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ASSESSMENT OF HEALTH CARE WORKERS' KNOWLEDGE OF EVIDENCE-BASED GUIDELINES FOR PREVENTING VENTILATOR-ASSOCIATED PNEUMONIA

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Abstract

Background: Ventilator-associated pneumonia (VAP) is a very common healthcare-associated infection (HCAI) in mechanically ventilated patients in the intensive care units (ICUs). It has been linked to increased morbidity, mortality, hospital stay and healthcare costs. Guidelines have been established to minimize the occurrence of VAP and also rely, to a large extent, on the knowledge and compliance of healthcare workers with recommended preventive measures. Objective: To find out the Knowledge about the prevention of ventilator associated pneumonia. Methodology: The study was descriptive cross-sectional study that included 100 health care workers from October 2025 to March 2026 in the ICUs of Lady Reading Hospital, and Hayatabad Medical Complex, Peshawar, Pakistan. A structured questionnaire was used to gather data about the knowledge of evidence-based guidelines for the prevention of ventilator-associated pneumonia. Demographic characteristics and knowledge scores were summarized using descriptive statistics. A one-way ANOVA followed by Tukey HSD post hoc tests were used to compare knowledge scores between groups of professionals. Results: 102 healthcare workers participated in the study, with 57.8% nurses, 29.4% respiratory therapists, and 12.7% Physicians. Knowledge of evidence-based VAP prevention guidelines was good, with more than 90% of the respondents aware of head-of-bed elevation, oral hygiene with chlorhexidine, optimal endotracheal tube cuff pressure, early mobility, and spontaneous breathing trials. However, significant amounts of missing knowledge about suctioning practice, as only 46.1% of them correctly identified the recommended route of suctioning and 48.0% the recommended patient position during the suctioning. Significant difference was found in the knowledge scores between the various professional groups ($F = 18.022$, $p < 0.001$) with the highest knowledge scores belonging to respiratory therapists, followed by Physicians and nurses. Conclusion: The knowledge of the evidence-based guidelines for VAP prevention was good among healthcare workers, with particularly high levels of understanding around head-of-bed elevation, oral hygiene, cuff pressure management, and early mobility. Nevertheless, there was a considerable lack of knowledge regarding the practices of suctioning. Physicians and nurses did not perform as well as respiratory therapists in their knowledge scores.

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Introduction

Ventilator-associated pneumonia (VAP) is a type of hospital-acquired pneumonia that develops 48 hours or more after initiation of mechanical ventilation through an endotracheal or tracheostomy tube. It is still one of the most frequent and dangerous HAI in the ICUs of patients on mechanical ventilation (1). Mechanical ventilation is a lifesaving intervention frequently used in intensive care units (ICUs), and about 77% of patients in the ICUs require ventilatory assistance during their hospital stay (2). Although beneficial, mechanical ventilation has several complications, one of which is VAP, which contributes to VAP morbidity and mortality. VAP incidence in ICUs has been reported to be as high as 65% and as low as 9% in ICUs around the world (3). VAP is associated with poor patient outcomes such as longer mechanical ventilator use, longer ICU stays, greater cost of healthcare, and elevated death rates (4). VAP has been reported in the US to be linked to an extra 5-16 days of ICU length of stay, and to significant increases in treatment costs per patient (5).

VAP is a multifactorial process. During endotracheal (ET) intubation, the natural protective mechanisms of the upper airway are bypassed and mucociliary clearance and cough reflexes are impaired, which increases the risk of aspiration of contaminated secretions into the lower respiratory tract. Biofilm on ET tubes also contributes the colonization and resistance to antimicrobial therapy. Advanced age, long-term mechanical ventilation, immune deficiency, malnutrition, prior antibiotic use, chronic lung disease, aspiration, reintubation, inadequate hand hygiene and failure to adhere to infection control measures by health care workers are common risk factors for VAP (6).

There are a number of international guidelines, such as Centers for Disease Control and Prevention (CDC) guidelines, the Institute for Healthcare Improvement (IHI) guidelines, and a number of critical care societies that have developed evidence-based guidelines for VAP prevention (7-9). Preventative strategies recommended include maintaining the head of the bed at 30-45 degrees, daily sedations interruption, early weaning from mechanical ventilation, avoiding unnecessary ventilator circuit changes, maintaining appropriate endotracheal cuff pressure, subglottic suction drainage of secretions, and using strict hand hygiene and infection control procedures (10).

Hence, this study conducted to find out the knowledge of healthcare workers about evidence-based guidelines for the prevention of ventilator-associated pneumonia.

Methodology

A descriptive cross sectional study was carried out on the healthcare workers of the intensive care units (ICUs) of Lady Reading hospital (LRH) and Hayatabad medical complex (HMC) in Peshawar, Pakistan from October 2025 to March 2026. The sample size was determined to be 97 participants when a 95% confidence level, 50% anticipated proportion, and a 10% margin of error were used; however, 102 healthcare workers were included in the study.

