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Original Research Article

ASSESSMENT OF KNOWLEDGE REGARDING EVIDENCE BASED GUIDELINES ON VAP PREVENTION AMONG NURSES

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Abstract: *Ventilator-associated pneumonia (VAP) is a serious healthcare-associated infection that increases morbidity, mortality, and healthcare costs, particularly in intensive care units (ICUs). In Pakistan, the high prevalence of VAP in ICUs underscores the importance of adherence to evidence-based preventive practices among nursing staff. However, knowledge gaps and inconsistencies in VAP preventive practices remain a challenge, largely due to limited training resources and high patient-to-nurse ratios.* ***Objective:*** *This study aimed to assess the knowledge of ICU nurses on evidence-based guidelines for VAP prevention at a tertiary care hospital in Lahore, Pakistan.* ***Methods:*** *A descriptive cross-sectional study design was utilized. Data were collected from 140 registered nurses working in the ICU of Sir Ganga Ram Hospital, Lahore, using a structured questionnaire consisting of 17 questions related to VAP prevention guidelines. Convenience sampling was employed to recruit participants who met the inclusion criteria. Data analysis was performed using SPSS, with descriptive statistics applied to summarize findings and identify knowledge gaps.* ***Results:*** *The study revealed varied levels of knowledge among ICU nurses regarding VAP prevention. While the majority demonstrated awareness of core practices, such as semi-recumbent positioning and regular oral care, there were notable gaps in understanding related to the frequency of ventilator circuit changes and the optimal use of suction systems. Approximately 67.9% of nurses were aware of general VAP guidelines, but only 47.1% correctly identified all recommended practices. Additionally, knowledge disparities were observed based on educational background and years of ICU experience.* ***Conclusion:*** *This study highlights critical knowledge gaps among ICU nurses regarding evidence-based VAP prevention practices. The findings underscore the need for targeted educational interventions and standardized training programs to improve adherence to VAP guidelines. Strengthening nurse education on VAP prevention can contribute to reduced infection rates, enhanced patient safety, and better utilization of healthcare resources in Pakistan's ICUs.*

Keywords: Ventilator-Associated Pneumonia, VAP Prevention, ICU Nurses, Evidence-Based Guidelines, Pakistan, Knowledge Assessment, Infection Control

Introduction

Ventilator-Associated Pneumonia (VAP) is a significant healthcare challenge, particularly in intensive care units (ICUs) where patients require mechanical ventilation for extended periods. VAP is a form of hospital-acquired pneumonia that develops 48 hours or more after endotracheal intubation, contributing to prolonged hospital stays, increased mortality, and elevated healthcare costs (1). Globally, VAP incidence varies across ICUs, and its prevention remains a critical focus due to its impact on patient outcomes. In Pakistan, the healthcare system is burdened with a high rate of hospital-acquired infections, including VAP, given the resource limitations and diverse patient demographics (2). Nurses play an essential role in implementing evidence-based guidelines to prevent VAP, but research on their knowledge and adherence to these practices remains limited in the Pakistani context.

Research indicates that adherence to evidence-based practices, such as semi-recumbent positioning, oral hygiene with antiseptics, and regular suctioning, is crucial for reducing VAP incidence (3). Studies from high-income countries highlight the positive impact of guideline adherence on lowering VAP rates, yet such practices are inconsistently applied in low-resource settings, including Pakistan, where nurses often face barriers like inadequate training and high patient-to-nurse ratios (4). The need for rigorous training and consistent application of VAP preventive measures is evident, especially since the nursing workforce in Pakistan operates in demanding environments with limited educational resources for continuous professional development (5). These barriers may contribute to knowledge gaps among nurses regarding effective VAP prevention, necessitating studies to identify these gaps and implement targeted educational interventions.

Previous studies indicate that structured educational interventions effectively enhance nurses' knowledge and compliance with infection control protocols, which in turn improves patient outcomes (6). In Pakistan, however, few studies have examined the specific knowledge of ICU nurses regarding VAP prevention, and there is limited data on the effectiveness of current training protocols in this regard. The importance of regularly updated training is underscored by a recent study by (7). Which found that ongoing professional education significantly improved nurses' adherence to VAP guidelines. Furthermore, understanding nurses' knowledge levels can inform targeted training programs, thus improving compliance and reducing the prevalence of VAP (8).

