Research Article

Assessment of Knowledge and Practice of ICU Nurses regarding Prevention of Ventilator-associated Pneumonia (VAP) at a Tertiary Care Hospital, Jammu and Kashmir

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I N F O

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A B S T R A C T

Background: Ventilator-associated pneumonia (VAP) is defined as pneumonia in a patient receiving mechanical ventilation that was not present at the time of admission to hospital or that occurs 48 hours after intubation and mechanical ventilation.

Objectives: The objectives of the study were to assess the knowledge and practice scores of ICU nurses, find the association of their knowledge and practice scores with selected demographic variables, and the correlation between their knowledge and practice scores.

Methodology: A quantitative research approach with descriptive correlational design was used. 60 staff nurses working in ICUs of SKIMS were selected by non-probability purposive sampling. Assessment of knowledge and practice was done by using a 'self-structured knowledge questionnaire' and 'observation checklist' respectively.

Results: The study showed that maximum staff nurses had moderate knowledge regarding prevention of VAP and majority had unsatisfactory practice. A statistically significant association was found between the knowledge score of nurses and their demographic variables (except gender), and between their practice score and demographic variables (except gender and in-service teaching programme attended regarding prevention of VAP). There was no significant correlation between knowledge and practice scores of study subjects regarding prevention of VAP.

Conclusion: The study concluded that the staff nurses working in ICUs lack adequate knowledge and satisfactory practice regarding prevention of VAP. There is a need to conduct in-service education and skill training programmes to improve their knowledge and practice to provide mechanically ventilated patients with the best standard of care possible.

Keywords: Knowledge, Practice, Staff Nurses, Intensive Care Units, Prevention, Ventilator-associated Pneumonia, VAP

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Introduction

According to Abraham Maslow's hierarchy of human needs theory (1943), the most fundamental needs of human beings are air, water, food, and sleep. Among these, air or oxygen stands topmost. Breathing is a process of inspiration and expiration that provides the required oxygen to the body to function well physiologically. But some of the critical or life-threatening conditions such as stroke, major head injury, and severe respiratory distress can imbalance the normal respiratory function.[1]

In recent years, management of clients with severe respiratory failure has aimed at developing different modes of ventilation that help to maintain oxygen levels and minimise complications in patients.[2] A mechanical ventilator is a device with a positive or negative pressure breathing mechanism that maintains ventilation and provides oxygen for a longer period of time to the patient.[3]

Although mechanical ventilation is one of the major supportive treatment modalities which is essential to maintain ventilation and oxygenation, it carries a lot of risks and complications. Common complications are alveolar hypoventilation, alveolar hyperventilation, atelectasis, fluid and electrolyte imbalance, pneumothorax, septicaemia, accidental extubation, and the most common being ventilator-associated pneumonia (VAP).[4]

Ventilator-associated pneumonia (VAP) is defined as pneumonia in a patient receiving mechanical ventilation that was not present at the time of admission to the hospital or that occurs 48 hours after intubation and mechanical ventilation.[3] VAP is the second most common nosocomial infection in Intensive Care Units (ICUs) after urinary tract infection and the most common in mechanically ventilated patients.[5] The risk of VAP is highest, early in the course of hospital stay. The risk is estimated to be 3% per day during the first 5 days of ventilation, 2% per day during 5 to 10 days of ventilation and 1% per day after this.[6] Despite major advances in techniques in caring for patients whose respiratory tracts are instrumented, and the routine use of efficient disinfection procedures for the respiratory equipment, VAP continues to complicate the course of 7% to 41% of patients receiving continuous mechanical ventilation.[7] Patients requiring invasive mechanical ventilation have a hospital mortality rate exceeding 35%. Additionally, survivors of invasive mechanical ventilation may experience significant long-term morbidity with substantially reduced functional status and ability to complete activities of daily living. Patients requiring invasive mechanical ventilation represent 2.8% of hospital admissions which contributes to 12% of hospital costs at $27 billion per year.[8] VAP rates range from 4 to 14 per 1000 mechanical ventilation days in the United States and 10 to 52.7 per 1000 mechanical ventilation days in developing countries.[9]

Considering the economic effects of VAP and the effects of VAP on morbidity, mortality, and the healthcare system, its prevention is a significant concern in every hospital. Most of the interventions and prevention strategies are part of routine nursing care. Nurses have different roles such as that of care providers, managers, educators, coordinators, and evaluators in preventing VAP. Lack of knowledge of prevention of infection and proper nursing care among nurses may become a barrier in adhering to evidence-based guidelines for preventing ventilator-associated pneumonia (VAP).[10]

