Vol. 2 No. 4 (2025)

ONLINE ISSN :3007-309X
PRINT ISSN :3007-3081

Journal of Medical & Health Sciences Review

KNOWLEDGE AND PRACTICES RELATED TO VENTILATOR-ASSOCIATED ERRORS AMONG NURSING PROFESSIONALS

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ARTICLE INFO:

Keywords: Mechanical Ventilation, Ventilator-Related Errors, Nurses' Knowledge, Clinical Practice, Intensive Care Unit, Peshawar, Patient Safety

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Article History:
Published on December 18, 2025

ABSTRACT

Background: Mechanical ventilation is widely used in intensive care units. However, ventilator-related errors and mismanagement can lead to severe complications. Nurses play a pivotal role in monitoring and managing ventilated patients, making their knowledge and practices crucial to patient safety.
Objective: This study aimed to determine awareness and practices of nurses regarding mechanical ventilation errors.
Methodology: A descriptive cross-sectional study was conducted in the intensive care units of two tertiary care hospitals: Khyber Teaching Hospital and Hayatabad Medical Complex, Peshawar. A total of 92 registered nurses were selected through proportionate stratified convenience sampling technique. Data were collected using a structured self-administered questionnaire. Data were analyzed using SPSS version 27.
Results: The findings revealed that 83% of the participants had good knowledge regarding ventilator management, while 17% demonstrated poor understanding. Nurses displayed satisfactory awareness of basic ventilator concepts such as Fraction of Inspired oxygen and tidal volume, but deficiencies were noted in alarm management, flow rate adjustment, and weaning procedures. A positive correlation was observed between knowledge and practices, indicating that improved understanding contributed to safer clinical behaviors.
Conclusion: The study concludes that nurses working in tertiary care hospitals of Peshawar generally possess good knowledge and satisfactory practices regarding ventilator management. However, gaps persist in technical areas that may predispose patients to ventilator-related errors. Regular in-service education, simulation-based training, and competency

assessments are recommended to strengthen practical skills and ensure the safe management of mechanically ventilated patients.

1. Background

Mechanical ventilation is one of foundation of supportive cares in intensive care units (ICUs), which is applied to support the life of the patients in cases where they are unable to provide adequate ventilation and oxygenation independently (1). Mechanical ventilation is a machine which is used to support the patients who are unable to breath spontaneously (2). This repetition highlights the fundamental role of mechanical ventilation; however, inconsistencies in its management remain a major challenge in many clinical settings.

Globally, around 40–60% of ICU patients require mechanical ventilation during their stay, highlighting its critical role in acute care management (3). Despite its lifesaving potential, mechanical ventilation is associated with significant risks, including ventilator-related errors (VREs) such as incorrect settings, circuit disconnections, alarm mismanagement, and infection-control failures (4). These errors contribute to increased morbidity, mortality, and prolonged ICU stays, accounting for nearly 25% of all critical care adverse events (5). These rising complication rates emphasize the need to monitor not only the patient but also the accuracy of ventilator management practices.

Errors related to ventilator management can lead to patient harm, including barotrauma, hypoxemia, ventilator-associated pneumonia, and even death. As nurses are the primary caregivers in intensive care units (ICUs), their knowledge, vigilance, and clinical practices play a central role in preventing such adverse events (6). Nurses' continuous presence at the bedside places them in a critical position to identify early signs of ventilator-related problems and intervene promptly.

Nonetheless, there is considerable risk of such adverse events with the use of the ventilator: mistakes in ventilator settings, patient-ventilator asynchrony, circuit disconnection, failure of alarms or wrong alarms response, improper hygiene and prevention of infections, and delays or omissions of interventions may all negatively impact the patients, predisposing them to ventilator-associated events (VAEs), ventilator-associated pneumonia (VAP), longer hospitalization, morbidity, mortality, and healthcare expenditures. Protective ventilation strategies have been shown to reduce postoperative respiratory complications, yet their implementation remains inconsistent. Preventable ventilator-associated events (VAEs) and ventilator-associated pneumonia (VAP) continue to affect up to 28% of mechanically ventilated patients, increasing healthcare costs and hospital stays (7–9). These preventable events reflect gaps in routine ventilator care that often arise from variations in staff competency, workload, and familiarity with updated protocols.

Nursing professionals are at the bedside managing ventilators. Nurses play a pivotal role in ventilator management, being responsible for monitoring ventilator parameters, responding to alarms, maintaining hygiene, and implementing ventilator bundles. Their competence, vigilance, and adherence to evidence-based protocols directly influence patient outcomes (10). The nurses oversee ventilator controls, react to alarms, keep circuits and tubing clean, provide suctioning, assure hygiene and often administer ventilator bundles/protocols (11). Therefore, their practice, attitudes, and knowledge, as well as the institutional environment, are in the middle of preventing ventilator-related errors (VREs) (12). This highlights that even minor lapses in routine care can accumulate and result in major clinical complications.

Knowledge and practice gaps have been increasingly identified by researchers, and interventions (education, bundles, and protocols) have been tried, but positive results have been encouraging, but not complete (13,14). Likewise, the study about the knowledge of nurses and preventive measures related to ventilated-associated complications (especially VAP) in 2023-2024 shows that despite the

awareness of 50% of nurses of the recommended elements of the bundle, they do not apply them consistently, with training interventions having a beneficial impact on knowledge and compliance. These practice lapses have added up to preventable ventilator-associated events and device-related incidents (15,16). This inconsistency between knowledge and practice remains a major barrier to safe ventilator care.

However, recent studies reveal notable knowledge and practice gaps among nurses regarding ventilator care and error prevention. Research conducted between 2023–2024 shows that while nearly 50% of nurses are aware of recommended bundle elements; consistent application remains suboptimal (17,18). Such gaps reinforce the importance of conducting localized studies to understand specific challenges faced by nurses in different healthcare systems.

