of evaluating ICU nurses employed by public hospitals' expertise of chest tube maintenance.

Because patient safety outcomes are directly related to the quality of nursing care, knowledge assessment is equally crucial. Inadequate understanding of chest tube maintenance can lead to poor drainage, tube occlusion, infection risk, incorrect handling of the drainage system, delayed detection of problems, and unintentional dislodgement. Halder and associates.Halder et al. (2025) reported that nurses' knowledge regarding management of chest tube drainage patients was an important area of concern, while Sabiha et al. (2025) found that nurses' knowledge and confidence levels in chest tube management needed improvement. These findings indicate that both theoretical knowledge and practical confidence are necessary for safe chest tube care. When nurses lack adequate knowledge, they may feel uncertain during patient care, especially in emergency situations such as sudden air leaks, excessive drainage, or respiratory deterioration. Therefore, regular assessment of nurses' knowledge can help hospital administrators and nurse educators identify learning needs and plan targeted educational interventions.

The goal of the current study is to evaluate ICU nurses' competence of chest tube management at a public tertiary care hospital. This subject is important because ICU nurses often provide care for patients who have chest tubes, and their expertise directly helps to reduce problems and enhance patient outcomes. Additionally, the study aids in determining whether variations in knowledge scores are related to demographic characteristics like gender. The study can offer helpful information for creating training sessions, refresher courses, clinical guidelines, and competency-based educational programs by evaluating nurses' current knowledge level. All things considered, the study is crucial for enhancing nursing practice, bolstering patient safety, and promoting evidence-based chest tube management in intensive care units.

Problem Statement

Because patients with chest tubes need constant monitoring, drainage system maintenance, infection control, problem detection, and prompt

reporting of adverse findings, chest tube management is a crucial duty of intensive care unit nurses. Serious problems such tube obstruction, infection, malposition, air leakage, respiratory discomfort, and delayed patient recovery can result from inadequate knowledge of chest tube maintenance. According to recent studies, nurses' proficiency and understanding of managing chest tubes continue to be a concern in various clinical settings. According to Rahim et al. (2025), nurses' expertise is closely linked to patient safety and the avoidance of complications when managing chest tubes. In a similar vein, Sabiha et al. (2025) discovered that nurses' knowledge and confidence in chest tube care needed to be improved, while Halder et al. (2025) revealed that nurses had an overall average level of understanding regarding chest tube drainage management. These results suggest that evaluating nurses' knowledge is essential to detecting gaps and raising the standard of care in intensive care units.

Adequate expertise is crucial for safe and effective nursing care since ICU nurses at tertiary care public sector institutions often manage critically sick patients with chest tubes. Recent data, however, indicates that nurses' understanding of chest tube drainage management, monitoring, complication avoidance, and evidence-based practice is still lacking. While Shrestha et al. (2025) emphasised the necessity of evaluating nurses' knowledge about care of patients undergoing chest tube management, Pradhan and Gurung (2025) discovered that nurses' knowledge regarding chest tube drainage differed according to clinical experience and working area. Preventing problems, ensuring good tube functioning, and improving patient comfort in patients with chest tubes are among the main duties of nurses, according to Çinar and Zengin (2026). In order to identify knowledge gaps and develop appropriate training, guidelines, and educational interventions, it is necessary to evaluate the ICU nurses' understanding of chest tube management in a tertiary care public sector hospital.

Research Objectives

- To assess the knowledge regarding chest tube management among ICU nurses in a tertiary care public sector hospital.
- To compare the knowledge scores regarding chest tube management between male and female ICU nurses.

Research Hypothesis

H0: There is no significant difference in knowledge scores between male and female participants.

H1: There is a significant difference in knowledge scores between male and female participants.

Literature Review

Chest tubes are placed to remove air, blood, pus, or fluid from the pleural space and allow for re-expansion of the lung. Chest tube management is a significant nursing responsibility in the intensive care and surgical nursing settings (Çinar, 2026; Ghazali, 2021; Anderson, 2022). Patients who require chest tubes are often critically ill and require constant monitoring to avoid complications such as tube blockage, infection, accidental dislodgement, air leak, pneumothorax, hemothorax, and respiratory distress. Çinar and Zengin (2026) reported that chest tube application is an invasive drainage procedure performed in cases such as pneumothorax, hemothorax, pleural effusion and empyema and requires careful nursing care to preserve cardiopulmonary function.Similarly, clinical guidelines state that nurses should check the drainage system regularly and ensure that the tubing does not have kinks or obstructions, keep the drainage unit below the chest level and ensure the connections are secure to facilitate safe drainage and prevent complications (Royal Children's Hospital Melbourne, 2025). These responsibilities demonstrate that management of the chest tube is not solely a technical task, but a patient safety priority requiring knowledge, skill and clinical judgment.Recent studies have shown that nurses' knowledge of chest tube management varies in different hospitals and clinical settings. Pradhan and Gurung (2025) examined the nurses' knowledge of chest tube drainage in a teaching

