# Knowledge on Chest Tube Drainage among Nurses Working in a Teaching Hospital of Pokhara

Muskan Pradhan[1], *Bishnu Gurung[2]

[1]Province Hospital, Beni, Myagdi, Nepal

[2]Department of Adult Health Nursing, Pokhara Nursing Campus, Institute of Medicine, Tribhuvan University, Nepal

## ABSTRACT

**Introduction:** Chest tube drainage is one of the most important nursing procedures because patients who require chest tubes are usually seriously ill and require advanced nursing care. Inefficient nursing care of chest drains may be associated with unacceptable and sometimes life-threatening complications. Therefore, nurses must have sufficient knowledge to make the right decisions at critical points, minimize complications, and provide effective and quality care. This study aimed to identify the level of knowledge on chest tube drainage among nurses and to determine association level of knowledge and selected variables.

**Methods:** A descriptive cross-sectional study was conducted among nurses at the Gandaki Medical College Teaching Hospital and Research Center in Pokhara. Simple random sampling technique was used, to select 117 nurses in the study. Data was collected using self-administered structured questionnaire and entered into SPSS version 22, Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe the variables. Inferential statistics (chi-square test) was used to determine the association between the level of knowledge on chest tube drainage and selected background variables.

**Results**: The findings of the study reported that 57.3% of the nurses had satisfactory knowledge, while 42.7 percent had unsatisfactory knowledge on chest tube drainage. Similarly, there was a significant association between the level of knowledge with working area (p value= 0.001) and working experience (p value= 0.018).

**Conclusion**: This study concludes that less than half of the nurses have unsatisfactory knowledge on chest tube drainage. Hence, it is necessary to provide continuing education and training to improve nurses' knowledge of Chest Tube Drainage.

**Keywords:** Chest Tube Drainage, Knowledge, Nurses, Pokhara, Teaching Hospital

***Correspondance:** Bishnu Gurung, Lecturer, Department of Adult Health Nursing, Pokhara Nursing Campus, Institute of Medicine, Tribhuvan University, Nepal, 9846295383
Email: bisnuonline@gmail.com
bishnu.gurung@ponc.tu.edu.np

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## INTRODUCTION

A chest tube is a hollow, flexible tube inserted through the side of the chest into the pleural space to drain air, blood, pus, or lymph. Chest tube drainage are commonly performed procedure in a hospital setting used in the treatment of respiratory diseases, such as pneumothorax, heart surgery, chest surgery, or trauma. The use and care of chest tubes and chest tube drainage is a simple but essential

technique in critical care and emergency settings, which involves keeping the tube functioning properly while caring for patients with chest tube drainage.[1]

Chest drains are often inserted into patients with different conditions, and nurses often deal with them. The common indications for chest drain insertion were cardiac surgery (84.8%) and pleural effusion (6.3%).[2] A study conducted at Dhulikhel Hospital, Kathmandu, showed an increase in the number of patients suffering from pneumothorax. The results showed that among 144 patients suffering from pneumothorax, 135 required chest tube drainage insertion.[3]

Nurses play an important role in chest drain care, both before the procedure (preprocedural) and after the procedure (postprocedural). Poor nursing care or incorrect surgical techniques during the placement of chest drains can lead to serious and sometimes life-threatening complications. Despite its significance, many nurses lack standardized knowledge regarding the proper preparation, management, and care of patients undergoing chest tube drainage which could adversely impact patient outcomes and safety.[4]

Various studies have been conducted in different countries to assess the knowledge and practice of nurses regarding chest tube drainage and findings showed varied results.[5] The study conducted at tertiary level hospital of Chitwan showed that more than half (56.8%) nurses had moderate knowledge regarding management of patient with chest tube while 40.9 percent and 2.3% had good and poor knowledge respectively.[6] Likewise, most ICU nurses (55%) in Jodhpur, India had average knowledge regarding chest tube drainage.[5] Another study conducted in Karachi, Pakistan, in 2024 among 120 nurses found that most nurses had moderate knowledge, whereas a few had high knowledge.[7]

Similar studies have been conducted in other countries which shows poor and inadequate knowledge level in nurses managing chest tube which indicated the lack of evidence-based nursing care and insufficient training.[2,4]

Nurses must be aware of and knowledgeable about chest tube drainage, which will be helpful in protecting the patient and helping them recover from serious pulmonary problems. Effective nursing care requires theoretical knowledge of chest tube management. Hence, the researchers conducted this study with the aim to assess knowledge on chest tube drainage among nurses in a teaching hospital of Pokhara.