Ventilator support is a life-saving procedure to severely ill patients, but it involves the risk of ventilator-related errors, which may result in severe complications, more morbidity, longer hospital stay, and even death. Since nurses are the main care providers in the intensive and critical care unit, they are instrumental in their prevention due to their knowledge, attention, and compliance with the best practice. The risk of ventilator-related errors is exacerbated in low-resource areas such as Pakistan, where the nurse-to-patient ratios already are less than ideal, and training opportunities do not exist. It is important to investigate the knowledge and practice of nurses in tertiary care hospitals.

There is a particular need for evidence from Pakistan to understand how resource constraints, workload, and training limitations shape nurses' ability to prevent ventilator-related errors.

2. METHODOLOGY

2.1 Study Design

This study was a descriptive Cross-Sectional study. Cross-Sectional study is basically a snapshot study in which data is taken a short period of time. This design was selected because it allows assessment of nurses' knowledge and practices at a single point without influencing their responses.

2.2 Study Setting

This study was carried out in Hayatabad Medical Complex (HMC), and Khyber Teaching Hospital Peshawar (KTH). Both are major tertiary care hospitals with busy intensive care units, which provided an appropriate environment for assessing ventilator-related practices.

2.3 Objective

To assess the Knowledge and practices of nurses' professionals regarding ventilator related errors in Intensive Care Units.

2.4 Operational Definitions

Knowledge and Practice

It is the understanding of nurses regarding the principles, procedure, and considerations of the nurses regarding the errors in Mechanical Ventilators in Intensive care units. Nurses' knowledge and practices will be assessed through a structured and validated questionnaire with certain cut of points that 0-59% is poor and 60% to 100% is good (16).

Ventilator-Related Error

Ventilator related errors are any preventable event related to ventilator use that may cause or increased risk of ventilator-associated complications.

2.5 Study Duration

This study was conducted in a very limited period of six months after initial approval of the institute.

2.6 Study Population

All Nursing staff working in the Intensive care units of the tertiary care hospital such as Hayatabad Medical Complex, and Khyber Teaching Hospital Peshawar is the population of the study. These units include medical, surgical, and general ICUs where mechanical ventilation is routinely used.

2.7 Sample Size

OpenEpi version 3.01 was used to determine the sample size for a descriptive cross-sectional study. With a 95% confidence level, a 5% margin of error, and an anticipated proportion of 50%, about 120 nurses, finite population correction was applied. After adjustment, the

minimum required sample size was 92 nurses. Participants were recruited in proportion to each hospital.

2.8 Sampling Technique

A proportionate stratified convenience sampling approach was used. The study population was first divided into strata by hospital (Khyber Teaching Hospital and Hayatabad Medical Complex). Within each stratum, participants were selected in proportion to the number of ICU nurses available at that hospital. Eligible nurses who met the inclusion criteria and were present during the data collection period were recruited consecutively until the desired sample size was reached.

2.9 Inclusion Criteria

The following participants were included in the study:

All the registered nurses working in the intensive care units of HMC and KTH. The Nursing staff that have more than six months working experience in intensive care units of HMC and KTH. The Nursing staff that have not attended any training session regarding ventilator and its risks

2.10 Exclusion Criteria

The following participants were excluded in the study:

The staff working on management level such as head nurses and managers. The participants who were not willing to participate in the study, and those who were absent or on leave.

2.11 Data collection Procedure

An initial approval was granted before data collections. The data were collected in the intensive care units of Khyber Teaching Hospital and Hayatabad Medical Complex Peshawar. The data were collected using adopted questionnaires. It took 20 to 30 minutes to collect the data. The knowledge was categorized as Poor knowledge and practice 0-59% and good knowledge and practice 60% - 100%. The knowledge and practices was assessed by three parts of Questionnaire that are: Social demographic factors = 7 items, Knowledge assessment= 16 items, Practices assessment = 25 items

2.12 Ethical Considerations

Initially the study was approved from the supervisor and institute. Before data collection, formal data collection approval was taken from the Institute. Formal data collection approval was taken for the hospital administration before collection of the data. The aims and objective of the study was share with the participants and consents were granted. The participants were allowed if they withdraw from the study at any stage of data collection. To maintain the confidentiality of the study, the data were collected in a separate room.

2.13 Data Analysis

Statistical Package for Social Science (SPSS) version 27 was used. Descriptive statistics was used to describe socio-demographic data.

Frequencies and percentages were calculated for categorical variables while mean and standard deviations was calculated for continuous data.

3. Results

3.1 Socio-Demographic profile

3.1.2 Age Distribution

The data show that the majority of the nurses (40.7%) were between 36 to 45 years of age, followed by 35.2% who were between 25 to 35 years. A smaller proportion (14.8%) were above 45 years, while only 9.3% were below 25 years. This indicates that most of the participants were in their mid-career stage, representing a group with substantial professional maturity and clinical experience (Figure 1).