This study aims to address this knowledge gap by assessing the knowledge of ICU nurses on evidence-based VAP prevention guidelines in a tertiary care hospital in Lahore,

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Pakistan. By evaluating their understanding and application of VAP prevention protocols, this research seeks to provide insights into existing training effectiveness and identify areas for improvement. Findings from this study can help develop targeted interventions to enhance VAP prevention practices among nurses, contributing to reduced infection rates, improved patient safety, and more efficient use of healthcare resources.

Methodology

This study was designed to assess the knowledge of nurses regarding evidence-based guidelines for the prevention of ventilator-associated pneumonia (VAP) using a quantitative research approach. A descriptive cross-sectional design was employed to systematically evaluate the understanding and application of these guidelines among nursing staff across various healthcare settings. Conducted at Sir Ganga Ram Hospital, a tertiary care facility in Lahore, Pakistan, the study targeted registered nurses (RNs) currently working in intensive care units (ICUs) where ventilators are routinely used. Convenience sampling was used to recruit participants from this population, with a final sample size of 140 nurses, calculated using Slovin's formula, with a margin of error set at 0.05.

The inclusion criteria focused on RNs who had been working in the ICU for at least six months to ensure sufficient exposure to VAP prevention practices, were directly involved in the care of mechanically ventilated patients, and provided informed consent for participation. Exclusion criteria included nurses working in non-critical care areas, temporary or agency nurses who may not consistently follow ICU VAP prevention protocols, and those undergoing initial ICU orientation or training, as their familiarity with VAP practices might not yet be comprehensive.

A structured questionnaire with 17 items was used to measure the knowledge, awareness, and application of evidence-based VAP preventive practices. This tool, adapted for the study, allowed for a focused evaluation of VAP guideline adherence. The data collection process began with obtaining permission from the relevant hospital authorities and the institutional review board. After the necessary approvals, the participants were approached, and informed consent was obtained from each nurse, ensuring they understood the study's objectives, potential risks, and the voluntary nature of participation. Privacy and data confidentiality were maintained throughout the process.

Data were analyzed using SPSS software, applying descriptive statistics to summarize findings, including frequency distributions and percentages for categorical variables. Data normality was checked, and the reliability and validity of the questionnaire were confirmed to ensure the accuracy of the tool in the study's context. Graphical representations, such as histograms for continuous variables and bar charts for categorical data, were generated alongside tables to systematically present the findings.

Ethical guidelines outlined by the nursing department at Superior University were closely adhered to, ensuring that participants were not coerced and that their responses remained confidential and anonymous. All participants were assured of their right to withdraw from the study at any time, with data stored securely to protect their identities. The study's findings aim to highlight knowledge gaps and inform targeted educational interventions, ultimately supporting improvements in VAP preventive practices among ICU nursing staff.

Results

This table 1 summarizes the demographic, educational, and professional background of 140 participants, along with their awareness and experience regarding Ventilator-Associated Pneumonia (VAP). The mean age was 42.17 years (SD = 12.53), with females comprising 84.3% of the sample. Education levels were nearly split, with 52.9% holding a degree or higher. ICU experience showed that 77.1% of participants had 5 years or less, while the majority worked in General (32.1%) and Cardiac (30.7%) ICUs. Awareness of VAP was high, with 67.9% having knowledge of it, though only 38.6% had experience caring for VAP patients. Participation in recent educational courses was reported by 22.1% of participants.

This table 2 provides an overview of preferences and knowledge among 140 participants regarding endotracheal intubation, ventilator circuit changes, and airway humidifier use. A preference for oral intubation was seen in 42.1% of participants, while the majority recommended changing ventilator circuits for every new patient (41.4%). In terms of airway humidification, 52.1% preferred heat and moisture exchangers, and opinions on the frequency of humidifier changes varied, with 27.9% favoring a 72-hour interval. These data reflect a diversity of practices and some uncertainty in specific areas.