hospital of Pokhara and found that the nurses' knowledge was affected by factors such as working area and working experience. The findings suggest that nurses who work frequently with patients with chest tubes may learn better from clinical exposure. In another recent study, Shrestha et al. (2025) examined nurses' knowledge on chest tube management in a tertiary level hospital of Chitwan, Nepal and highlighted the importance of assessing knowledge and its association with demographic and professional variables.The findings of these studies suggest the need for knowledge assessment as ICU nurses may vary in their preparedness, clinical exposure and confidence in the management of chest tube drainage systems. Hence, the knowledge gaps can be used to plan continuing education and skill development programs for hospitals.

Similar data from Pakistan and other developing countries also show the need to improve nurses' knowledge and practice in the management of chest drains (Kouser, 2023; Khan, 2025). Ahmad et al. (2024) conducted a study among ICU nurses in tertiary care hospitals in Lahore, Pakistan and reported that chest drain management is an important part of critical care nursing that demands complete knowledge and compliance to evidence-based practice. Their study also noted that in resource-poor settings, lack of nursing competencies can have negative implications on patient safety and clinical outcomes.Similarly, Ullah et al. (2024) discovered that only a small percentage of critical care nurses at a tertiary care cardiac center had good understanding of chest tube maintenance, with the majority having moderate expertise. According to this research, structured and thorough training may be necessary for nurses working in critical care settings in order to increase their knowledge and proficiency. These results are extremely pertinent to public hospitals, where nurses frequently oversee critically ill patients with little funding and a heavy workload.

Additionally, a number of recent studies have linked patient outcomes and the avoidance of complications to nurses' understanding of chest tube maintenance. According to Rahim et al. (2025), since nurses are the primary caregivers in charge of keeping an eye on chest tubes and spotting problems, their knowledge and abilities are crucial for patient safety.According to their study, chest tube issues can include malposition and infection, and lowering the incidence of complications among patients with chest injuries requires understanding of chest tube management. Additionally, Halder et al. (2025) found that nurses' understanding of managing chest tube drainage was generally mediocre. To increase nurses' proficiency, they suggested educational programs, specialized training, workshops, and seminars. These results imply that nurses' capacity to identify abnormal findings and react appropriately may be hampered by a lack of expertise, which could put patients with chest tubes at greater risk.

Another crucial component of chest tube care is practical skill and confidence.According to Sabiha et al. (2025), nurses' confidence and knowledge regarding chest tube management needed to be improved. This suggests that information on its own would not be sufficient unless nurses are also comfortable using it in practical settings. This is crucial because ICU nurses frequently deal with critical circumstances including unexpected respiratory distress, increased drainage, air leakage, or tube displacement. In these circumstances, nurses have to quickly assess patients and interact with doctors and other medical specialists. To increase knowledge and confidence, ongoing competency-based training, bedside monitoring, and evidence-based protocols are necessary (Fisher, 2016) (Sharma, 2026). Overall, the literature shows that chest tube management remains an important area of nursing practice, and continuous assessment of ICU nurses' knowledge is necessary to improve patient safety, reduce complications, and promote evidence-based care.

Research Methodology

Research Design:

This study evaluated ICU nurses' knowledge of chest tube management in a tertiary care public sector hospital using a quantitative descriptive

cross-sectional research design. Because the study's goal was to gauge nurses' current level of knowledge at a certain moment in time, this design was deemed appropriate. The cross-sectional design of the study allowed for the evaluation of participants' knowledge without any intervention or follow-up, while the quantitative technique assisted in gathering numerical data through a standardized questionnaire

Sampling Technique

The study's participants were chosen using a non-probability convenience sampling technique. The study comprised ICU nurses who were available and willing to participate during the data collection period. 37 ICU nurses from a public tertiary care hospital made up the sample. This sample strategy was appropriate since it made it simple to reach the target group in a hospital setting and assisted in gathering information from nurses who were directly involved in the treatment of patients who had chest tubes.