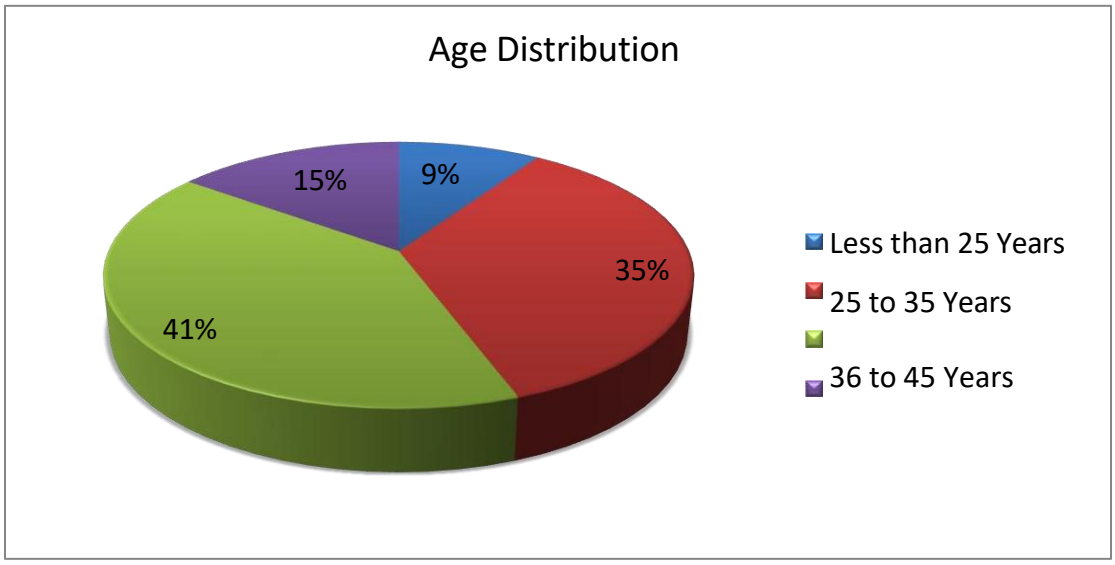

Figure 1: Pie-Chart depicting age of the participants

3.1.3 Gender Distribution

Among the 92 respondents, females formed the majority, with males following. (Figure 2).

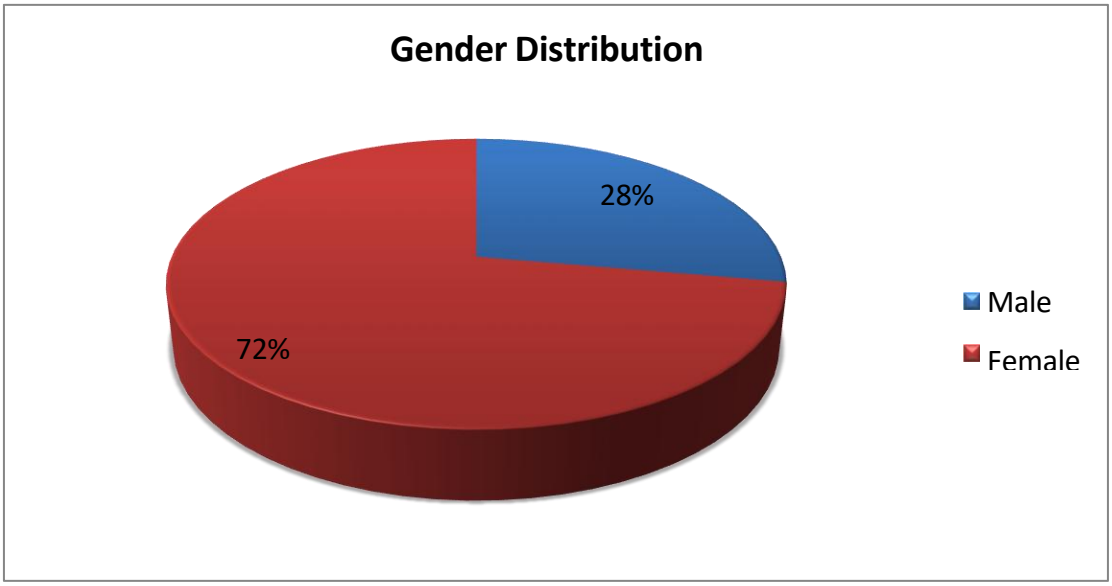

Figure 2: Pie-Chart depicting gender distribution of the participants

3.1.4. Working Experience

The Figure 3 reveals that 35.2% of participants had less than 5 years of working experience, another 35.2% had more than 10 years, and 29.6% had 5–10 years of experience. These findings show a balanced distribution between novice and experienced nurses, which may enhance the credibility of results, as the sample includes a wide range of experience levels.

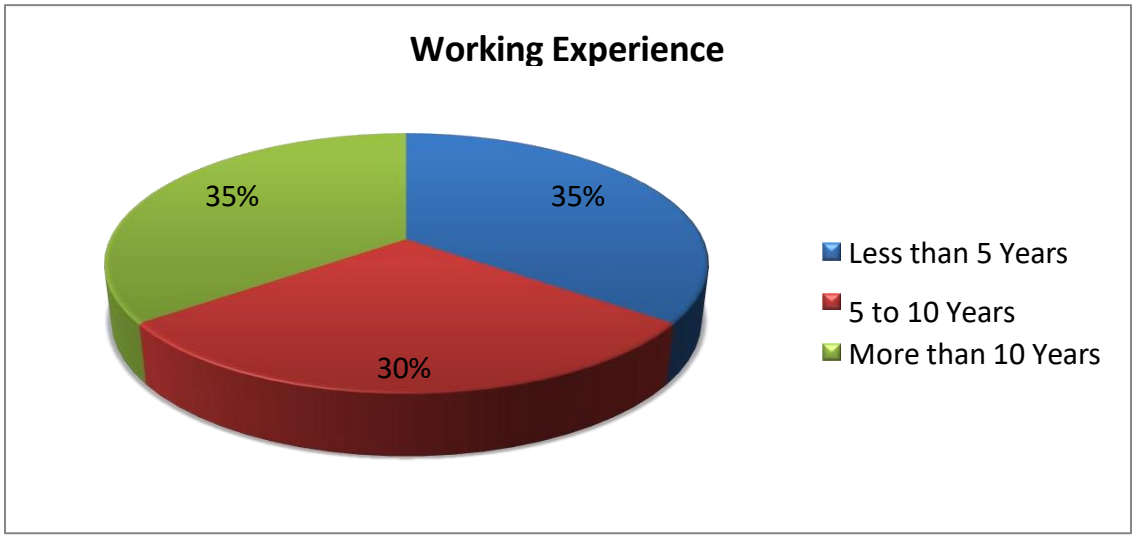

Figure 3: Pie-Chart depicting working experience of the participants

3.1.5 Education Status

Regarding educational background, 55 participants (59.8%) had a BSN or post-RN credential, while 37 (40.2%) held diplomas. This finding signals a rising trend toward advanced nursing education in tertiary-care hospitals. (Figure 4).

