

Research Article

Prevention of Ventilator-associated Pneumonia: Knowledge and Practice of Ventilator Care Bundle among ICU Nurses of Tertiary Care Hospitals of Jodhpur, Rajasthan

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A B S T R A C T

Introduction: Hospital-acquired pneumonia, particularly ventilator-associated pneumonia (VAP), is a major public health concern in Asia. ICU nurses play a crucial role in preventing VAP and need to be knowledgeable about evidence-based practices to improve patient outcomes. Understanding nurses' knowledge and practices is vital for enhancing their adherence to VAP prevention guidelines.

Methods: The study used a descriptive cross-sectional design and was carried out in various ICUs of a tertiary care hospital in Jodhpur. A total of 120 ICU nurses were enrolled in the study. A structured questionnaire was used to evaluate the knowledge and practice of nurses related to VAP prevention. The data were analysed using the SPSS software. Descriptive statistics and chi-square tests were used for inferential analysis.

Results: The study found that 60% of the nurses had moderately adequate knowledge about VAP prophylaxis. As for the practice scores, 67% of nurses had moderately good practice related to VAP prevention. A positive correlation was observed between knowledge and practice scores. However, there was no significant association of practice and knowledge scores with age, gender, or professional qualification.

Conclusion: The study concluded that the ICU nurses' knowledge as well as practice regarding VAP prevention were above average. The result of the study highlights the need for continuous education as well as training programmes to enhance nurses' knowledge as well as adherence to evidence-based VAP prevention guidelines.

Keywords: Ventilator-Associated Pneumonia, Practice and Knowledge, Ventilator Care Bundle, ICU Nurses

Introduction

In Asia, hospital-acquired pneumonia is an enormous public health concern. A national and local study on the causes, spread, and identification of hospital-acquired pneumonia found that 5–10 cases of ventilator-associated pneumonia (VAP) were diagnosed for every 1000 people in Asia.¹ The average length of ICU stay for patients with VAP was 16 days as compared to an average of 8 days for patients without VAP. The mortality rate among patients with VAP varied between 16% and 94%, while in non-VAP patients, it ranged from 0.2% to 51%.^{2–4} VAP is one of the most prevalent nosocomial illnesses that develops 48 hours after insertion and start of artificial breathing. Gram-negative microorganisms account for 50%–80% of the most frequent sources of VAP.⁵ In addition, the first 4 to 7 days after being admitted to the hospital are when *Streptococcus pneumoniae*, Methicillin-resistant *Staphylococcus aureus* and *Haemophilus influenzae* are most prevalent, while the prevalence of intestinal gram-negative organisms, MRSA, and *Pseudomonas* bacteria increases with the increase in the duration of intubation or hospitalisation of a patient.⁶

Still, nurses need to know about the problem and have evidence-based ways to avoid it in order to be able to use mechanical ventilation in their nursing treatment and care. The nurses' experience would help them give the best care to patients on ventilators.⁷

For healthcare workers to follow the best practices, they must know the various VAP safety practices. The knowledge of nurses can help them to increase their own self-assurance in their ability to make wise decisions and contribute to the successful recovery of patients receiving mechanical ventilation.

ICU healthcare workers have a unique advantage in preventing VAP because they remain by the patient's bedside continually. Their ability to apply evidence-based knowledge directly impacts patient care, making them pivotal in VAP prevention efforts.⁸ Assessing nurses' knowledge who are working in the ICU regarding VAP prevention can be instrumental in raising awareness, improving practices, and effectively combating this serious issue in India. Therefore, the study was designed to evaluate the knowledge and expressed practices of VAP prevention among intensive-care nurses. To improve patient outcomes, nurses must have the necessary knowledge and must adhere to proper procedures.

Methodology

An evaluation of ICU nurses' practises and understanding of VAP prevention was done using a descriptive cross-sectional study technique. The research was carried out in 2019–20 at several ICUs of a tertiary care facility in India (Mathura Das Mathur Hospital, Jodhpur). The main intensive care unit

(ICU), pulmonary ICU, neurological ICU, trauma unit ICU, and CTVS (cardiothoracic and vascular surgery) ICU were chosen. The patients who fulfilled the requirements criteria like being haemodynamically unstable and on a breathing machine were selected. In all selected areas, the number of ventilators used as well as the nurse-to-patient ratio were almost identical. Typically, one bedside nurse (sister grade 2) cared for three stable patients who were not on a respirator or two stable patients on a ventilator during each shift. The data were collected exclusively during the morning hours in the respective ICUs. It is expected that all nurses would follow the practice guidelines and have the necessary information because each patient must obtain a package of care in accordance with the VAP prevention guidelines. Although the purposive selection method was used, only 120 nurses were included due to the short time available for data gathering. A scholar developed a structured questionnaire for knowledge assessment and expressed checklist to assess practice. A total of 30 multiple-choice questions (MCQs) about VAP avoidance were included in the knowledge assessment. The maximum possible score was 30, and one point was awarded for each right answer.