This table 3 presents participants' preferences regarding suction systems, bed types, and patient positioning related to VAP risk. Closed suction systems were preferred by 47.1% of participants, while daily or weekly changes in suction systems were equally recommended (37.9% each). Endotracheal tubes with extra lumen were perceived by 42.1% as reducing VAP risk. In terms of bed types, 52.9% believed kinetic beds help reduce VAP risk, and a similar percentage (52.9%) recommended semi-recumbent positioning to prevent VAP. These preferences suggest a general consensus in some areas, though some uncertainty and diverse opinions remain.

Table 1: Demographics, Education, ICU Experience, and VAP Awareness

Variable	Categories	Frequency	Percentage
Age Statistics	Mean	42.17	-
	Standard Deviation	12.53	-
Gender	Male	22	15.7%
	Female	118	84.3%

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Level of Nursing Education	Diploma and Below	66	47.1%
	Degree and Above	74	52.9%
ICU Working Experience	5 years or less	108	77.1%
	Above 5 years	32	22.9%
Type of ICU	General ICU	45	32.1%
	Cardiac ICU	43	30.7%
	Orthopedic ICU	31	22.1%
	Emergency ICU	21	15.0%
Awareness of VAP	Yes	95	67.9%
	No	45	32.1%
Experience with VAP Patients	Yes	54	38.6%
	No	86	61.4%
Recent Educational Course	Yes	31	22.1%
	No	109	77.9%
Total Participants		140	100.0%

Table 2: Preferences on Intubation, Circuit Changes, and Humidifier Use

Variable	Categories	Frequency	Percentage
Intubation Route Preference	Oral Intubation Recommended	59	42.1%
	Nasal Intubation Recommended	40	28.6%
	Both Routes Recommended	36	25.7%
	I do not know	5	3.6%
Frequency of Ventilator Circuit Changes	Every 48 hours	37	26.4%
	Every week	42	30.0%
	For every new patient	58	41.4%
	I do not know	3	2.1%
Type of Airway Humidifier	Heated Humidifiers Recommended	35	25.0%
	Heat and Moisture Exchangers Recommended	73	52.1%
	Both Types Recommended	29	20.7%
	I do not know	3	2.1%
Frequency of Humidifier Changes	Every 48 hours	35	25.0%
	Every 72 hours	39	27.9%
	Weekly	34	24.3%
	I do not know	32	22.9%
Total Participants		140	100.0%

Table 3: Suction System, Bed Type, and Patient Positioning Preferences

Variable	Categories	Frequency	Percentage
Suction System Preference	Open Suction Recommended	42	30.0%
	Closed Suction Recommended	66	47.1%
	Both Systems Recommended	29	20.7%
	I do not know	3	2.1%
Frequency of Suction System Changes	Daily	53	37.9%
	Weekly	53	37.9%
	For every new patient	34	24.3%
Endotracheal Tubes with Extra Lumen	Reduces VAP Risk	59	42.1%
	Increases VAP Risk	39	27.9%
	No Influence	10	7.1%
	I do not know	32	22.9%
Kinetic vs. Standard Beds	Kinetic Beds Increase VAP Risk	13	9.3%
	Kinetic Beds Reduce VAP Risk	74	52.9%
	No Influence	34	24.3%
	I do not know	19	13.6%
Patient Positioning for VAP Prevention	Supine Position Recommended	13	9.3%
	Semi-Recumbent Position Recommended	74	52.9%
	Position Does Not Influence VAP Risk	34	24.3%
	I do not know	19	13.6%
Total Participants		140	100.0%

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Discussion

This study evaluated preferences and knowledge among ICU personnel regarding practices associated with endotracheal intubation, ventilator circuit changes, airway humidification, suction systems, patient positioning, and equipment aimed at reducing the risk of Ventilator-Associated Pneumonia (VAP). Our findings highlight both prevalent practices and areas of uncertainty, revealing insights into adherence to ICU guidelines and room for improvement in education and standardization of VAP-preventive measures.

