



## ORAL CARE PROTOCOL AND THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA IN ICU PATIENTS: A LITERATURE REVIEW

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### ABSTRACT

Patients undergoing mechanical ventilation are at high risk of developing infectious complications, particularly Ventilator-Associated Pneumonia (VAP). Structured oral care through the implementation of an oral care protocol plays a critical role in preventing such infections. This study employed a Systematic Literature Review design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Relevant articles were identified from databases including Google Scholar, Elsevier, ScienceDirect, and ResearchGate. The review focused on articles published within 2020-2025 and relevant to oral care in mechanically ventilated patients. The keywords used in the article search were Ventilator-Associated Pneumonia, Oral Care Protocol, and Mechanical Ventilation. The findings indicate that structured oral care protocols significantly reduce the incidence of VAP. Effective strategies include the use of additional topical agents such as honey, disposable oral care kits, and individualized care approaches based on appropriate assessment tools. Regular training and ICU nursing certification are also key factors in optimizing the implementation of oral care. Moreover, attention to nurse-to-patient ratios contributes to improved care quality. Oral care for ventilated patients should be integrated into hospital Standard Operating Procedures (SOPs) using an evidence-based approach. Institutional support through training, resource provision, and policy development is essential to enhance intervention effectiveness and reduce complications such as VAP.

Keywords: ICU nursing; oral care protocol; oral health; ventilator; ventilator associated pneumonia

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## INTRODUCTION

Ventilator-Associated Pneumonia (VAP) is a nosocomial infection that occurs after 48 hours in patients receiving mechanical ventilation through endotracheal intubation. VAP is one of the leading causes of increased morbidity and mortality in intensive care units (ICUs) (Sari & Utami, 2020). The risk of developing VAP increases with the duration of mechanical ventilation, due to the colonization of pathogenic microorganisms in the oral cavity and lower respiratory tract (Musdalipah et al., 2021).

One effective preventive measure is the systematic and structured implementation of an oral care protocol. This protocol includes oral hygiene interventions aimed at maintaining oral cleanliness, reducing pathogenic microorganism colonization, and preventing the transmission of infection to the lower respiratory tract (Gershonovitch et al., 2020). Several studies have demonstrated that the use of antiseptic solutions, such as chlorhexidine, in oral care can significantly reduce the incidence of VAP.

Several studies have highlighted the critical role of structured oral care protocols in improving oral health outcomes among mechanically ventilated patients. Abdelaziz Mohammed and Naem Badr (2023) demonstrated that the implementation of a standardized oral care protocol significantly

improved oral health status, as measured by the Beck Oral Assessment Scale (BOAS), particularly in the domains of teeth, saliva, and mucosal integrity. These findings support the notion that systematic oral care is not merely a supportive intervention, but a clinically relevant strategy that directly influences patient outcomes in the ICU setting.

Nevertheless, evidence also suggests that the effectiveness of oral care interventions depends on the comprehensiveness of the protocol. Anggraeni et al. (2020) reported that routine oral care using chlorhexidine gluconate alone did not consistently prevent deterioration of oral health in intubated patients, emphasizing the importance of mucosal hydration and soft tissue care. Further research by Anggraeni et al. (2022) showed that the addition of honey as a topical agent significantly improved oral health status, particularly in the lips, gums, mucosa, and tongue, indicating that adjunctive agents may enhance the protective effects of standard oral care practices.

In addition to chemical and topical interventions, professional and need-based oral care approaches have demonstrated substantial benefits. Choi et al. (2022) found that professional oral care significantly reduced plaque accumulation and improved soft tissue health in critically ill trauma patients receiving mechanical ventilation. Similarly, Saklani et al. (2021) and Salarzahi et al. (2021) reported that both comprehensive and need-based oral care protocols effectively improved oral health status and reduced the occurrence and progression of pneumonia, underscoring the importance of tailoring oral care interventions to individual patient conditions.

Moreover, recent studies emphasize that successful oral care implementation is influenced not only by clinical protocols but also by system-level factors. Unahalekhaka et al. (2025) demonstrated that the use of standardized single-use oral care sets significantly reduced VAP incidence and healthcare costs, while improving adherence to clinical guidelines. Yavuz et al. (2025) further highlighted that nurse training, certification, and adequate nurse-to-patient ratios play a decisive role in prioritizing and delivering effective oral care. These findings suggest that integrating evidence-based oral care protocols into ICU policies, supported by continuous education and organizational commitment, is essential to optimize VAP prevention and improve patient safety outcomes.

