



## A study on Knowledge on Oral Care and Prevention of Ventilator Associated Pneumonia among critical care nurses

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**Abstract: Background & objectives:** Ventilator-associated pneumonia (VAP) is a commonest nosocomial infection globally with highest mortality. Hence, it is very essential for nurses to possess proper knowledge and follow proper procedures during care to enhance patient outcomes. **Methods:** A cross-sectional online survey was conducted targeting 350 critical care nurses with age group 20-45 years of age posted in critical care settings in tertiary care hospitals in India. The association between the knowledge of oral care in preventing ventilator associated pneumonia amongst critical care nurses at tertiary care hospitals with selected demographic variables was done using appropriate statistical analyses. **Results:** 198 (56.6%) Critical care nurses had strong knowledge scores, 130 (37.1%) had excellent knowledge scores, 20 (5.7%) had average knowledge scores, and 2 (0.6%) had low knowledge scores. **Interpretation & Conclusion:** This study provided the vital insight on lack of proper knowledge among nurses on role of oral care in prevention of VAP. Therefore, education of nurses on sustainable and appropriate oral care for ICU patients, and the development of a standardized and evidence-based oral care protocol are required.

**Keywords:** Oral care; Critical care nurse; Ventilator associated pneumonia

### INTRODUCTION

Ventilator associated pneumonia (VAP) is the most prevalent nosocomial infection among patients on mechanical ventilation globally. The National Healthcare Safety Network (NHSN) reports that the prevalence of VAP varies from 0.0 to 4.40 per 1,000 ventilator days across different hospitals. <sup>1, 2</sup>The incidence rate of VAP varies substantially between nations, ranging from 2.13 per thousand ventilator days to 116 per thousand ventilator days. The medical intensive care unit (MICU) in India reported the highest prevalence rate at 37.5%, while the palliative care ICU in South Korea recorded the lowest prevalence rate at 2.13%. The first five days of mechanical ventilation have the highest risk for VAP (3%) and the average time between intubation and the onset of VAP is 3.3 days. Between days 5 and 10 of ventilation, this risk decreases to 2% per day, and 1% day after that. <sup>3</sup> According to studies, the attributable mortality for VAP varies between 33-50% but is highly dependent on the underlying medical condition. Because of the application of preventative measures, the attributable risk of death has decreased over time and is now estimated to be between 9 and 13 percent. Intensive care unit (ICU) patients who are on mechanical ventilation are entirely dependent on nurses. Thus, the critical nurses' knowledge, attitude, and oral care practices have a significant impact on the patients' outcome. To lessen the occurrence or incidence of VAP, there are numerous strategies available. One of the best methods for preventing VAP in ICU patients on

mechanical ventilation is oral care. Practically other demands of nursing care of those hospitalized in the ICU have eclipsed and overshadowed oral care practice followed for reducing VAP in ICUs. Nurses working in critical care must have a positive attitude and sound knowledge on oral care to prevent health care associated infection (HAI) especially VAP.