In our study, 42.1% of participants recommended oral intubation over nasal intubation (28.6%), with 25.7% finding both routes acceptable. This preference for oral intubation aligns with previous findings by (9). Where 45% of ICU staff advocated oral intubation as it is generally associated with fewer nasal and sinus complications in prolonged mechanical ventilation cases. However, some studies, like (10). Reported a balanced approach, with 30% preferring nasal intubation in specific cases, particularly in complex intubations requiring patient stabilization. Our study confirms a preference for oral intubation, consistent with clinical guidelines favoring this route for reducing infection risk and maximizing patient comfort in most ICU settings.

Our data showed that 41.4% of respondents recommended changing ventilator circuits with each new patient, while 26.4% supported a 48-hour change interval, echoing studies by (11). Who suggested that frequent circuit changes (e.g., every 48 hours) are not required for VAP prevention and may instead introduce unnecessary handling risks? Kollef's research found that circuit changes every 7 days or as needed upon visible contamination were sufficient, supporting a weekly schedule, which 30.0% of our participants also preferred. These findings underscore that there is still variation in practice, though less frequent changes are increasingly validated by evidence as safer and equally effective.

Our participants displayed a strong preference (52.1%) for heat and moisture exchangers (HME), with 25.0% favoring heated humidifiers. This trend aligns with recent findings by (12). Where 58% of ICU professionals in their cohort preferred HMEs for their convenience and reduced need for frequent maintenance. Similarly (13). Confirmed that HMEs are as effective as heated humidifiers in reducing VAP incidence, supporting their practicality and efficacy. Our study's data reinforce the emerging consensus that HMEs can effectively maintain airway moisture and reduce contamination risk compared to more complex systems requiring regular cleaning.

Closed suction systems were recommended by 47.1% of participants, reflecting a preference also observed in findings from (14). Where 50% of ICUs employed closed systems to limit exposure to environmental pathogens. This compares with our finding of 47.1% preference, which indicates an alignment with Lorente's results, as closed systems have been documented to lower VAP rates by minimizing airway exposure. Our findings confirm that, in line with established recommendations, closed suction systems are viewed as more effective in infection control compared to open systems, which were only favored by 30.0% in our study.

Our study showed that 52.9% of respondents recommended semi-recumbent positioning, a widely recognized VAP-preventive measure. This is consistent with earlier research by (15). Which demonstrated a 50% reduction in VAP risk among patients maintained in a 45-degree head-of-bed elevation. Drakulovic's study reported a 48% adoption rate for semi-recumbent positioning in their cohort, closely matching the 52.9% preference observed in our study. This consistency supports the well-established benefit of semi-recumbent in this study, 52.9% believed that kinetic beds could reduce VAP risk, an observation that aligns with (16). Who found a 50% reduction in VAP rates when kinetic therapy was incorporated into ICU protocols? Similarly, others like (17). Observed a reduction in ICU stay duration with kinetic beds, further supporting their benefits in improving respiratory function and reducing infection risk. Our results suggest that ICU personnel are increasingly recognizing the advantages of kinetic beds in managing critically ill patients, although further education may be necessary to address the 13.6% of participants who remained uncertain about their efficacy.

While our study sheds light on ICU practices, some limitations must be considered. The sample was restricted to a single geographic region, limiting the generalizability of findings to other ICU settings. Additionally, responses may reflect institutional practices rather than individual preferences, potentially skewing results. Future studies should consider a broader sample, incorporating multicenter data to validate our findings and establish a more standardized approach to ICU practices.

Conclusion

In conclusion, this study highlights the diverse practices and preferences among ICU personnel regarding intubation methods, ventilator circuit changes, humidifier use, suction systems, patient positioning, and specialized equipment for VAP prevention. While there is general adherence to evidence-based practices, such as the preference for oral intubation, closed suction systems, and semi-recumbent positioning, notable variations and some uncertainty persist, particularly in areas like ventilator circuit and humidifier change frequencies. Comparisons with past research reveal alignment with established guidelines in several areas but underscore the need for enhanced education and standardization to minimize risks and improve patient outcomes. These findings suggest that consistent training and updated protocols could bridge gaps in practice and support a more unified approach to VAP prevention in ICU settings.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRBEC-SNU-0012/23)

Consent for publication

Approved

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Conflict of interest

The authors declared absence of conflict of interest.

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Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Conception of Study, Final approval of manuscript.
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