However, the implementation of oral care protocols in some healthcare facilities remains suboptimal. Limited resources, inadequate training, and low awareness among healthcare workers are major challenges to effective implementation. Therefore, improving understanding and awareness of the importance of oral care in mechanically ventilated patients is essential to prevent VAP and enhance the quality of patient care.

## **METHOD**

This study employed a systematic literature review design. The literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach. The databases used included Google Scholar, ScienceDirect, and ResearchGate, with articles published within 2020-2025.

The keywords used in the article search were Ventilator-Associated Pneumonia, Oral Care Protocol, and Mechanical Ventilation. The literature search was conducted between October and November 2025. The data used in this study were secondary data, obtained not from direct observation but from previously conducted research studies. Secondary sources consisted of reputable national and international journal articles relevant to the predetermined topic, namely Oral Care Protocols and the Prevention of Ventilator-Associated Pneumonia in ICU Patients. The results of the article selection process are illustrated in the flow diagram below.

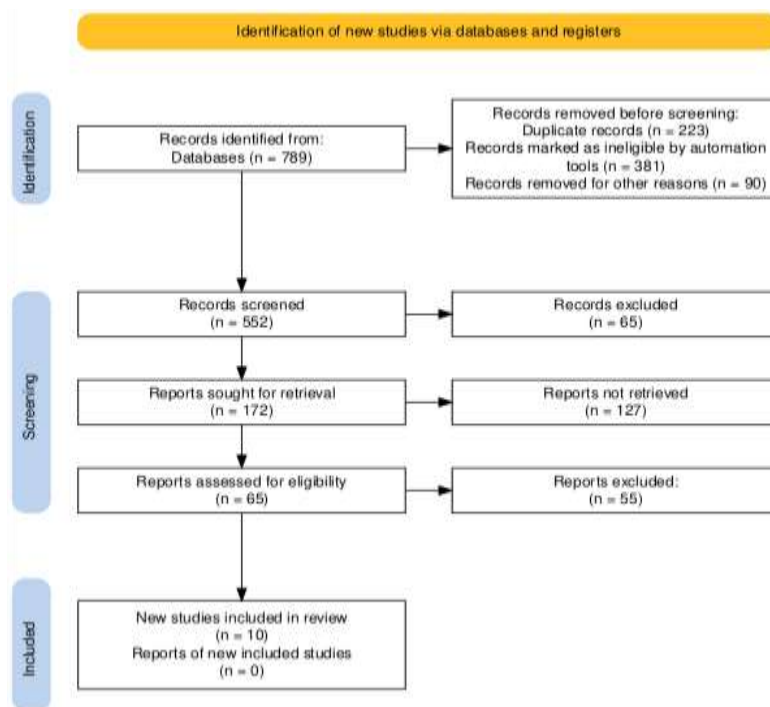


Figure 1. PRISMA Flow Diagram

The article search strategy was conducted using the PICOS framework, which consists of the following components:

1. Population/Problem: The population or problem analyzed in accordance with the predetermined theme of the literature review.
2. Intervention: The management or intervention applied to individual cases or populations, including a description of the intervention relevant to the selected theme of the literature review.
3. Comparison: An alternative intervention or management approach used for comparison; if unavailable, studies without a control group were also considered.
4. Outcome: The results or outcomes reported in previous studies that are relevant to the predetermined theme of the literature review.
5. Study Design: The research design used in the articles included in the review.