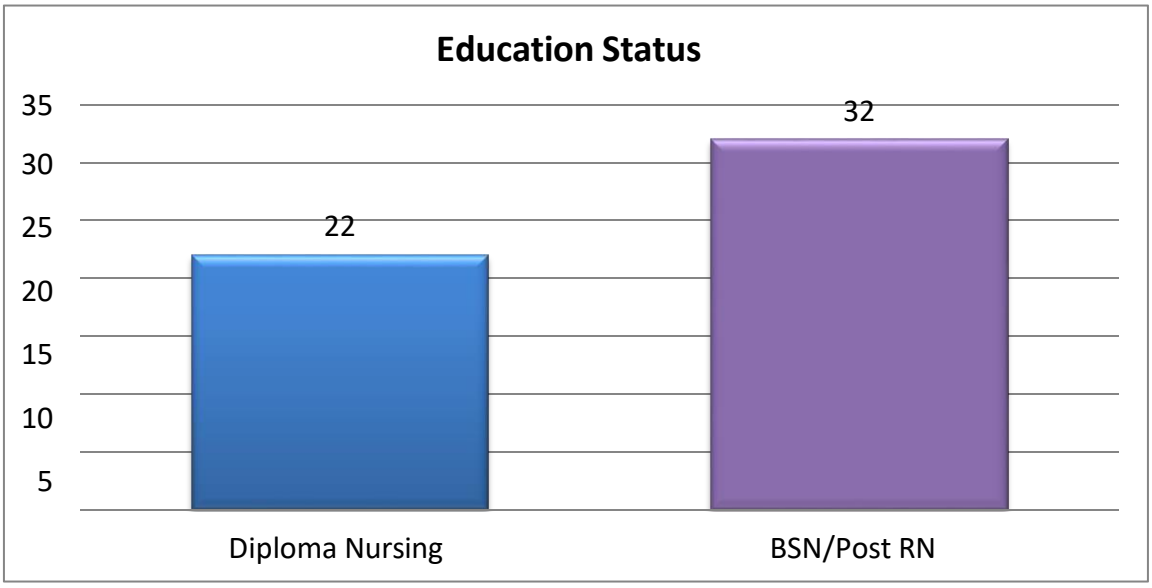

Figure 4: Bar-Chart depicting education status of the participants

3.1.6 Working Hospitals

Among the 92 participants, 54 nurses (58.7%) worked at Khyber Teaching Hospital (KTH), while 38 nurses (41.3%) were from Hayatabad Medical Complex (HMC). This proportional distribution reflects the relatively larger ICU workforce at KTH compared with HMC. (Figure 5).

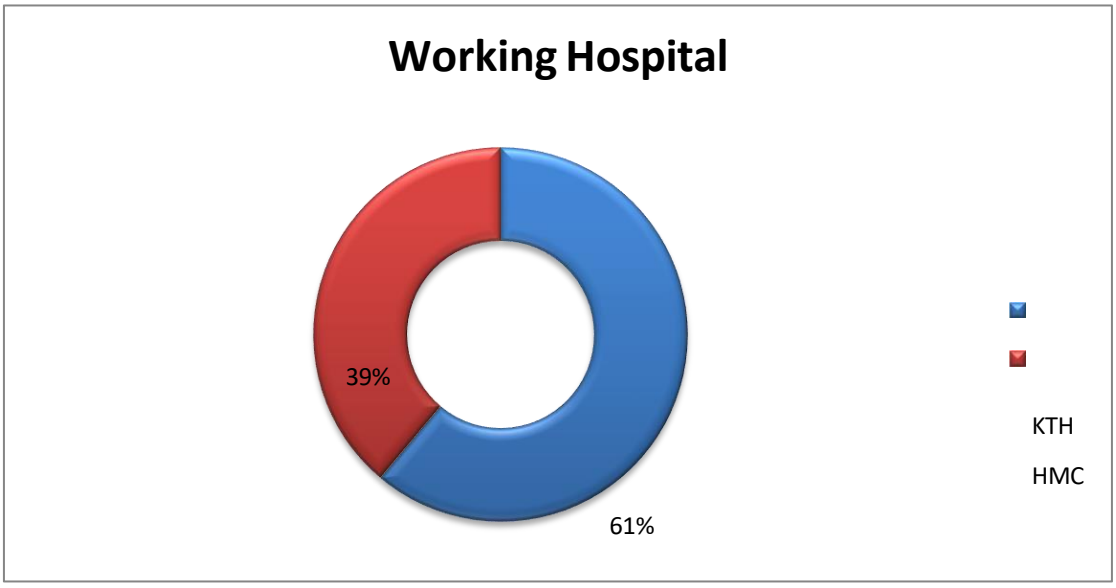

Figure 5: Pie-Chart depicting working hospital of the participants

3.1.7 Formal Training

Regarding formal training, 37 participants (40.2%) reported having received formal ventilator care training, while 55 participants (59.8%) said they had not. This finding is particularly notable, as it reveals that the majority of nurses lack structured training in ventilator management, despite working in tertiary care hospitals where these skills are essential. (Figure 6).