### MATERIALS AND METHODS

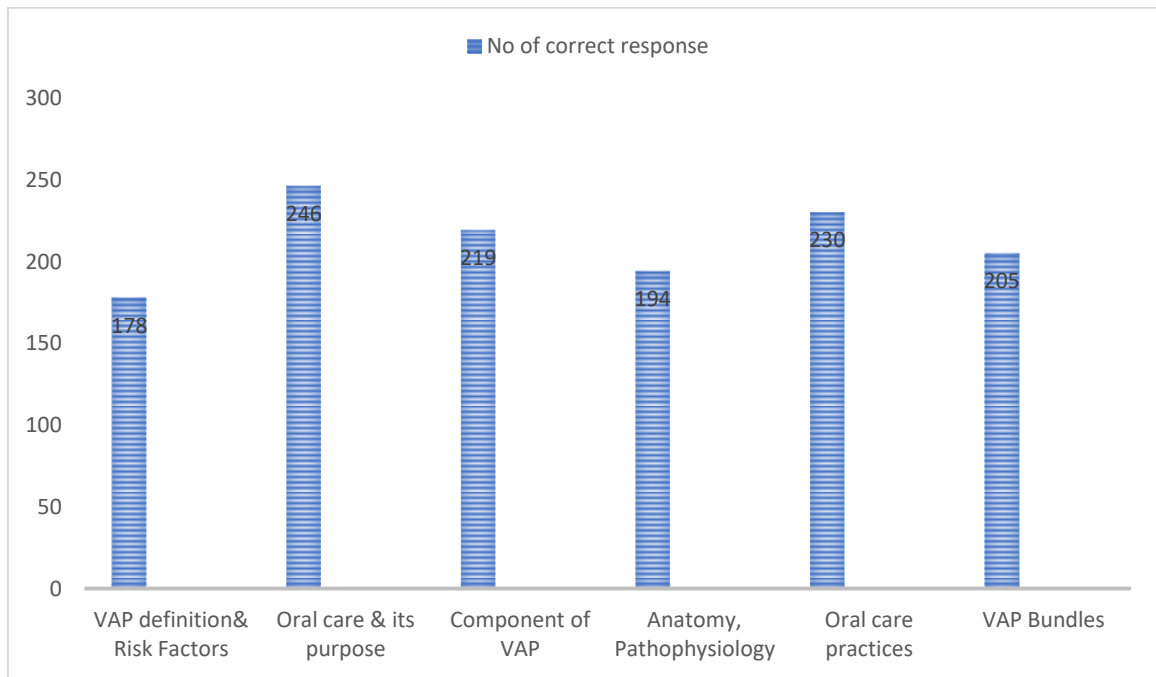
A cross-sectional online survey was conducted among 389 critical care nurses working in critical care settings across eight tertiary care hospitals in India. All study participants were informed on the purpose of the study, anonymity, and confidentiality, and consent was taken before they filled out the questionnaire. The responses of 350 nurses who gave consent and participated in the study were used for the final analysis. A structured questionnaire on knowledge and practices of oral care in preventing VAP consisting of 25 items was developed after validation by the experts. The variables were analyzed using appropriate statistical test. The general characteristics of critical care nurses were analyzed using descriptive statistics. The association between the knowledge of oral care in preventing ventilator associated pneumonia amongst critical care nurses at tertiary care hospitals with selected demographic variables was done using appropriate statistical formula. All statistical analyses were analyzed at a significance level of 0.05. Statistical analysis was performed using SPSS version 24.

**RESULTS**

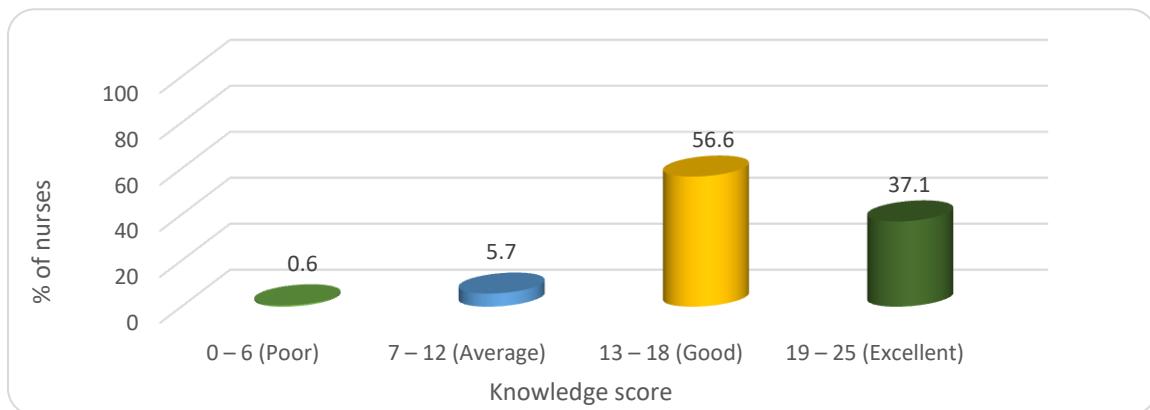
**Table 1: Socio-demographic information of participants.**

	Parameters	No of cases	Percentage (n=350)
Age (Yrs)	20 – 25	122	34.9
	26 – 30	66	18.9
	31 – 35	130	37.1
	36 – 40	20	5.7
	41 – 45	12	3.4
Gender	Male	3	0.9
	Female	347	99.1
Marital status	Married	165	47.1
	Unmarried	185	52.9
Religion	Hindu	306	87.4
	Muslim	6	1.7
	Christian	26	7.4
	Others	12	3.4
Qualification	12 <sup>th</sup>	105	30.0
	Graduate	214	61.1
	Post graduate	31	8.9

**Fig 1**  
Evaluation of knowledge of critical care nurses on VAP definition and risk factors, Oral care and its purposes, components of VAP, VAP Bundle, Anatomy, pathophysiology, Oral care and its practices was analyzed.