Kalyan G et al.[11] in 2020 conducted a descriptive survey to assess the knowledge and practices of 108 ICU nurses related to prevention of VAP in different ICUs of a tertiary care centre in India. Out of the 108 nurses enrolled in the study, 82 (75.93%) had average, 24 (22.22%) had good, and 2 (1.85%) nurses had poor knowledge. Assessment of the practices revealed that 68 (94.44%) nurses had average whereas only 4 (5.55%) nurses had good practice.

Sharma A[12] in 2019 conducted a descriptive study on 50 staff nurses to assess their knowledge regarding the prevention of ventilator-associated pneumonia (VAP) among patients admitted in intensive care units of selected hospitals in Jalandhar. Results showed that among 50 nurses under study, 66% had below-average knowledge regarding VAP, 28% had average knowledge, 6% had good knowledge, while none of the nurses had excellent knowledge regarding prevention of VAP.

Soni KC, Mehta RK[5] in 2018 conducted a descriptive cross-sectional study on 136 critical care nurses to assess knowledge, adherence to, and barriers towards the prevention of ventilator-associated pneumonia among nurses at Chitwan Medical College, Nepal. The study findings revealed that only 14.7% of the critical care nurses had good, 47.1% had fair, and 38.2% had poor level of knowledge. More than half (51.5%) of the nurses had low adherence whereas 48.5% of nurses had high adherence towards VAP prevention strategies.

Ali NS[13] in 2013 conducted a descriptive exploratory study on 45 critical care nurses to assess their knowledge and compliance with ventilator-associated pneumonia prevention bundle at Cairo University Hospital, Egypt. The results revealed that 90% of staff nurses had unsatisfactory knowledge score (7.46 ± 2.37) and most of the nurses did not have compliance with VAP prevention bundle practices (8.62 ± 7.9).

Keeping in view the role of intensive care nurses in the prevention of VAP and owing to lack of information about their knowledge and practice in Kashmir, the current study was carried out with an objective to assess the knowledge and practice of ICU nurses regarding prevention of ventilator-

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associated pneumonia (VAP) at Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Soura, Srinagar, Kashmir.

Methodology

A quantitative research approach with descriptive correlational design was selected to carry out this study. Permission was obtained from the concerned authorities of Mader-e-Meharban Institute of Nursing Sciences and Research (MMINSR), SKIMS, Soura, Srinagar to conduct the final study. Ethical clearance was obtained from Institutional Ethics Committee (IEC), SKIMS. Permission was also accorded from the concerned authorities [Medical Superintendent (SKIMS) and HOD (anaesthesiology and critical care, SKIMS)] of the hospital to conduct the study on purposively selected 60 ICU nurses who were directly involved in bed-side nursing care with a minimum of 1 year of work experience in ICU areas. Permission was also obtained by taking informed consent individually from each ICU nurse, prior to his/ her inclusion as sample in the study. Privacy, confidentiality, and anonymity were being guarded.

After seeking permission to conduct the study, data was collected from 60 staff nurses working in ICUs of SKIMS from 12th September to 10th October 2020. Assessment of demographic data of study subjects was done through 5-itemed questionnaire related to their age, gender, professional qualification, years of experience in ICU, and in-service teaching programme attended regarding prevention of VAP. Assessment of knowledge regarding prevention of VAP was done through 54-itemed self-structured knowledge questionnaire (each correct and incorrect response was given a score of '1' and of '0' respectively) and assessment of practice was done through 38-itemed observation checklist (each correct step followed by the staff nurse was given a score of '1' and each incorrect step was given a score of '0').

The knowledge score was categorised into various levels based on the criterion developed by Busi S and Ramanjamma K[14] in 2016 in their study. If the score was > 75% (42-54), it was considered adequate; if the score was 50-75% (27-41), it was considered moderate, and if the score was < 50% (0-26), it was considered inadequate. The practice score was categorised into two levels based on the criterion developed by Sisey B[15] in 2017 in his study. If the score was ≥ 77% (30-38), it was considered satisfactory; if the score was < 77% (0-29), it was considered unsatisfactory.