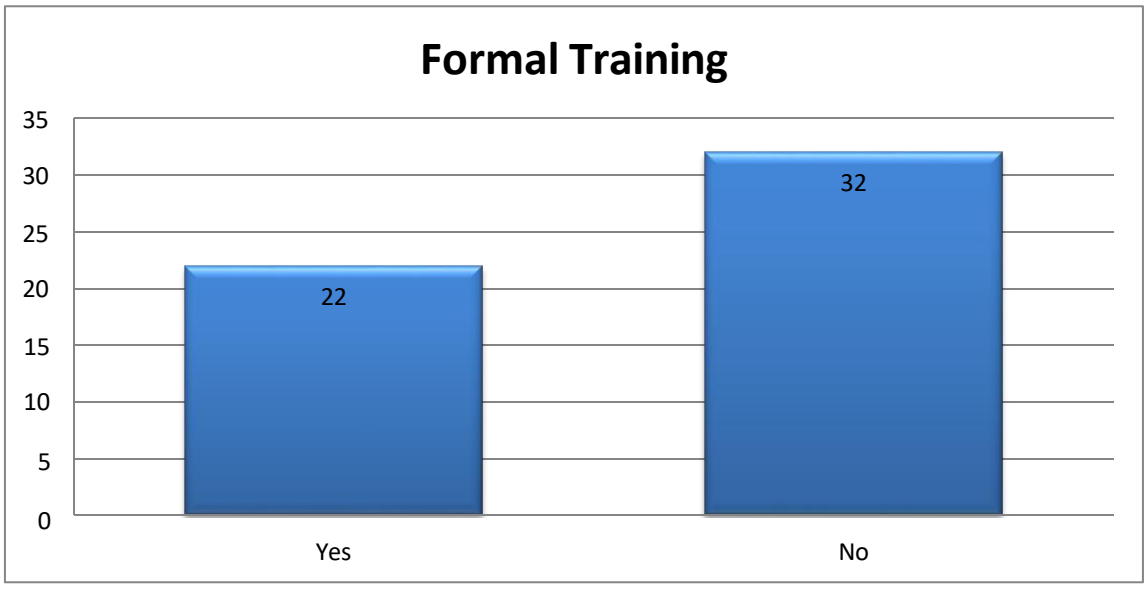

Figure 6: Bar-Chart depicting formal training of the participants

3.2 Understanding regarding Mechanical Ventilation Errors

The findings related to nurses' knowledge of ventilator care practices indicate a generally good understanding among the participants, though with noticeable areas requiring improvement. A majority of the respondents demonstrated satisfactory knowledge of the key

clinical indicators for initiating mechanical ventilation. Specifically, 70.4% knew the appropriate PaO_2 level, 63% were aware of the critical respiratory rate, and 66.7% understood the critical pH value required for ventilator initiation. Similarly, knowledge of ventilator modes was fairly high, with 70.4% identifying volume-targeted modes and 64.8% recognizing pressure-targeted modes. Furthermore, 64.8% could explain the term FiO_2, and 59.3% understood PEEP and its function, reflecting a moderate grasp of essential ventilatory parameters. Awareness of basic ventilator mechanics, such as tidal volume (63%) and causes of high-pressure alarms (66.7%), was also relatively strong, although nearly one-third lacked complete understanding, which could affect clinical decision-making during ventilator management. However, some aspects of ventilator management knowledge were less satisfactory. Only 53.7% of nurses knew how to assess whether the ventilator flow rate matched the patient's inspiratory effort, which is a critical skill in ensuring patient comfort and preventing ventilator asynchrony. Similarly, only 61.1% understood the steps for extubation, and 63% knew the correct sequence of weaning, showing a need for further training in patient transition from mechanical ventilation. Despite this, a relatively high percentage (68.5%) recognized the potential risks of repeatedly silencing alarms and could identify signs indicating a patient's readiness for weaning (68.5%), suggesting an awareness of safety concerns and patient monitoring protocols. Overall, while most nurses possessed foundational knowledge regarding ventilator parameters and functions, gaps remained in areas such as ventilator patient synchrony, weaning, and extubation processes highlighting the importance of continuous professional education and hands-on ventilator training to enhance clinical competence.

Table 1: Understanding of participants regarding Mechanical Ventilation errors, n=92

Items	Yes	No
	F (%)	**F (%)**
Do you know the amount of PaO_2 for initiation of a mechanical ventilator?	65 (74.4%)	27 (29.6%)
Do you know the critical respiratory rate for initiating mechanical ventilation?	58 (63.0%)	34(37.0%)
Do you know the critical pH value for initiating mechanical ventilation?	61(66.7%)	31(33.3%)
Do you know volume-targeted mechanical ventilator mode?	65(70.4%)	27(29.6%)
Do you know pressure-targeted mechanical ventilator mode?	60(64.8%)	32(35.2%)
Can you explain the term FiO_2?	60(64.8%)	32(35.2%)
Do you know the term PEEP and its functions?	55(59.3%)	37(40.7%)
Do you know the term tidal volume?	58(63.0%)	34(37.0%)
Do you know the cause of high-pressure alarms?	61(66.7%)	31(33.3%)
Do you know the cause of low-pressure alarms?	58(63.0%)	34(37.0%)

Do you know how to check if ventilator flow rate matches patient inspiratory efforts?	61(53.7%)	31(46.3%)
Do you know what changes should be made if a patient is breathing fast?	58(64.8%)	34(35.2%)
Do you know the potential risks of repeatedly silencing alarms?	49(68.5%)	33(31.5%)
Do you know signs/symptoms that indicate a patient is not ready for weaning?	60(68.5%)	32(31.5%)
Do you know the correct sequence of weaning?	63(68.47%)	29(31.52%)
Do you know the steps for extubation?	56(60.68%)	36(39.13%)

3.3 Practices of participants regarding Mechanical Ventilation Errors

The findings of the study in Table 2 revealed that most nurses demonstrated satisfactory practices regarding essential ventilator-related care procedures. A majority (64.8%) reported performing endotracheal or tracheal suctioning when required, and 74.1% regularly checked the endotracheal tube (ETT) level and rotated its position every 24 hours. Similarly, 77.8% of the nurses routinely checked cuff pressures every 6–12 hours, and 81.5% recognized complications associated with ETT, indicating good awareness of airway management.

Regarding suctioning practices, 75.9% instilled normal saline before suctioning and pre-oxygenated patients with 100% oxygen, aligning with recommended care standards. Moreover, 70.4%–74.1% of participants reported following ventilator care bundle practices, monitoring anxiety, and informing patient relatives about their condition, reflecting a high level of engagement in patient safety and communication.

