

Knowledge of Intensive Care Unit Health Care Professionals on Prevention of Ventilator Associated Pneumonia

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Abstract

Background: Ventilator-associated pneumonia (VAP) is lung infection that can develop in patients who require ventilator support. This type of pneumonia is most frequently found in intensive care units (ICUs). ICU staff play a vital role by focusing on infection prevention. Their knowledge and skills in preventing VAP are essential in creating effective strategies to minimize its impact. Implementing VAP Bundles of Care is crucial in reducing the morbidity and mortality rates associated with VAP. **Aims:** To assess the understanding of healthcare providers who are working in ICUs regarding the implementation of practices to prevent VAP. **Materials and methods:** The study conducted in various ICUs, aiming to gather insights from the ICU staff members. Through purposive sampling, total number of the participant are 96 ICU workers. To gather information, we utilized a customized and knowledge based questionnaire. The study employed descriptive tests, focusing on frequencies and percentages, to analyze the data collected from the ICU staff members. **Results:** After evaluating the participants' knowledge on preventing VAP,

it was observed that many ICU workers had gaps in their understanding. Nurses made up the majority 62.5%, with the remaining 37.5% being respiratory therapists. 99% of participants acknowledged that raising the HOB was a crucial, 97% highlighted the importance of oral hygiene with chlorhexidine, 59% supported implementing daily sedation breaks, 79% of participants identified the closed suction system and 46% of the participants highlighted the importance of DVT and GI prophylaxis in preventing VAP. **Conclusion:** The research revealed that ICU staff might benefit from additional support in preventing VAP. It is essential to prioritize ongoing education and training programs focused on this topic to ensure that they have the necessary knowledge and skills to effectively prevent and manage this serious condition

Introduction

Ventilator-associated pneumonia (VAP) is a serious healthcare-associated infection that develops in patients receiving mechanical ventilation for more than 48 hours (1). It is classified as a form of nosocomial pneumonia and is commonly encountered in intensive care units (ICUs). Clinically, VAP is characterized by new or progressive pulmonary infiltrates on chest imaging, along with signs such as fever, leukocytosis, and purulent tracheal secretions (2). It remains a major cause of morbidity and mortality among critically ill patients, contributing to prolonged hospital stays, increased healthcare costs, and poor patient outcomes (3). The pathogenesis of VAP is multifactorial such as the entrance of microorganisms into the lower respiratory tract through an endotracheal tube, aspiration of contaminated oropharyngeal secretions and gastric contents, impaired cough reflex, and compromised immune responses (4). Common pathogens associated with VAP include *Staphylococcus aureus* and members of the Enterobacteriaceae family (3). Several risk factors such as prolonged mechanical ventilation, advanced age, emergency intubation, re-intubation, tracheostomy, prior antibiotic exposure, blood transfusion, and extended ICU stay (6). Prevention of VAP requires a multifaceted approach such as elevation of the head of the bed to 30–45 degrees, maintenance of oral hygiene, use of closed suctioning systems, subglottic secretion drainage, daily assessment of readiness for extubation, prophylaxis for deep vein thrombosis (DVT) and gastrointestinal (GI) complications (7). Implementation of these interventions has been shown to significantly reduce the incidence of VAP and improve patient outcomes (8). Despite the availability of well-established guidelines, adherence to VAP prevention strategies remains inconsistent, particularly in low- and middle-income countries. Several studies in Ethiopia, Jordan, Saudi Arabia, and Tanzania have highlighted gaps in knowledge and practice among ICU healthcare professionals (1, 2, 5, 9). Educational interventions have been shown to improve knowledge and compliance with VAP prevention guidelines. However, barriers such as lack of training opportunities, insufficient staffing, and limited resources continue to hinder effective implementation of evidence-based practices. In Pakistan, limited data are available regarding the knowledge of ICU healthcare professionals on VAP prevention. Considering the high burden of healthcare-associated infections in resource-limited settings, it is essential to assess the awareness and knowledge of frontline healthcare workers.

Table 1 VAP prevention strategies

1. Hand hygiene
2. Semi-recumbent position
3. Oral care with chlorhexidine
4. Non-invasive positive pressure ventilation
5. GI and DVT prophylaxis
6. Daily sedation vacation

7. Subglottic secretion drainage
8. Early extubation

Methods

A descriptive cross-sectional study was conducted in the intensive care units of three tertiary care hospitals in Peshawar: Lady Reading Hospital, Khyber Teaching Hospital, and Hayatabad Medical Complex. A total of 96 healthcare professionals, including nurses and respiratory therapists, were enrolled using non-probability purposive sampling. Sample size was calculated using Open Epi. Data were collected using a structured questionnaire consisting of two sections: Demographic characteristics and Knowledge regarding VAP prevention. Data were analyzed using SPSS version 26. Frequencies and percentages were calculated for categorical variables. Ethical approval and institutional permissions were obtained prior to data collection.