To determine the content validity, the tool (self-structured knowledge questionnaire and observation checklist) along with the objectives of the study, scoring key, content validity certificate, and evaluation criteria were submitted to 10 research experts and clinicians specialised in the concerned field. Suggestions and recommendations given by the experts were accepted and necessary corrections were done to modify the tool.

The reliability of the self-structured knowledge questionnaire was determined by 'Test-retest method' and the reliability of observation checklist was determined by 'Inter-rater method'. Karl Pearson's correlation reliability coefficient computed for self-structured knowledge questionnaire was "r = 0.92" and for observation checklist, it was "r = 0.82". Both the self-structured knowledge questionnaire and observation checklist were found to be consistent.

Results

The Statistical Package for Social Sciences (SPSS) software programme was used for data analysis. Frequency distributions were obtained and descriptive statistics were calculated.

The findings of the present study showed that majority of the staff nurses i.e., 31 (51.7%) were in the age group of 21-30 years, most of the staff nurses i.e., 47 (78.3%) were females, majority of the staff nurses i.e., 46 (76.7%) were graduates, most of the subjects i.e., 37 (61.7%) were having ICU experience of 1-5 years, most of the respondents i.e., 48 (80%) had not attended any in-service teaching programme, as depicted in Table 1.

Knowledge regarding Prevention of VAP

Maximum number of staff nurses i.e., 49 (81.66%) had moderate knowledge, 7 (11.6%) had inadequate knowledge whereas minimum number i.e., 4 (6.66%) had adequate knowledge regarding prevention of ventilator-associated pneumonia (VAP) as depicted in Table 2. The mean knowledge score of staff nurses was 34.13 ± 5.98 with a median of 34.5. The minimum score was 16 and maximum was 48 with a range of 32.

Practice regarding Prevention of VAP

Maximum staff nurses i.e., 53 (88.33%) had unsatisfactory practice score and only 7 (11.67%) had satisfactory practice score as depicted in Table 3. The mean practice score of staff nurses was 24.53 ± 4.61 with a median of 25.1. The minimum score was 16 and maximum was 32 with a range of 16.

Association between Knowledge Score of Staff Nurses and their Selected Demographic Variables

There was a significant association between the knowledge score of staff nurses and demographic variables, viz. age (p = 0.013), professional qualification (p = 0.001), ICU experience (p = 0.011), and in-service teaching programme attended regarding prevention of VAP (p = 0.001) while no significant association was found between the knowledge score and gender (p = 0.334) as depicted in Table 4.

Association between Practice Score of Staff Nurses and their Selected Demographic Variables

There was a significant association between the practice

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score of staff nurses and demographic variables, viz, age (p = 0.004), professional qualification (p = 0.032), experience in ICUs (p = 0.001) while no significant association was found between the practice score and demographic variables, viz, gender (p = 0.637) and in-service programme attended (p = 0.108) as depicted in Table 5.

Correlation between Knowledge and Practice Scores of Staff Nurses regarding Prevention of VAP

There was no significant correlation (r = 0.053, p = 0.690) between knowledge and practice scores of staff nurses regarding prevention of VAP as depicted in Table 6.

Table 1.Distribution of Staff Nurses according to Demographic Variables

(n = 60)

Demographic Variables		Frequency	Percentage
Age (in years)	21-30	31	51.7
	31-40	17	28.3
	41-50	8	13.3
	51-60	4	6.7
Gender	Male	13	21.7
	Female	47	78.3
Professional qualification	Diploma	2	3.3
	Graduation	46	76.7
	Post-graduation	12	20
ICU experience (in years)	1-5	37	61.7
	6-10	11	18.3
	> 10	12	20
In-service teaching programme attended	Yes	12	20
	No	48	80

Table 2.Distribution of Staff Nurses according to their Knowledge Score

(n = 60)

Knowledge Level	Knowledge Score	Frequency	Percentage
Inadequate	0-26	7	11.66
Moderate	27-41	49	81.66
Adequate	42-54	4	6.66

Table 3.Distribution of Staff Nurses according to their Practice Score

(n = 60)

Practice Level	Practice Score	Frequency	Percentage
Unsatisfactory	0-29	53	88.33
Satisfactory	30-38	7	11.67

Table 4.Association between Knowledge Score of Staff Nurses and their selected Demographic Variables

(n = 60)