178 Nurses were well versed with VAP definition and risk factors, 246 were thorough with oral care and its purpose, 219 could answer component of VAP, 194 has strong hold on anatomy, pathophysiology, 230 followed oral care practices and 205 could answer VAP bundles correctly.(Figure 1)



**Fig 2: Knowledge score of critical care nurses**

As depicted in Fig 2, 198 (56.6%) critical care nurses had good knowledge score, 130 (37.1%) critical care nurses had excellent knowledge score, 20 (5.7%) critical care nurses had average knowledge score and 2 (0.6%) critical care nurses had poor knowledge score. Knowledge score regarding preventing VAP with age in study group is significant as  $P < 0.0001$  at F value 7.18. There is significant difference of knowledge score regarding preventing VAP with gender in study group as  $P = 0.003$  i.e. female had

significantly more knowledge than male at Z value 2.94. There is no significant difference of knowledge score regarding preventing VAP with marital status in study group as  $P > 0.05$  at Z value 1.41, religion in study group as  $P > 0.05$  with F value 1.24, qualification in study group as  $P > 0.05$  with F value 0.41, professional qualification in study group as  $P > 0.05$  at F value 2.27 i.e. knowledge score was more in GNM than others professional qualification but not statistical significant.

**Table 2: Comparison of knowledge score according to year of experience in study group**

Year of experience (Yrs)	Knowledge score			F Value	P Value
	n	Mean	SD		
1 – 3	193	16.94	2.877	5.55	<0.0001
4 – 6	34	16.21	3.382		
7 – 9	42	18.71	2.122		
10 – 12	62	16.34	2.415		
13 & above	19	16.32	4.042		

The above table (Table 2) shows that there is significant difference of knowledge score regarding preventing VAP with year of experience in study group as  $P < 0.0001$  i.e.

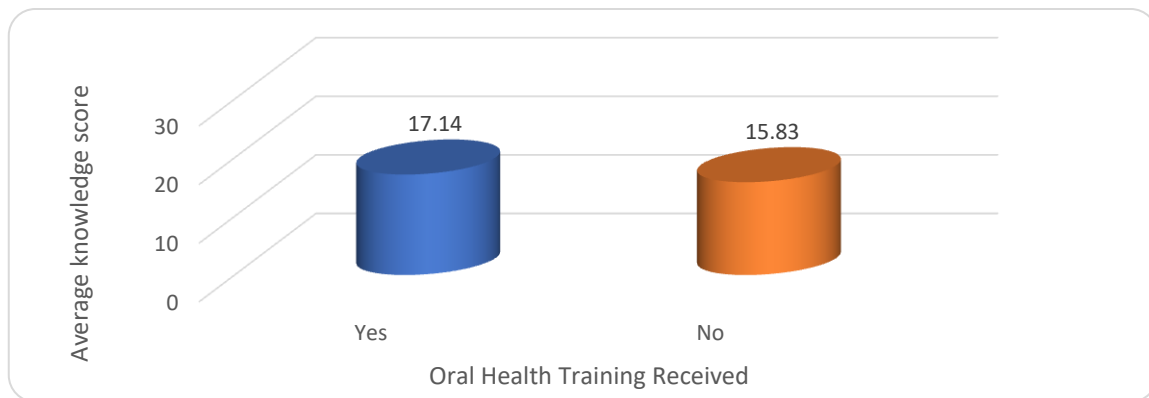
knowledge score was significantly more in 7 – 9 year of experience than others year of experience at F value 5.55.

**Table 3: Comparison of knowledge score according to nurse patient ratio in study group**

Nurse patient ratio	Knowledge score			F Value	P Value
	N	Mean	SD		
1:01 to 1:05	209	16.60	2.709	5.16	0.006
1:06 to 1: 10	110	17.67	2.971		
1:11 and above	31	16.61	3.685		

The above table (Table 3) shows that the knowledge score regarding preventing VAP with nurse patient ratio in the study group differs significantly as  $P = 0.006$  and F value is

5.16 i.e. the nurse patient ratio of 1:06 to 1:10 had a considerably higher knowledge score than other nurse patient ratios.



**Fig 3: Oral Health training and its impact on knowledge of preventing VAP**

The above graph Fig 3 reveals the knowledge score regarding preventing VAP with oral health training acquired in the study group differs significantly as  $P < 0.0001$  and Z value is 4.17, i.e. those who got oral health training had much higher knowledge scores than those who did not.