Permanently employed HCWs with at least six months ICU experience were included in the study. Excluded were students, trainees, and pharmacists, nursing assistants, and those with less than 6 months experience in the ICU, and those unwilling to participate. The structured questionnaire was used to collect data, focusing on the knowledge of evidence-based guidelines for the prevention of ventilator-associated pneumonia (VAP). The questionnaire was given to the participants with informed consent and filled out independently.

IBM SPSS Statistics software was used to code and analyze data. Participant characteristics and knowledge scores were summarized using descriptive statistics such as frequencies, percentages, means and standard deviations. One-way analysis of variance (ANOVA) and Tukey's HSD Post hoc test were used to compare the differences in knowledge scores between the different professional groups. The level of statistical significance was $p < 0.05$.

The Institutional Review Board of Khyber Medical University, Peshawar, and the ethics committees of LRH and HMC gave ethical approval.

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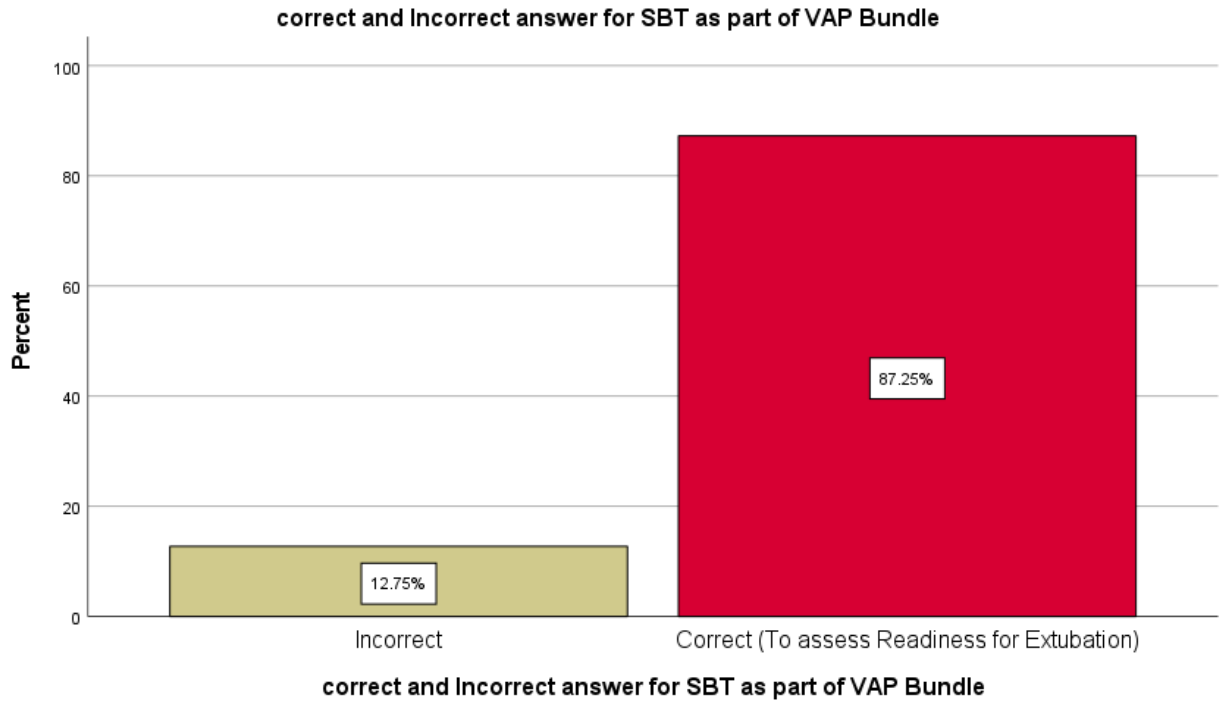
Results

102 healthcare workers participated in the study. The participants' mean age was 28.8 ± 2.86 years and 74.5% were 29 years or younger. Most of the participants were nurses (57.8%, n=59), respiratory therapists (29.4%, n=30) and doctors (12.7%, n=13). Of the total participants, 59.8% (n=61) were male. The majority of the respondents (65.7%) had 3-5 years of experience, and 26.5% responded with over 5 years of experience. Overall, there was a high level of knowledge about evidence-based VAP prevention guidelines. Thirty to 45 degrees was the head-of-bed elevation all participants recommended. High levels of knowledge were also found regarding endotracheal tube cuff pressure of 20-30cmH_2O (97.1%), early mobilisation as a preventative strategy (92.2%), spontaneous breathing trials (87.3%) and routine change of the ventilator circuit if visibly soiled or malfunction (74.5%).