Demographic Variables		Level of Knowledge as per Score			Chi-square	p-value	Df	Significance
		Inadequate (0-26)	Moderate (27-41)	Adequate (42-54)				
Age (in years)	21-30	5	26	0	16.231	0.013*	6	S*
	31-40	2	14	1				
	41-50	0	5	3				
	51-60	0	4	0				
Gender	Male	0	12	1	2.192	0.334	2	NS

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					Chi-square	p-value	df	Significance
	Female	7	37	3				
Professional qualification	Diploma	1	1	0	20.728	0.001*	4	S*
	Graduation	6	40	0				
	Post-graduation	0	8	4				
ICU experience (in years)	1-5	7	30	0	13.147	0.011*	4	S*
	6-10	0	10	1				
	> 10	0	9	3				
In-service teaching programme attended	Yes	1	7	4	17.143	0.001*	2	S*
	No	6	42	0				

S* = Significant (p ≤ 0.05) NS = Non-significant (p > 0.05)

Table 5. Association between Practice Score of Staff Nurses and their selected Demographic Variables

(n = 60)

Demographic Variables		Level of Practice as per Score		Chi-square	p-value	df	Significance
		Unsatisfactory (0-29)	Satisfactory (30-38)				
Age (in years)	21-30	30	1	13.579	0.004*	3	S*
	31-40	16	1				
	41-50	5	3				
	51-60	2	2				
Gender	Male	11	2	0.223	0.637	1	NS
	Female	42	5				
Professional qualification	Diploma	2	0	6.912	0.032*	2	S*
	Graduation	43	3				
	Post-graduation	8	4				
ICU experience (in years)	1-5	35	2	13.340	0.001*	2	S*
	6-10	11	0				
	> 10	7	5				
In-service teaching programme attended	Yes	9	3	2.588	0.108	1	NS
	No	44	4				

S* = Significant (p ≤ 0.05) NS = Non-significant (p > 0.05)

Table 6. Correlation between Knowledge and Practice Scores of Staff Nurses regarding Prevention of VAP

(n = 60)

Scores	Mean ± SD	Median	Pearson's Correlation Coefficient (r)	P-value	Significance
Knowledge	34.13 ± 5.98	34.5	0.053	0.690	NS
Practice	24.53 ± 4.61	25.1			

S* = Significant (p ≤ 0.05) NS = Non-significant (p > 0.05)

Discussion

The Intensive Care Unit (ICU) nurses have an integral role in the prevention, control, and treatment of hospital-acquired infections among intubated patients as they are in position to utilise known VAP prevention strategies in clinical practice. Awareness and knowledge related to VAP prevention strategies is of paramount importance for health care professionals to adhere to the best practices

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and reduce the risk of occurrence of VAP and decrease morbidity and mortality among mechanically ventilated patients in the ICU.[11]

The results of the present study revealed that majority of the staff nurses i.e., 49 (81.66%) had moderate knowledge, followed by 7 (11.6%), who had inadequate knowledge, and minimum number i.e., 4 (6.66%) had adequate knowledge regarding prevention of VAP. Majority of the staff nurses i.e., 53 (88.33%) had unsatisfactory practice, and only 7 (11.67%) had satisfactory practice. These findings are consistent with findings of a study conducted by Kapoor J[16] in 2017 to assess the knowledge and practice of intensive care nurses (n = 50) regarding prevention of VAP among patients admitted in critical care units, Government Medical College hospitals, Jammu. The findings revealed that most of the staff nurses i.e., 22 (44%) had average knowledge, followed by 16 (32%) who had good knowledge, 8 (16%) had below-average knowledge, and only 4 (8%) had excellent knowledge regarding prevention of VAP. Most of the staff nurses i.e., 32 (64%) had unsatisfactory practice scores whereas only 18 (36%) staff nurses had satisfactory practice scores regarding prevention of VAP. These findings are further endorsed by a study conducted by Busi S, Ramanjamma K[14] in 2016 to assess the effectiveness of structured teaching programme on the level of knowledge and practice regarding prevention of VAP among critical care nurses (n = 30) of NRI General Hospital, Guntur, Andhra Pradesh, India. The study revealed that majority of the staff nurses i.e., 21 (70%) had moderate knowledge and practice, followed by 9 (30%), who had inadequate knowledge and practice while none had adequate knowledge and practice regarding prevention of VAP.