Results

A total of 96 healthcare professionals participated in the study, including 62.5% nurses and 37.5% respiratory therapists. The majority of participants (71.9%) had more than two years of experience, while 19.8% had 1–2 years and 8.3% had less than one year of experience. Most participants held a bachelor's degree (62.5%), followed by diploma (29.2%) and master's degree (8.3%). Additionally, 68.8% had received formal training on VAP prevention.

Table 2 Demographics information

Demographic category	Frequency	%age
Occupation		
Nurse	60	62.5
Respiratory therapist	36	37.5
Working Experience		
<1 year	8	8.3
1-2 year	19	19.8
>2 year	69	71.9
Level of education		
Diploma	28	29.2
Bachelor's degree	60	62.5
Master's degree	8	8.3
Formal Training		
Yes	66	68.8
No	30	31.3

Regarding knowledge of VAP, most participants correctly identified key clinical features such as fever (84%) and tracheal secretions (76%), as well as tracheal intubation as a major risk factor (94%). However, only 25% recognized an increased white blood cell count as a sign of VAP, indicating gaps in deeper clinical understanding. Furthermore, 66% incorrectly believed that VAP is caused solely by bacterial infections. Knowledge of preventive strategies was generally high for basic measures, with 99% identifying head-of-bed elevation and 97% recognizing oral hygiene with chlorhexidine as important interventions. However, awareness of advanced preventive measures was comparatively lower, including in-line suctioning (68%), daily sedation breaks (59%), and DVT/GI prophylaxis (46%).

Table 3: Knowledge of VAP prevention

Knowledge about VAP prevention	Correct (%)	Incorrect (%)
Oral hygiene strategies for VAP prevention	97%	3%
Position strategies for VAP prevention	99%	1%
Suction strategies for VAP prevention	68%	32%
Prophylactic strategies for VAP prevention	46%	54%
Sedation breaks strategies for VAP prevention	59%	41%

Overall, participants demonstrated adequate knowledge of basic VAP prevention strategies deficiencies were observed in advanced concepts, highlighting the need for more comprehensive training programs.

Discussion

This study assessed the knowledge of ICU healthcare professionals regarding ventilator-associated pneumonia (VAP) prevention in a resource-limited setting. The findings indicate that while participants demonstrated adequate awareness of basic preventive measures, gaps persist in advanced knowledge and comprehensive understanding. Most participants held a bachelor's degree, consistent with findings from studies conducted in Saudi Arabia (2). A relatively higher proportion of participants in this study (68.8%) had received formal training on VAP prevention compared to previous studies, suggesting improved access to training (10). However, this did not fully translate into comprehensive knowledge, highlighting limitations in the depth and effectiveness of training programs. Awareness of key preventive measures such as head-of-bed elevation and oral hygiene was high, aligning with international studies (11). Nearly all participants recognized head-of-bed elevation as an essential intervention, which is higher than reports from Ethiopia (12). Similarly, knowledge regarding oral hygiene practices was comparable to findings from studies in China (13). In contrast, knowledge of advanced preventive strategies remained suboptimal. Only 59% of participants were aware of the role of daily sedation interruption, consistent with findings from Tanzania (1). This indicates a need for greater emphasis on sedation management in training programs. Awareness of closed suction systems was moderate and comparable to studies from Jordan, while knowledge of DVT and GI prophylaxis was relatively low, reflecting limited understanding of indirect preventive measures (10, 14). The observed gaps may be attributed to limited continuing education opportunities and resource constraints, which are common in developing countries. Previous studies have demonstrated that structured educational interventions significantly improve knowledge and compliance with VAP prevention guidelines. Overall, healthcare professionals showed satisfactory knowledge of basic practices, deficiencies in advanced concepts highlight the need for comprehensive and continuous training programs to enhance adherence to evidence-based VAP prevention strategies.

Conclusion

This study highlights that although ICU healthcare professionals possess basic knowledge of ventilator-associated pneumonia (VAP) prevention, important gaps remain in comprehensive understanding and advanced practices. Continuous and structured training programs are essential for improving knowledge, enhancing adherence to evidence-based guidelines, and ensuring high-quality patient care. Strengthening education and skill development initiatives can play a key role in reducing the burden of VAP in critical care settings.

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