**DISCUSSION**

In our study, 198 (56.6%) Critical care nurses had good knowledge scores, 130 (37.1%) had excellent knowledge scores and 20 (5.7%) had average knowledge scores. The result revealed the participating nurses had better knowledge about oral care compared to what was seen in other similar studies. In the study by Cybele Lara Abad *et al.*, the majority (44/60, 73.33%) of ICU nurses and ICPs were able to

properly answer half of the questions on VAP Bundle.<sup>4</sup> In a related study by Asia Mukhtar, Muhammad Afzal, *et al.* (2017), The nurses had fair knowledge >50% and practice level was poor < 60%. Majority of nurses do not perform oral care and give it less priority Oral hygiene care is often missed and neglected care.<sup>5</sup> In our study 230 (65.72%) nurses practiced oral care which was higher in comparison to the above study. In the study done by Geetanjali Kalyan, Ravina Bibi *et al.* (2020) found that 82 (75.93%) had average knowledge of VAP prevention, 24 (22.22%) had strong knowledge, and 2 (1.85%) had low knowledge.<sup>6</sup>

Our study showed that nurses with experience of 7-9 years had more knowledge compared to their peers with either less or more experiences. As  $P < 0.0001$  and F value is 7.18, there

is a significant variation in knowledge score related preventing VAP with age in the research group. In study done by Cybele Lara Abad *et al.*<sup>4</sup>nurses with longer experience in the ICU (i.e. >4 years) were more likely to have undergone VAP bundle training. However, their knowledge (score of 6 points) appeared similar to less experienced nurses (data not shown), which differs from published data.<sup>7</sup> In one study by Blot SI, Labeau S, Vandijck D, *et al.*, the average knowledge level was higher among more experienced ICU nurses (>1 year experience) and those holding a special degree in emergency and intensive care.<sup>8</sup>Therefore, the hypothesis that there is an association between knowledge and experience or training inferred in our study was similar to other studies.

We observed there was significant difference in knowledge score regarding preventing VAP among gender in the study group with P value of 0.003 and Z value as 2.94 respectively. Female nurses had significant expertise and knowledge compared to their male counterpart. The findings are corroborated with the study done by Abbas Haghghat *et al.*<sup>9</sup>, who found that female nurses had greater levels of patient oral care knowledge and practice than male nurses. In contrast, ChaltungKhishung Anal *et al.* done in tertiary care hospital in Assam in 2018 found no correlation between age and gender, with a Chi square value of 1.14. With  $P>0.05$  and Z value is 1.41, there is no statistically significant difference between knowledge scores related preventing VAP and marital status in the study group. As  $P>0.05$  and F value is 1.24, there is no statistically significant difference in knowledge scores between the study group on preventing VAP with religion.<sup>10</sup>

Although Haghghat A *et al.*<sup>9</sup> concluded that nurses with lesser educational qualifications had less knowledge, there is no statistically significant difference between knowledge scores about preventing VAP with qualification in our research group with  $P>0.05$  and F value being 0.41. The findings in our study with respect to educational qualification of nurses was similar to findings in study by Asia Mukhtar, Muhammad Afzal, *et al.*<sup>5</sup>Though GNM had a higher knowledge score than other professionals, but it was not statistically significant. There was no statistically significant difference between the two groups of nurses (nursing diploma versus bachelor's degree or higher) in our study. The similar findings were seen in the study done by ChaltungKhishung Anal *et al.*<sup>10</sup> and study by Alotaibi AK *et al.*<sup>11</sup>

In our study the knowledge score regarding preventing VAP and Oral health care in critically ill patients of nurses who had attended or were trained in a workshop on oral health care differed significantly with one who had not received training with P value or 0.0001 and Z value is 4.17. The results seen collaborated with various studies done both in India and abroad.<sup>12, 13</sup> In the study by Oner Cengiz *et al.* "The effectiveness of training given to nurses for reducing ventilator-associated pneumonia in intensive care patients" in the year 2019 concluded that incidence of VAP in the ICU decreased with the VAP training given to critical care nurses.<sup>14</sup>With the appropriate changes in training curriculum or more structured training the critical care

nurses we can definitely decrease the incidence of VAP and prevent mortality.

## CONCLUSION

This study showed that critical care nurses who play a very vital role in patient oral care and prevention of VAP in mechanically ventilated patients in ICU, have varying level of awareness, training and knowledge on the same. The knowledge differed with their number of years with practical experience working in ICU and training received on the same subject. Therefore, education or training of nurses on uniform and standardized oral care protocol for ICU patients, and the development of evidence-based oral care protocol are required.

## DECLARATIONS

**Ethical and informed consent:** Ethical approval was obtained from the institutional review board. Informed written consent was obtained from the participants and confidentiality was maintained throughout.

**Conflict of interests:** The authors declare no conflicts of interest.

**Source of funding:** The project was self-funded. No external agency had funded the project.

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