In this study, the level of knowledge regarding VAP prevention was categorised into three groups: poor (less than 50%), regular (50%–75%), and good (75%–100%). To assess the practices of ICU nurses in VAP prevention, an observation checklist was utilised, where each correct action received a score of one, with a maximum possible score of 12. The level of practice was categorised into three groups: poor (less than 50%), average (50%–75%), and good (75%–100%). To ensure the tool's validity, nursing and medical experts reviewed and validated it. The content validity index (CVI), which measures the tool's coverage of relevant content, was calculated and was found to be greater than 0.75, signifying a high level of content validity. Additionally, the tool's reliability was assessed using the split-half method, which yielded a reliability coefficient of 0.86, indicating strong internal consistency. Paper and pencil were used to test people's knowledge and skills. To avoid bias, the practices were evaluated in the morning, during the first four hours, when nurses were doing most of their everyday tasks. We used the final hour of the early shift to test their knowledge. The data were analysed by means of SPSS version 17, which stands for the Statistical Package for Social Sciences. Frequency and proportion were used for descriptive statistics, and the chi-square test was used for inferential statistics.

Ethical Considerations

Before commencing data collection, we obtained permission from the Ethics Committee of Mathura Das Mathur Hospital in Jodhpur, Rajasthan. Following ethical approval, we

sought consent from individual participants to evaluate their knowledge and practices.

Result

Sociodemographic Characteristics

Table 1 presents the distribution of the sample as per demographic characteristics. It shows that 70 (58%) participants were male, and 37% of them fell in the age group of 25 to 30 years. Similarly, around 110 nurses held

a GNM Diploma as part of their academic qualification. The majority of participants (42%) had 1–10 years of experience of working in an ICU. Additionally, 53 (44%) nurses had undergone formal in-service training related to VAP care bundles.

Table 2 shows that 60% of the participants demonstrated moderately adequate knowledge, while 40% exhibited satisfactory knowledge regarding the prevention of VAP.

Table 1. Distribution of Sociodemographic Variables of Samples

(N = 120)

S. No.	Demographic Variable	Frequency	Percentage
1.	Age (in years)		
	a. < 25	21	17
	b. 25–30	44	37
	c. 31–35	31	26
	d. ≥ 36	24	20
2.	Gender		
	a. Male	70	58
	b. Female	50	42
3.	Professional qualification		
	a. GNM	110	91
	b. BSc Nursing	2	2
	c. Post-BSc Nursing	8	7
	d. MSc Nursing and above	0	0
4.	Total years of experience		
	a. < 1	32	27
	b. 1–10	51	42
	c. ≥ 10	37	31
5.	Attended in-service education related to ventilator-associated pneumonia care bundles		
	a. Yes	53	44
	b. No	67	56

Table 2. Level of Knowledge regarding Prevention of Ventilator-associated Pneumonia

(N = 120)

S. No.	Level of Knowledge	Frequency	Percentage
1.	Inadequate knowledge	0	0
2.	Moderately adequate knowledge	72	60
3.	Adequate knowledge	48	40

Based on the data given in Table 3, it is clear that out of a sample of 120 individuals, only 4 individuals (3%) had poor practice related to VAP care bundles, while 80 individuals (67%) had moderately good practice, and 36 individuals (30%) had good practice.

Table 4 shows that a positive connection ($r = 0.6759$) was seen between knowledge and practice scores with respect

to VAP care packages in a sample of 120 people. This shows that practice scores were likely to rise along with knowledge scores. As compared to the average practice score, which is 7.7 with a standard deviation of 1.7, the average knowledge score is 18.3 with a standard deviation of 4.1. The central tendency and variability of the scores in the sample are indicated by these statistics.

Table 3. Level of Knowledge regarding Prevention of Ventilator-associated Pneumonia

(N = 120)

S. No.	Level of Practice	Frequency	Percentage
1.	Poor practice	4	3
2.	Moderately good practice	80	67
3.	Good practice	36	30

Table 4. Coefficient of Correlation between Knowledge and Practice Scores

(N = 120)

S. No.	Variables	Mean	Standard Deviation	Coefficient of Correlation
1.	Knowledge score	18.3	4.1	-
2.	Practice score	7.7	1.7	0.6759

Table 5. Association of Knowledge and Practice Scores with the Selected Demographic Variables

(N = 120)

S. No.	Demographic Variables	Knowledge Association		Practice Association	
		χ^2 Value	p Value	χ^2 Value	p Value
1.	Age (in years)				
	(a) < 25	1.076	0.7827	1.1911	0.7559
	(b) 25–30				
	(c) 31–35				
2.	Gender				
	(a) Male	1.6014	0.2057	1.85	0.1735
	(b) Female	0.1735	0.2057	1.85	0.1735
3.	Professional qualification				
	(a) GNM	0.379	0.823	0.1174	0.105
	(b) BSc Nursing				
	(c) Post-BSc Nursing				
	(d) MSc Nursing				
4.	Total years of experience				
	(a) < 1	0.3052	0.8584	12.99	0.0015
	(b) 1–10				
	(c) ≥ 10				
5.	Attended in-service education related to ventilator-associated pneumonia care bundles				
	(a) Yes	4.14	0.041	1.699	0.1962
	(b) No				

Based on the given Table 5, it was seen that there was no significant association of age, gender, and professional qualification with knowledge or practice related to VAP care bundles, as the p values were greater than 0.05 for all variables.