Data Collection Tool: A standardised questionnaire designed to evaluate ICU nurses' understanding of chest tube management was used to gather data. In addition to 8 true/false knowledge-based questions on chest tube care, the questionnaire included demographic data such as age, gender, and qualification. Every right answer received a score of 1, and every wrong answer received a score of 0. The sum of the scores for each knowledge item was used to get the overall knowledge score. Cronbach's Alpha was used to assess the knowledge questionnaire's reliability; the result was .832, which indicates strong internal consistency

Ethical Considerations: The investigation was conducted with ethical considerations in mind. Prior to data collection, permission was acquired from the relevant hospital authority. The study's goal was explained to the participants, and their involvement was entirely voluntary. Prior to data collection, informed consent was obtained from each participant. The questionnaire did not use participant names or other forms of personal identification in order to preserve confidentiality and anonymity. Additionally, participants were told that they could leave the research at any time without facing any repercussions.

Data Analysis: Data was analyzed using SPSS version 26, At first inferential statistics were run and then independent t test was run. The details of all the tests are as follows.

Table 1: Reliability Statistics

Cronbach's Alpha	N of Items
.832	8

Cronbach's Alpha was used to assess the internal consistency of the chest tube management knowledge questionnaire. The instrument's dependability was found to be good, with a Cronbach's Alpha score of.832 for eight items. As a result, the questionnaire was deemed suitable for assessing ICU nurses' understanding of chest tube maintenance and internally consistent.

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Age	37	1	3	1.68	.103	.626
Gender	37	1	2	1.27	.074	.450
Qualification	37	1	4	1.65	.130	.789
Knowledge	0					
Valid N (listwise)	0					

According to the descriptive statistics, information on age, gender, and qualification was gathered from 37 ICU nurses. With a mean of 1.68 and standard deviation of 0.626 for the age variable, which varied from 1 to 3, the majority of respondents were closer to the lower age groups. One gender group was more common than the other, as indicated by the gender range of 1 to 2 with a mean of 1.27 and standard deviation of 0.450. With a mean of 1.65 and standard deviation of 0.789, qualification ranged from 1 to 4, indicating that participants belonged to various qualification levels, with the majority of replies falling into the lower coded groups.

The Knowledge variable in the table, however, has an issue as its N is 0 and its Valid N listwise is likewise 0. This indicates that descriptive statistics for knowledge were not computed by SPSS, most likely due to the knowledge variable's missing values, incorrect computation, or entry as a string or non-numeric variable. As a result, this table cannot be used to interpret knowledge ratings. The knowledge variable should be verified and accurately calculated from the eight knowledge items prior to final analysis in order to get the mean, minimum, maximum, and standard deviation. Because demographic factors like age, gender, and qualification are categorical, frequency and percentage tables are better suited than means.

Table 3:Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
kk	Equal variances assumed	2.531	.121	.823	35	.416	.44074	.53566	-.64672	1.52820
	Equal variances not assumed			1.161	34.374	.254	.44074	.37962	-.33043	1.21191

To find out if the knowledge scores of the male and female participants differed significantly, the independent samples t-test was used. The significance value of p =.121 from Levene's Test for Equality of Variances is higher than .05. The row "Equal variances assumed" was interpreted since it shows that the assumption of equal variances was satisfied. The t-test result indicated that there was no statistically significant difference in the knowledge scores of male and female participants (t(35) =.823, p =.416).

The mean difference in knowledge scores between male and female participants was 0.44074, indicating a negligible difference. Further evidence that the difference was not significant came from the 95% confidence interval, which included zero and ranged from -0.64672 to 1.52820. The null hypothesis was upheld since the p-value was higher than .05. Thus, it can be said that ICU nurses' knowledge scores about chest tube maintenance were not significantly impacted by their gender.

Discussion:

With a Cronbach's Alpha of .832 for eight items, the results of the current study demonstrated that the knowledge questionnaire about chest tube maintenance had good internal consistency. This suggests that the instrument for evaluating the expertise of ICU nurses was trustworthy. Because inadequate monitoring, a lack of sterile technique, a lack of understanding of drainage systems, and a delayed detection of issues might compromise patient safety, chest tube maintenance is a crucial

ICU nursing role. In order to safely manage patients with chest tubes, nurses need to possess sufficient theoretical and practical expertise, according to recent studies. For instance, Halder et al. (2025) discovered that nurses' general understanding of chest tube drainage management was only average, whereas Pradhan and Gurung (2025) observed that nurses need adequate expertise to make accurate clinical decisions during chest tube drainage treatment. Similar to this, Sabiha et al. (2025) found that many nurses lacked confidence and competence when it came to managing chest tubes, underscoring the necessity of ongoing professional development. The significance of evaluating ICU nurses' expertise in the current study is supported by these results.