## METHODS

A descriptive cross-sectional study was done among nurses working in Gandaki Medical College Teaching Hospital and Research Center (GMCTHRC) which is a tertiary level hospital located in Western Nepal, specifically in Pokhara-09, Prithivi chowk. It is a 550 bedded hospital staffed by a total of 387 healthcare personnel, with 248 registered nurses.

Simple random sampling technique was used to select the nurses from different ward using lottery method. Sample size(n) was 117, which was calculated using Cochrane formula as given as: $n= z^2pq/e^2$ where n=sample size, z=confidence level-1.96, p=prevalence of good knowledge=8.33= 0.083[5] q=(1-p=0.91), e=margin of error-0.05, n=117.

Nurses who had at least 3 months of working experiences, willing to participate and present during the time of data collection were included in the study.

A self-administered structured questionnaire was developed by the research team based on the objectives of the study after extensive literature review and consulting with subject expert which consisted of two parts: Part I was about Background information of the nurses

which includes six items and Part II was about questions related to knowledge on chest tube drainage that comprised 19 questions. There were two multiple-response questions and 17 multiple-choice questions. Each correct response was scored 1, and an incorrect response was scored 0. In multiple response questions, if the respondent had not marked the incorrect response, the score was given as 1. Total score was 27.

The study was conducted after approval and written permission from the Research Committee of Pokhara Nursing Campus, Gandaki Medical College Teaching Hospital and Research Center (GMCTHRC), Pokhara, and ethical approval from the Institutional Review Committee of Tribhuvan University, Institute of Medicine (407(6-11) E2, Ref: 081/082). The study objectives were explained to the nursing staff and written informed consent was obtained. Voluntary participation was done. Anonymity was maintained by using code numbers instead of names, and confidentiality was ensured by not disclosing the information to others. The data collection process was completed in two weeks (from 2025/01/26 - 2025/02/08).

The collected data were rechecked for completeness and accuracy, categorized according to the research objectives, and analyzed using different statistical tools as appropriate. The collected data were coded, classified, and tabulated. Data processing was performed using a computer and analyzed in IBM SPSS-22(International Business Machines Statistical Package for Social Science). Data were analyzed in terms of frequency, percentage, mean and standard deviations. Chi-square test was used to determine the association between the level of knowledge and selected variables. Level of significance was set at $p<0.05$.

## RESULTS

Majority (72.6%) of nurses were below 25 years of age, with a mean age of 24 years. Most nurses (58.1%) had completed PCL Nursing, 59.8 percent nurses worked in critical areas, and 90.6% of nurses had less than 5 years of experience. Similarly, 92.3% of the nurses had no training in chest tube drainage, whereas only 7.7% of the nurses had training in chest tube drainage. Similarly, 69.2% of nurses had taken care of patients with chest tube drainage, while 30.8% of nurses had not (Table 1).

**Table 1:** Background Information of Nurses (n=117)

| Characteristics | Number | Percent |
|---|---|---|
| Age (in years) | | |
| <25 | 85 | 72.6 |
| 25 - 34 | 28 | 23.9 |
| ≥35 | 4 | 3.5 |
| Mean age ± SD: 24.67 ± 0.533 Min:18, Max:42 | | |
| Qualification | | |
| PCL | 68 | 58.1 |
| Bachelor | 47 | 40.2 |
| MN | 2 | 1.7 |
| Working area | | |
| Critical | 82 | 70.1 |
| General | 35 | 29.9 |
| Working experience (years) | | |
| < 5 | 106 | 90.6 |
| ≥ 5 | 11 | 9.4 |
| Previous Training on chest tube drainage | | |
| No | 108 | 92.3 |
| Yes | 9 | 7.7 |
| Care of patient with chest tube | | |
| Yes | 81 | 69.2 |
| No | 36 | 30.8 |

Most of the nurses (82.9 %) answered that the meaning of chest tube drainage is the catheter inserted through the thorax to remove air and fluid from the pleural space. Similarly, 76.9% of the nurses answered that the purpose of chest tube drainage is to establish normal negative pressure in the pleural space, and 85.5% answered to prevent the entry of air and fluid back into the pleural space.

Similarly, 85.5, 76.9, and 56.4 percent of nurses answered pneumothorax, pleural effusion, and hemothorax as indications of chest tube drainage, respectively.

Likewiae, only 31.6% answered that the appropriate site for removal of air is 2nd–4th intercostal space and 18.8% answered that the fluid is removed from 5th-6th intercostal space. Moreover, 65.1% of nurses answered -20 to-30 cm for suction pressure on adults. Similarly, 73.5% of the nurses answered that the principle of a closed drainage system is to allow air and fluid to pass outside the system, and 73.5% nurses answered that the sign indicating successful placement is that air or fluid begins draining from the chest tube (Table 2).