In terms of specific ventilator care components, the findings showed mixed results. A high percentage of nurses (81.5%) used chlorhexidine for oral hygiene and 79.6% used sodium bicarbonate, showing adherence to infection prevention protocols. However, only 63% provided oral hygiene once or twice daily, suggesting inconsistency in oral care frequency. For eye care, 70.4% wiped eyes correctly from the inner canthus to the outer side, but fewer (59.3%) reported taping the eyes shut, which may indicate variation in understanding or implementation of eye care protocols.

Additionally, most nurses (66.7%–70.4%) used various strategies to relieve patient anxiety, such as talking, helping patients write, or contacting family members. Despite this, about one-third of participants did not routinely engage in such anxiety-relieving interventions, highlighting areas for improvement in holistic ventilator care practices. Overall, while nurses showed strong adherence to several key ventilator care procedures, gaps remain in consistent oral hygiene, eye care, and anxiety management practices.

Table 2: Practices of participants regarding Mechanical Ventilation errors, n=92

	Yes	No
Items	**F (%)**	**F (%)**
Do you perform endotracheal/tracheal suctioning when required?	60(64.8%)	32(35.2%)
Do you check endotracheal tube (ETT) level regularly?	68(74.1%)	24(25.9%)

Do you rotate the ETT position every 24 hours?	68(74.1%)	24(25.9%)
Do you check cuff pressures every 6–12 hours?	68(77.8%)	24(22.2%)
Do you recognize complications of ETT?	72(%81.5)	20(18.5%)
Do you instill normal saline before suctioning?	75(75.9%)	17(24.1%)
Do you pre-oxygenate patients with 100% O_2 before suctioning?	70(%75.9)	22(24.1%)
Do you monitor patient anxiety while on mechanical ventilation?	70(66.7%)	22(33.3%)
Do you recognize anxiety findings in ventilated patients?	61(68.5%)	31(31.5%)
Do you inform relatives of ventilated patients about their status?	63(74.1%)	29(25.9%)
Do you follow ventilator care bundle practices to prevent VAP?	68(70.4%)	24(29.6%)
Do you check cuff pressure using palpation method?	65(70.4%)	27(29.6%)
Do you check cuff pressure using CPM method?	65(72.2%)	27(27.8%)
Do you check cuff pressure using minimal leak test (MLT)?	66(59.3%)	26(40.7%)
Do you provide oral hygiene once daily?	55(63.0%)	38(37.0%)
Do you provide oral hygiene twice daily?	56(63.0%)	36(37.0%)
Do you use chlorhexidine for oral hygiene?	56(81.5%)	36(18.5%)
Do you use sodium bicarbonate for oral hygiene?	81(79.6%)	11(20.4%)
Do you wipe eyes from inner canthus to out as eye care?	73(70.4%)	19(29.6%)
Do you tape eyes shut for eye care?	65(59.3%)	27(40.7%)
Do you use teardrops for eye care?	55(70.4%)	37(29.6%)

3.4 Overall Understanding: Overall understating of the participants was assessed. The majority (83%) of the participants was reported Good Understanding while 17% of the participants were reported Poor Understanding (Figure 7).

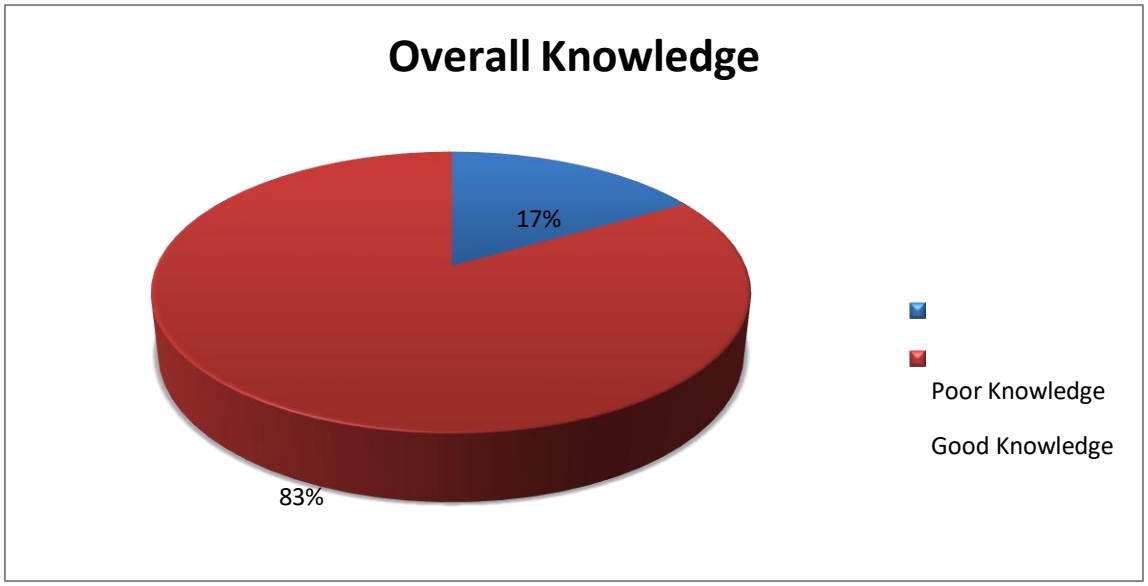

Figure 7: Pie-Chart depicting overall undertraining of the participants regarding Mechanical Ventilation

3.5 Overall Practices

Overall practices of the participants were assessed. The majority (69%) of the participants was reported Good practices while 31% of the participants were reported Poor practices (Figure 8).