The study's independent samples t-test revealed that the knowledge scores of male and female ICU nurses did not differ statistically significantly (t(35) =.823, p =.416). This indicates that knowledge about chest tube management was not substantially influenced by gender. Shrestha, Sapkota, and Thakur (2025), who found no significant correlation between nurses' knowledge of chest tube management and certain sociodemographic factors including age, education, work experience, and recommendations, corroborate this conclusion. However, some recent research indicates that factors other than gender may have an impact on knowledge, such as professional experience, working area, training, or qualification. For instance, Ahmad, Saddique, and Tasneem (2024) reported that more experience and advanced qualification were associated with higher competency in chest drain management, while Pradhan and Gurung (2025) found significant associations between knowledge and working area as well as working experience. To increase nurses' proficiency in chest tube management, recent research also suggests clinical training, protocol-based care, and organised education. Therefore, regular training and evidence-based guidelines are advised to increase ICU nurses' knowledge and patient safety, even if gender was not a major factor in this study.

Results and Conclusion

The purpose of the study was to evaluate ICU nurses' competence of chest tube maintenance at a public tertiary care hospital. The study included 37 ICU nurses in total. According to the descriptive statistics, the respondents' ages were divided into three groups, with a mean of 1.68 and a standard deviation of 0.626. With a mean of 1.27 and a standard deviation of 0.450, gender was classified into two groups. Four categories were used to code qualification, with a mean of 1.65 and a standard deviation of 0.789. These results show that the respondents' qualifications, age groups, and gender classifications varied. The computed knowledge variable should be thoroughly examined before disclosing its descriptive mean and standard deviation, as the descriptive table revealed that the knowledge variable contained missing values in that particular output.Cronbach's Alpha was used to evaluate the knowledge questionnaire's reliability. Cronbach's Alpha for 8 items was .832, indicating strong internal consistency. This demonstrates that the knowledge questionnaire was trustworthy and appropriate for additional data analysis. The knowledge scores of male and female ICU nurses were compared using an independent samples t-test. The assumption of equal variances was satisfied because Levene's Test for Equality of Variances was not significant, F = 2.531, p =.121. As a result, the row labelled "equal variances assumed" was interpreted. Male and female ICU nurses' knowledge ratings did not differ statistically significantly, according to the t-test result, t(35) =.823, p =.416. Although male nurses had a slightly higher mean knowledge score (M = 8.74, SD = 1.63) than female nurses (M = 8.30, SD = 0.67), the difference was not statistically significant. As a result, the null hypothesis was upheld, showing that knowledge scores about chest tube management were not substantially impacted by gender.A Cronbach's Alpha value of .832 indicated the reliability of the chest tube management knowledge questionnaire, according to the study. Male nurses had a marginally higher mean score than female nurses, and the results demonstrated that ICU nurses have quantifiable

knowledge regarding chest tube administration. Nevertheless, there was no statistically significant difference in the knowledge scores of male and female nurses. Therefore, it can be concluded that gender did not have a significant influence on knowledge regarding chest tube management among ICU nurses.

Overall, the study highlights the importance of assessing nurses' knowledge about chest tube management because ICU nurses play a vital role in patient monitoring, drainage care, infection prevention, and early identification of complications. Although gender was not found to be a significant factor, continuous training, workshops, clinical guidelines, and refresher sessions are recommended to improve nurses' knowledge and ensure safe chest tube management practices in ICU settings.

Recommendations

- Regular training sessions and workshops should be arranged for ICU nurses to improve their knowledge and practical skills regarding chest tube management.
- Evidence-based guidelines and protocols for chest tube care should be developed and displayed in ICU settings to support safe and standardized nursing practice.
- Periodic knowledge assessments should be conducted among ICU nurses to identify learning gaps and plan need-based refresher courses.
- Simulation-based training should be introduced so nurses can practice managing chest tube complications such as tube blockage, air leakage, accidental dislodgement, and excessive drainage.

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