**Table 2:** Knowledge on General Information about Chest Tube Drainage among Nurses (n =117)

| Correct Responses | Number | Percent |
|---|---|---|
| Meaning | | |
| A chest tube is catheter inserted through thorax to remove air and fluid from pleural space | 97 | 82.9 |
| Purposes ** | | |
| To establish normal negative pressure in the pleural space | 90 | 76.9 |
| To prevent the entry of air and fluid back into the intra-pleural space | 100 | 85.5 |
| Indications ** | | |
| Pleural effusion | 90 | 76.9 |
| Pneumothorax | 100 | 85.5 |
| Hemothorax | 66 | 56.4 |
| Appropriate site for removal of air is $2^{nd}$ -$4^{th}$ intercostal space | 37 | 31.6 |
| Appropriate site for removal of fluids is $5^{th}$ -$6^{th}$ intercostal space | 22 | 18.8 |
| Suction pressure on adult is -20 to -30 cm | 76 | 65.1 |
| Principle of closed drainage system is to allow air and fluid to pass outside the system | 86 | 73.5 |
| Air or fluid begins draining from the chest tube is sign of successful placement | 86 | 73.5 |

***Multiple response question*

Most nurses recognized their key roles as assisting the procedure, providing sterile equipment, and ensuring patient safety (72.6%). About 84.6% of the nurses correctly answered that the chest tube should be secured and connected immediately after insertion, and 77.8% noted that vital signs should be checked every 15 min in the first hour. Additionally, 63.2% correctly answered that the drainage should be checked every 4 hours, 86.3% preferred the semi-Fowler's position, and 66.7% emphasized monitoring drainage and covering the site with a sterile dressing if the tube dislodges.

More than half of nurses (61.5%) answered that they would call the physician if the drainage suddenly became cloudy and thick, and 21.4% of nurses answered that they understood tidaling to be the fluctuation of the fluid level in the water-sealed chamber. Similarly, 29.1 percent of the nurses answered that the common complication was skin infection at the insertion site, and 75.2% nurses answered indication for removal was decreased drainage and improved lung expansion on X-ray. (Table 3).

**Table 3:** Knowledge Regarding Nursing Responsibilities for Chest Tube Drainage among Nurses (n=117)

| Correct Responses | Number | Percent |
|---|---|---|
| To assist the procedure, provide sterile equipment, and ensure patient safety | 85 | 72.6 |
| Secure the chest tube and connect it to the drainage system after insertion | 99 | 84.6 |
| Monitor vital signs every 15 minute within first hour | 91 | 77.8 |
| Checked chest drainage every 4 hour | 74 | 63.2 |
| Position appropriate for patient is semi-fowlers position | 101 | 86.3 |
| Monitor color, amount and consistency of drainage in the drainage collection chamber | 78 | 66.7 |
| If the tube accidentally dislodged, cover the site with a sterile dressing and call for help | 78 | 66.7 |
| If the drainage becomes cloudy and thick, call the physician | 72 | 61.5 |
| Tidaling means the fluctuation of the fluid level in the chamber | 25 | 21.4 |
| Skin infection is the common complication at the insertion site | 34 | 29.1 |
| Indication for removal is decreased drainage and improved lung expansion on X-ray | 88 | 75.2 |

More than half (57.3%) of nurses had satisfactory level while 42.7% had unsatisfactory level of knowledge (Table 4). There is significant association between level of Knowledge with working area and with working experience. However, no association was observed with other background variables, such as age, qualification, special training, and patient care (Table 5).

**Table 4:** Level of Knowledge on Chest Tube Drainage among Nurses (n=117)

| Level of Knowledge | Number | Percent |
|---|---|---|
| Satisfactory knowledge (> 16) | 67 | 57.3 |
| Unsatisfactory knowledge (≤ 16) | 50 | 42.7 |
| *Mean ± SD = 16.58 ±3.2 Min = 6, Max =23* | | |