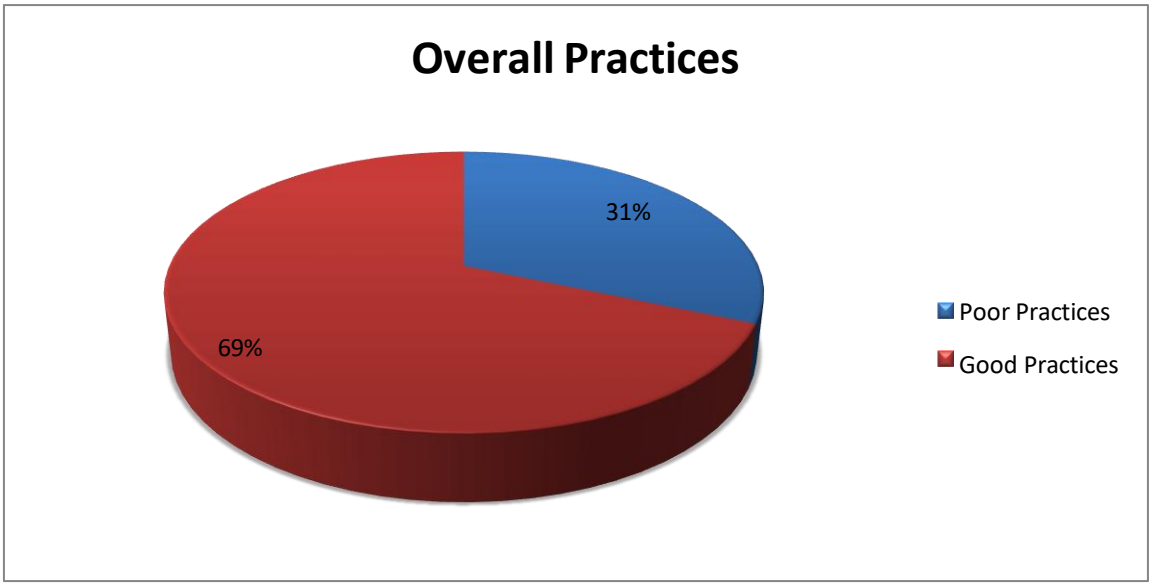

Figure 8: Pie-Chart depicting overall practices of the participants regarding Mechanical Ventilation

4. Discussion

The present study aimed to assess the knowledge and practices of nurses regarding ventilator-related errors in tertiary care hospitals of Peshawar. The findings revealed that a majority of nurses demonstrated a good understanding (83%) of mechanical ventilation concepts, whereas 17% exhibited poor understanding. In terms of practice, 69% of the participants showed good adherence to

ventilator care standards, while 31% reported poor practices. The results of this study are consistent with earlier research conducted globally and within Pakistan. For instance, a study found that 76% of nurses working in intensive care units in Lahore had moderate to good knowledge of mechanical ventilation, yet gaps existed in areas such as alarm management, ventilator settings, and weaning protocols (13). Similarly, another study reported that 68% of critical care nurses demonstrated satisfactory knowledge about ventilator settings and patient monitoring but lacked adequate training on managing ventilator alarms and preventing ventilator-associated pneumonia (VAP) (19). In line with these findings, the present study also observed high knowledge levels among most nurses, particularly those with BSN or higher qualifications, while diploma holders tended to show comparatively weaker understanding (20). Moreover, study reported that nurses' knowledge of ventilator parameters such as FiO_2, PEEP, and tidal volume was satisfactory; however, the practical implementation of this knowledge was inconsistent. This partially aligns with the current study's finding that 31% of nurses had poor practices despite relatively good knowledge, suggesting that theoretical understanding does not always translate into optimal bedside performance (21). Another study, similarly noted that while 71% of nurses were familiar with ventilator terminology, only 54% followed evidence-based ventilator care bundles in practice (13). This discrepancy between knowledge and practice underscores the persistent challenge of integrating clinical knowledge into daily patient care routines. A comparable trend was observed in a cross-sectional study that assessed ICU nurses' knowledge and practice regarding mechanical ventilation in Islamabad. Their study revealed that although 80% of nurses possessed adequate theoretical knowledge, only 60% followed recommended clinical guidelines, highlighting the influence of workload, lack of continuous education, and inadequate institutional support (18). Likewise, in their study conducted in Saudi Arabia, reported that 75% of nurses had moderate knowledge, but 45% showed suboptimal practices, particularly in suctioning, cuff pressure monitoring, and patient communication findings that mirror those in the current study (22). However, the finding that nearly one-third of the participants demonstrated poor practices suggests that knowledge alone is insufficient to ensure competency in mechanical ventilation management. Similar conclusions were drawn in a multicenter study in Riyadh, where they found that lack of supervision, high patient load, and insufficient hands-on training were the main reasons for poor practical performance despite satisfactory theoretical knowledge (23). In the context of the present study, the absence of structured in-service training and limited simulation-based practice sessions could be contributing factors. The results also revealed that 59.3% of participants had not received formal training in ventilator care, which further supports this interpretation (24).

Strengths and Limitations

By evaluating both areas jointly, this study offers a more comprehensive view of nurses' proficiency in managing ventilated patients and delivers insightful information about their knowledge and behaviors surrounding mechanical ventilation. The inclusion of nurses from ICU, CCU, and emergency units improved the representation of various clinical situations, and the use of a standardized and pretested questionnaire boosted data reliability. Additionally, the study adds local data from Pakistan, where there is little research on nurses' ventilator-related mistakes.

However, the use of self-administered questionnaires may have produced socially acceptable answers, and the cross-sectional design makes it impossible to prove causal correlations. The study's limited applicability to other areas stems from the fact that it was limited to two tertiary institutions in Peshawar. Furthermore, the sample size was somewhat limited, and direct clinical practice observation which could have given a more accurate picture of actual bedside practices was not included.

Conclusion

The majority of nurses had strong mechanical ventilation knowledge and practices, according to the survey, but there are still significant gaps in areas like ventilator settings, alert handling, and infection prevention. These gaps emphasize the necessity of ongoing professional development to improve theoretical knowledge and practical abilities. Reducing avoidable ventilator-related problems and enhancing patient outcomes depend on nurses being more proficient in ventilator care.

Recommendations

To improve nurses' abilities in ventilator control and patient safety, regular in-service training and refresher courses should be set up. Current information on respiratory care and mechanical ventilation should be included in nursing courses. To reinforce practical skills, competency-based examinations and simulation exercises should be used. To effectively represent real clinical procedures, future research should include direct observation and several facilities.