However, there was a considerable association between the total years of experience and practice related to VAP care bundles, as indicated by a chi-square value of 12.99 and a p value of 0.0015. This suggests that nurses with multiple years of experience may be more likely to have better practice related to VAP care bundles.

Additionally, there was a significant association between attended in-service education related to VAP care bundles and knowledge, as indicated by a chi-square value of 4.14 and p value of 0.041. This suggests that attending in-service education may improve nurses' knowledge that is associated with VAP care bundles. However, there was no significant association between attended in-service education and practice, as the p value was greater than 0.05.

Discussion

This study was carried out in a resource-limited country to evaluate the knowledge and practice of VAP prevention among ICU nurses. The study's findings revealed that the nurses exhibited commendable knowledge in terms of VAP prevention, as assessed through a structured knowledge questionnaire. The results also showed that the level of practice among nurses, evaluated using a structured checklist, was consistent with their knowledge scores. On comparing these results with a similar study conducted in Tanzania, it was found that the distribution of knowledge levels was similar, with a majority of nurses falling into the excellent and very good categories.⁹ Additionally, the current study's mean percentages of knowledge and practice scores were 61.18% and 62.02%, respectively suggesting that the ICU nurses' overall performance in VAP prevention was above average. The study's findings indicated that ICU nurses in the resource-limited setting demonstrated good knowledge and adherence to VAP prevention guidelines, which is promising for patient outcomes and healthcare quality. However, continuous efforts to improve education and training programmes can further enhance nurses' knowledge and practices, ultimately leading to better patient care and VAP prevention. Regarding knowledge score, the mean score was found to be 18.3 with a standard deviation of 4.11. However, Llauradó et al.'s research and a study conducted by Jansson and colleagues reported low knowledge scores of 45.10% and 59.90%, respectively, in adherence to VAP preventive measures. Another study by Ali et al. consistently recorded a low knowledge score of 7.46 (\pm 2.37).¹⁰⁻¹²

The study's findings showed that ICU nurses with VAP prevention training had higher practice scores than nurses without frequent training. Another research that found that regular education and training increased awareness of and adherence to VAP preventive measures also backed these conclusions, and that after educational classes, substantial practical changes were noticed.¹³

The results of this study indicate differences between more experienced and less experienced nurses in contrast to several prior studies.¹⁴⁻¹⁷ The knowledge and practice scores showed a considerable association among nurses in the present study. This study finding is supported by a study conducted by Parihar in various intensive care units.¹⁸

The study result showed a notable correlation between years of experience and the application of VAP care bundles in clinical practice. These findings align with earlier research that demonstrated a favourable association between clinical experience and the quality of patient care, for example, a study by Tella et al. found that nurses with multiple years of experience showed better performance in clinical practice.¹⁹ Similarly, another study by Mahmoudi et al. found that years of experience were positively associated with compliance with the evidence-based practice guidelines.²⁰

Furthermore, this study found attending in-service education about VAP care bundles to be significantly associated with improved knowledge. This finding is consistent with the findings of a previous study by Milstone et al., which found that attending educational sessions on infection prevention led to improved knowledge and practices among healthcare workers.²¹ Additionally, a study by Amin et al. found that nurses who participated in educational programmes had better knowledge of infection control practices.²²

However, unlike the current study, a few previous studies have shown a significant association between attending educational programmes and improved practice, for instance, a study by Tafreshi et al. found that attending educational programmes on evidence-based practice led to improvements in clinical practice among nurses.²³ Similarly, a study by Mogyoródi et al. found that attending educational programmes on VAP care bundles led to improved adherence to the guidelines among healthcare workers.²⁴

Over all the findings of this study provide further evidence that experience and education are important factors in improving healthcare professionals' knowledge and practice related to VAP care bundles. However, further research is needed to determine the most effective educational strategy for improving clinical practice in this area.

Compared to earlier studies, the current research shows a moderate level of knowledge concerning the prevention

of VAP. Lack of information could be a possible obstacle to implementing evidence-based recommendations for the prevention of VAP, even though understanding the principles of evidence-based care cannot guarantee their application. VAP protection recommendations may alter over time. The evaluation will need to be modified and re-evaluated every time new evidence-based methods for decreasing VAP are created.

This study's findings had a wide range of consequences. The first stage in improving nurses' average general knowledge is creating effective and varied educational initiatives. The research highlights the significance of nursing knowledge and an evidence-based practice strategy in preventing VAP. This study holds great value as it will spark further inquiries and hypotheses for additional research in the field.

Conclusion

Our research shows that intensive care unit nurses' knowledge regarding VAP prevention is weak. A high degree of understanding is strongly correlated with having higher education and critical care unit training. Thus, it demonstrates the need for in-depth instruction and training. Intensive care infection control programmes should be added to the nursing curriculum by the nursing school. In addition, policymakers and managers ought to focus on putting into practice and updating VAP prevention recommendations, as doing so would help to raise the standard of nursing care and equip nurses with the information they need to make sound decisions.

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Conflict of Interest: None

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