*Possible Score:0-27*

**Table 5:** Association between Level of Knowledge on Chest Tube Drainage and Selected Variables (n=117)

| Variables | Level of Knowledge | | $x^2$ | *p*–value |
|---|---|---|---|---|
| | Unsatisfactory No. (%) | Satisfactory No. (%) | | |
| Age (years) | | | | |
| ≤ 25 | 41(48.2) | 44(51.8) | 3.842 | 0.050 |
| >25 | 9(28.1) | 23(71.9) | | |
| Qualification | | | | |
| PCL | 34(50.0) | 34(50.0) | 3.502 | 0.061 |
| Bns/BSC/MN | 16(34.0) | 33(66.0) | | |

| Variables | Level of Knowledge | | $x^2$ | *p*–value |
|---|---|---|---|---|
| | Unsatisfactory No. (%) | Satisfactory No. (%) | | |
| Working area | | | | |
| General | 7(20.0) | 28(80.0) | 10.548 | 0.001* |
| Critical | 43(52.4) | 39(47.6) | | |
| Working experience(years) | | | | |
| <5 | 49(46.2) | 57(53.8) | 5.616 | 0.018* |
| ≥ 5 | 1(9.1) | 10(90.9) | | |
| Previous training on chest tube drainage | | | | |
| Yes | 5(55.6) | 4(44.4) | 0.655 | 0.418 |
| No | 45(41.7) | 63(58.3) | | |
| Care of patient with chest tube | | | | |
| Yes | 30(37.0) | 51(63.0) | 3.493 | 0.062 |
| No | 20(55.6) | 16(44.4) | | |

**p value significant at <0.05, $x^2$ Chi-square*

## DISCUSSION

The study findings show that nurses have moderate knowledge regarding chest tube drainage, which is comparable to findings in many low- and middle-income countries. However, the proportion of nurses with good knowledge is low, indicating the need for targeted interventions such as continuous professional education, protocol-based care, clinical audits, and on-the-job training programs. The comparison with other studies reinforces that better training environments, supervision, and policy support significantly influence the knowledge. Without systemic improvements, the gap of theoretical knowledge may persist, ultimately compromising patient safety and outcomes.

The frequent use of chest tube drainage in hospitals, as reflected by the increasing number of cases related to pneumothorax and surgical interventions, such as those reported in a study conducted in Kathmandu, reinforces the necessity of having well-trained nursing staff.[3] In a study conducted in Jordan, the most common reasons for chest drain insertion were cardiac surgery and pleural effusion, with a three-month prevalence rate of 8 percent.[2] These data support the high clinical relevance of chest tube management and the critical role of nurses in ensuring patient safety and preventing complications, such as tube dislodgement, infection, or blockage.

However, some gaps in knowledge were noted. For example, only 31.6% correctly identified the proper insertion site for air removal, and only 21.4% understood the meaning of "tidaling" in a water-seal drainage system. In terms of complications, only 29.1 percent of nurses identified skin infection at the insertion site as a common complication of chest tube drainage. Furthermore, although 61.5% of nurses responded appropriately by stating that they would call a physician if the drainage became cloudy and thick, a significant proportion did not recognize this as a red flag for infection or tube malfunction. These areas are important for preventing complications and ensuring proper tube function. If nurses lack this specific knowledge, there is a risk of providing incomplete or unsafe care to patients.

The study revealed that 57.3% of the nurses had a satisfactory level of knowledge, whereas 42.7% of nurses had an unsatisfactory level of knowledge. These findings are similar to those of a study conducted in Chitwan which revealed 56.8% of nurses had moderate or satisfactory level of knowledge.[6] This result is also supported by another study conducted in Turkey, which revealed that 55.6% of nurses had a satisfactory level of knowledge, while 44.4% of nurses had an unsatisfactory level of knowledge.[8] However, the result differs from the study conducted in Egypt where nurses were found to have more unsatisfactory level of knowledge (75.7%) than satisfactory level of knowledge (24.3%).[9] The difference may be due to less practical exposure, limited training opportunities, and fewer resources for skill development compared to Nepal.

The study showed that there was a significant association between the level of knowledge with working area (p=0.007) which is similar to the study conducted in Jordan and Iran, that revealed a statistically significant association between the level of knowledge and the working area. In this study, there was also significant association between level of knowledge with working experience (p=0.018).[2] This is similar to the study conducted in Egypt which revealed statistically significant association between level of knowledge with working experience(p=0.011).[10] Likewise, there is no significant association between level of knowledge with age, qualification, previous training and taken care of patient with chest tube drainage. This is similar to the study conducted in Chitwan which revealed no association between level of knowledge and selected background variables.[6] The lack of association may be due to limited opportunities for regular training and practical exposure. In many healthcare settings, training is often theoretical and not followed by continuous practice, so knowledge tends to depend more on the current working area than on demographic or educational factors.

## CONCLUSION

This study concludes that more than half of nurses have satisfactory level of knowledge on chest tube drainage. Working area and working experience tend to influence the level of knowledge on chest tube drainage. However, still less than half of the nurses have unsatisfactory knowledge on chest tube drainage, and most nurses lacks formal training therefore, the study recommends to organize in-service training, and continuing nursing education on chest tube drainage. Similar studies can be conducted in large number of samples in other hospital to generalize the findings.

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