Funding Statement

Declaration of Conflicting Interest

No conflict of interest to declare.

Funding

No funding was received for this study.

Acknowledgment:

The author thanked the participants in this study and the Hospital administration who supported the data collection process.

Conflict of Interest

The authors declare **no conflict of interest**.

Declaration of Use of AI in Academic Writing

ChatGPT has been used to adjust some of the part of article in the writing process to improve readability and remove grammatical errors. However, he took full responsibility for the content.

References

1. Walter K. Mechanical ventilation. Jama. 2021;326(14):1452.
2. Pham T, Brochard LJ, Slutsky AS. Mechanical ventilation: state of the art. In: Mayo Clinic Proceedings. Elsevier; 2017. p. 1382–400.
3. Jiang T, Lin T, Shu X, Song Q, Dai M, Zhao Y, et al. Prevalence and prognostic value of preexisting sarcopenia in patients with mechanical ventilation: a systematic review and meta-analysis. Crit Care. 2022;26(1):140.
4. Kamio T, Masamune K. Mechanical ventilation-related safety incidents in general care wards and ICU settings. Respir Care. 2018;63(10):1246–52.
5. Ladha K, Melo MFV, McLean DJ, Wanderer JP, Grabitz SD, Kurth T, et al. Intraoperative protective mechanical ventilation and risk of postoperative respiratory complications: hospital based registry study. Bmj. 2015;351.
6. Ambrosino N, Vitacca M. The patient needing prolonged mechanical ventilation: a narrative review. Multidiscip Respir Med. 2018;13(1):112–21.
7. Payen V, Jouvet P, Lacroix J, Ducruet T, Gauvin F. Risk factors associated with increased length of mechanical ventilation in children. Pediatr Crit Care Med. 2012;13(2):152–7.
8. Trudzinski FC, Neetz B, Bornitz F, Mueller M, Weis A, Kronsteiner D, et al. Risk factors for prolonged mechanical ventilation and weaning failure: a systematic review. Respiration. 2022;101(10):959–69.
9. Kózka M, Sega A, Wojnar-Gruszka K, Tarnawska A, Gniadek A. Risk factors of pneumonia associated with mechanical ventilation. Int J Environ Res Public Health. 2020;17(2):656.
10. Clare M, Hopper K. Mechanical ventilation: ventilator settings, patient management, and nursing care. Compend Contin Educ Pr Vet. 2005;27(4):256–68.
11. Alabdulwahhab MJ, Alabbas AA, Alhababi YAA, Alattafi YHA, Almatter MNA, Almousa MH, et al. The Role of the Nurse in Managing Mechanically Ventilated Patients. J Int Cris Risk Commun Res. 2024;7(S10):1766.
12. Tingsvik C, Johansson K, Mårtensson J. Weaning from mechanical ventilation: factors that influence intensive care nurses' decision-making. Nurs Crit Care. 2015;20(1):16–24.
13. Hassen KA, Nemera MA, Aniley AW,

Olani AB, Bedane SG. Knowledge Regarding Mechanical Ventilation and Practice of Ventilatory Care among Nurses Working in Intensive Care Units in Selected Governmental Hospitals in Addis Ababa, Ethiopia: A Descriptive Cross-Sectional Study. Crit Care Res Pract. 2023;2023(1):4977612.
14. Abdulkadir K, Hassen E, Desta T, Demissie DB. Knowledge, practice, and Associated Factors towards Mechanical Ventilation Management among Adult Intensive Care Unit Nurses at Public Hospitals in Addis Ababa, Ethiopia. MJH. 2022;1(2):1378–2790.
15. Alreshidi MS, AlRashidi FA, Tuppal CP, Prudencio DAM, Alrashidi N, Villagracia RWA, et al. Nurses' Knowledge on the Prevention of Ventilator-Associated Pneumonia (VAP) among Critically Ill Patients. Nurse Media J Nurs. 2024;14(1):65–73.
16. Alanazi S, Alonazi WB. Enhancing critical care practitioners' knowledge and adherence to ventilator-associated events bundle: a comprehensive analysis. Front Med. 2024;11(November):1–10.
17. Guilhermino MC, Inder KJ, Sundin D. Education on invasive mechanical ventilation involving intensive care nurses: a systematic review. Nurs Crit Care. 2018;23(5):245–55.
18. Saritas S, Kaya A, Dolanbay N. Knowledge and Practices of Intensive Care Nurses on Mechanical Ventilation. Int J Caring Sci. 2019;12(1):30–9.
19. Lee H, Han JW. Development and evaluation of a virtual reality mechanical ventilation education program for nursing students. BMC Med Educ. 2022 Nov;22(1):775.
20. Zainib T, Rattani S, Asif N, Khuwaja HMA. Nurses' knowledge, attitude, and perceived barriers toward protective lung strategies of pediatrics mechanically ventilated patients in a tertiary care hospital in Pakistan. Acute Crit Care. 2025;40(1):128–35.
21. Hammod HJ, Mohammed S. Effectiveness of an Educational Program on Nurses Knowledge Concerning Complications Prevention of Mechanical Ventilation at Intensive Care Unit in Al-Hussain Teaching Hospital at Nassiryah City. Kufa J Nurs Sci. 2016;6(2).
22. Ebrahim AAEK, El-Dakhakhny AM, AbdElnabi HA. Nurses' Knowledge Regarding Care Provided to Children on Mechanical Ventilation. Zagazig Nurs J. 2023;19(1):165–76.
23. Aldhahir AM, Alqarni AA, Madkhali MA, Madkhali HH, Bakri AA, Shawany MA, et al. Awareness and practice of airway pressure release ventilation mode in acute respiratory distress syndrome patients among nurses in Saudi Arabia. BMC Nurs. 2024;23(1):79.
24. HadiAtiyah H, Abdul-Wahhab MM. Nurses Knowledge toward Essential Care for Adult Patients Undergoing Mechanical Ventilation at Critical Care Unit in Baghdad City. High Educ. 2016;4(8.0):100.