The present study revealed that there was a significant association between the knowledge score of staff nurses and demographic variables, viz, age (p = 0.013), professional qualification (p = 0.001), ICU experience (p = 0.011), and in-service teaching programme attended regarding prevention of VAP (p = 0.001) whereas no significant association was found between the knowledge score and gender (p = 0.334). In a similar study conducted by Sisey B[15] in 2017 to assess knowledge, attitude and practices on the prevention of VAP among nurses (n =120) working in five selected adult intensive care units of government hospitals, Addis Ababa, Ethiopia, the findings revealed a statistically significant association between nurses' knowledge and their demographic variables viz, gender (p = 0.023), and years of experience in ICU (p = 0.015), whereas no significant association was found with demographic variables viz, age (p = 0.102) and educational level of nurses (p = 0.103). The findings of the present study are inconsistent with the findings of the study conducted by Pandhare P[17] in 2018 to assess the knowledge regarding prevention of VAP among

staff nurses (n = 93) working in selected NICUs and PICUs of Sangli-Miraj-Kupawad corporation area, India, in which statistically significant association was found between nurses' knowledge and their demographic variables viz, years of experience in ICU (p = 0.037) and qualification (p = 0.001), while no significant association was found with demographic variables like age (p = 0.366), gender (p = 0.55) and In-service education (p = 0.56).

The current study revealed that there was a significant association between the practice score of staff nurses and demographic variables, such as age (p = 0.004), professional qualification (p = 0.032), and experience in ICUs (p = 0.001). However, no significant association was found between the practice score and demographic variables, viz, gender (p = 0.637) and in-service programme attended (p = 0.108). In a similar study conducted by Sisey B[15] in 2017 to assess knowledge, attitude, and practices on the prevention of VAP among nurses (n = 120) working in five selected adult intensive care units of government hospitals, Addis Ababa, Ethiopia, the findings revealed a statistically significant association between nurses' practice score and their demographic variables viz, age (p = 0.044) and gender (p = 0.023), while no significant association was found with other demographic variables viz, educational level of staff nurses (p = 0.161) and years of experience in ICU (p = 0.248).

The findings of the present study showed that there was no significant correlation (r = 0.053, p = 0.690) between knowledge and practice scores of staff nurses regarding prevention of VAP. However, in a study conducted by Pérez-Granda MJ et al.[18] in 2013 to assess knowledge of and adherence to guidelines for prevention of VAP among physicians, nurses, and students in adult ICUs (n = 167) in a general referral hospital, Spain, the findings revealed a statistically significant correlation (r = 0.31, p = 0.001) between nurses' knowledge and practice scores.

Conclusion

The study concluded that ICU nurses lack adequate knowledge and satisfactory practice regarding the prevention of ventilator-associated pneumonia (VAP). This reflects that nurses either do not have access to or they do not update themselves with the latest evidence-based information regarding prevention of VAP. This study emphasises the need for the development of the latest written unit protocols related to the care of mechanically ventilated patients. Additionally, the hospital administration needs to find out ways to make the ICU nurses more aware of the latest VAP prevention evidence-based guidelines and should ensure strict adherence to the same, in clinical practice with regular feedback and audit. In-service education and skill training programmes should be organised and conducted regularly to improve knowledge and practice of ICU nurses

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to provide mechanically ventilated patients with the best standard of care possible and thus reduce the incidence and complications related to VAP.

Keeping in view the results of the present study in which only a few ICU nurses had adequate knowledge and satisfactory practice regarding prevention of ventilator-associated pneumonia (VAP), an 'information booklet' was developed by the researchers. The booklet after content validation was distributed among the ICU nurses working in Sher-i-Kashmir Institute of Medical Sciences, (SKIMS), in order to update their existing knowledge and practice and bring positive outcomes in the recovery of mechanically ventilated patients.

Limitations

- Small sample size (i.e., 60 ICU nurses) limited the generalisation of research findings
- Due to the mobilisation of staff nurses from routine wards to COVID-19 isolation wards, the investigator could not conduct a pre-experimental or quasi-experimental study due to non-availability of staff nurses
- Due to the time constraints, one-time observation of staff nurses was carried out to assess their practice regarding the prevention of VAP, which caused restrictions in the generalisation of their practice

Recommendations

There is a need to conduct in-service education and skill training programmes and to develop the latest written unit protocols to improve the knowledge and practice of ICU nurses to provide mechanically ventilated patients with the best standard of care possible and thus reduce the incidence and complications related to VAP.

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