Figure 1: Knowledge about Spontaneous breathing trail



Information about spontaneous awakening trials was sufficient, as 67.6% of the participants answered correctly. But there was a need for significant gaps in the knowledge of suctioning practices. Approximately 46% correctly identified the preferred route to suction in conscious patients and 48% correctly identified the recommended patient position for patients being suctioned.

There were significant differences between professional groups in terms of knowledge scores. Nurses had the next highest knowledge mean score (6.37), followed by respiratory therapists (7.87), and doctors (5.85). The difference in knowledge scores between the different professional groups was significant ($F = 18.022$; $p < 0.001$) according to one-way ANOVA.

Table 1: ***ONE-WAY ANOVA***

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	56.417	2	28.208	18.022	.000
Within Groups	154.956	99	1.565		
Total	211.373	101			

Post hoc analysis showed that the respiratory therapists were significantly higher than physicians (mean difference 2.02, $p < 0.001$) and nurses (mean difference 1.49, $p < 0.001$). No significant difference was found between physicians and nurses ($p = 0.358$).

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Table 1: *Multi comparison among Health Care workers*

(I) Role in ICU	(J) Role in ICU	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Doctor	nurses	-.52673	.38331	.358	-1.4388	.3854
	respiratory therapist	-2.02051*	.41542	.000	-3.0090	-1.0320
Nurses	doctor	.52673	.38331	.358	-.3854	1.4388
	respiratory therapist	-1.49379*	.28054	.000	-2.1613	-.8262
respiratory therapist	doctor	2.02051*	.41542	.000	1.0320	3.0090
	nurses	1.49379*	.28054	.000	.8262	2.1613

*. The mean difference is significant at the 0.05 level.

Discussion

This study confirm the recommendations of international guidelines, which highlight head-of-bed elevation, oral hygiene with chlorhexidine, endotracheal tube cuff pressure, early mobility and spontaneous breathing trials interventions as strategies to reduce aspiration and prevent VAP. Powers et al. also reported similar results, stating that oral care practices are important factors in decreasing the incidence of VAP in patients who are mechanically ventilated (11). While there were generally satisfactory levels of knowledge, significant gaps were identified related to the practices of suctioning. Only 46.1% of the participants were able to correctly identify the preferred position for suctioning in conscious patients and 48.0% in the recommended position for patients during suctioning. The results are in line with those of Gülsoy and Karagözoğlu who found gaps in workers in the health sector's knowledge and use of evidence-based clinical suctioning practices (12), and Iraqi researchers who found a lack of knowledge and practice of evidence-based clinical suctioning among health workers (13). Lack of knowledge in these areas could lead to aspiration, hypoxia, and subsequent respiratory complications, so it is important that there are specific educational interventions focused on these areas. The present study also showed that there was a significant difference between the knowledge of the professional groups. Physicians and nurses had significantly lower knowledge scores than respiratory therapists. This is consistent with the specific roles and training of respiratory therapists, who have a deeper focus on airway management, mechanical ventilation, and steps to prevent VAP. Previous research also found a relationship between professional specialization and higher scores on the adherence to evidence-based respiratory care practices (14). However, there were no significant differences between physicians and nurses, which indicated that the knowledge of the VAP prevention guidelines was similar between the two groups. This study's findings differ with study findings in Yemen and Pakistan in which the overall knowledge level of the ICU nurses was reported as weak to moderate (3, 4). In the current study, the comparatively high knowledge scores could be attributed to the increased exposure to evidence-based protocols, institutional policies and multidisciplinary critical care practices in the participating hospitals. However, gaps in knowledge about particular clinical procedures are still present, indicating that theoretical knowledge is not enough to guarantee optimal practice. The theory-practice gap mentioned by Pérez-Granda et al. is a critical factor to consider (15).

Conclusion

The knowledge of the healthcare workers working in intensive care units of tertiary care hospitals in Peshawar about the prevention of VAP based on evidence based guidelines was good. Head-of-bed elevation, oral hygiene, endotracheal tube cuff pressure management, early mobility, and spontaneous breathing trials were the highest. However, there were large gaps in knowledge regarding the practices of suction and positioning

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the patient during suctioning. The scores for knowledge were significantly higher for respiratory therapists than for Physicians and nurses, indicating that the type of profession has a significant impact on the knowledge about VAP.

Limitations

There are some limitations to this study. First, the cross-sectional design was used to measure the participants' knowledge at one point in time, and to investigate whether there were changes in knowledge over time and to establish causality. Second, the study was done only in two tertiary care hospitals of Peshawar, which may restrict the generalizability of the results to other health care settings. Third, the instrument used to measure the knowledge was self-administered questionnaire and can be prone to answer bias and may not reflect the actual practice in the clinic. Lastly, the study also assessed the knowledge of healthcare workers but not adherence to evidence-based guidelines for VAP prevention in clinical practice. Future research should also take a more direct approach to clinical practices and a larger, multicenter sample to give a more complete picture of the knowledge and adherence to VAP prevention practices.

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