## RESULT

Table 1.  
Characteristics of Included Studies

No.	Journal, Volume, ISSN, Url	Title, Author, Year Journal Publication	Method Review	Results	Database
1.	<i>Egyptian Journal of Care</i> , 14 (1), 475-485. 10.21608/ejhc.20.23.284069	<i>Effect of Oral Care Protocol on Oral Health Status among Mechanically Ventilated Patients</i> (Fatma & Naeem, 2023)	Design : Quasi-experimental with design <i>one group pre-test And post Test</i> Sample: 30 male and female patients Which treated in ICU Cairo University Hospital Variable : <i>Oral Care Protocol</i> And <i>Oral Health Status</i> Instruments: 1) Patient medical records, And 2) <i>Modified Beck Oral Assessment Scale (BOAS)</i> Analysis : Statistics descriptive, Chi-Square, and T-Test	- Results study about <i>Oral The Care Protocol</i> showed that there was a significant decrease in the average total oral health score. after intervention during 3 a day that show existence improvement in oral health status after oral care.  - Research results regarding <i>Oral Health Status</i> show a decline score health mouth average after intervention on all days for all BOAS scales, indicating that there was an improvement in oral health status after oral care.	Research Gate

No.	Journal, Volume, ISSN, Url	Title, Author, Year Journal Publication	Method Review	Results	Database
2.	Belitung Nursing Journal, 6(1), 21-26. <a href="https://doi.org/10.33546/bnj.971">https://doi.org/10.33546/bnj.971</a>	<i>The Effect of Oral Care Intervention on Oral Health Status of Intubated Patients in the Intensive Care Unit</i> (Anggraeni et al,(2020))	Design: Pre-experimental study with design One group pre-test post-test. Sample : 18 patient Which intubated in the Unit Maintenance Intensive (ICU) Al Islam Hospital in Bandung. <b>Variable</b> : <i>Oral Care Intervention</i> And <i>Oral Health Status</i> <b>Instruments</b> : 1) Scoring APACHE II, and 2) <i>Modified Beck Oral Assessment Scale</i> (BOAS) <b>Analysis</b> : Analysis Univariate, Shapiro-Wilk test, Levene test	- Results Study about <i>Oral Care Intervention</i> showed that there was a significant difference in BOAS scores before and after oral care intervention on the lips subscale (p = 0.003), gums and mucosa (p = 0.003), as well as water saliva (p = 0.004). - Research Results on <i>Oral Health Status</i> There are differences that significant between score oral health before And after oral care (p = 0.04).	Google Scholar
3.	International journal of environment and public health, 19(10), 6197. <a href="https://doi.org/10.3390/ijerph19106197">https://doi.org/10.3390/ijerph19106197</a>	<i>The Effect of Professional Oral Care on the Status of Critical Trauma Patients Using Ventilators</i> (Choi et al, 2022)	Design : Studies intervention And studies non-randomized comparative clinical trial Sample: A total of 100 people were divided in 2 group ; experimental group and control group each consisting of 50 people. Variable : <i>Oral Care</i> And <i>Oral Health Status</i> Instruments: 1) <i>Modified Bedside Oral Exam</i> (BOE), And 2) <i>Oral Exam Guide</i> (OEG) Analysis : Analysis Frequency And Independent T- Test	- The results of the study on <i>Oral Care</i> showed no significant difference between the two. group in score Total MBOE up to 48 hours after hospitalization . - The results of the study on <i>Oral Health Status</i> showed differences between the two groups. significant For MBOE (F = 16.10, p = 0.000), gingiva (F = 6.02, p = 0.018), And mucosa buccal (F = 4.21, p = 0.046), And score dental plaque after 72 hours (F = 13.15, p = 0.000).	Google Scholar
4.	The Malaysian Journal of Nursing (MJN), 13(2), 63-71. <a href="https://doi.org/10.31674/mjn.2021.v13i02.011">https://doi.org/10.31674/mjn.2021.v13i02.011</a>	<i>Effectiveness of a Need Based Oral Care Protocol on Oral Health Status, Occurance, and Progression of Pneumonia Among Ventilated Patients</i> (Manisha et al, 2021)	Design: Quasi-Experimental Sample: 50 patients using ventilator in a way randomly divided to in group studies and comparison group Variables: <i>Oral Care Protocol</i> , <i>Oral Health Status</i> , <i>Occurance</i> , and <i>Progression of Pneumonia</i> Instruments : 1) APACHE 11 Score , 2) <i>Clinical Pulmonary Infection Score</i> (CPIS), 3) <i>Modified Beck Oral Assessment Scale</i> (MBOAS) Analysis : Analysis Univariate, Shapiro-Wilk test, Levene's test	- The results of the study show findings related to <i>the Oral Health Protocol</i> show that The mean MBOAS scores differed significantly (F=5.82, P=0.001) across time; and significantly between groups across time (F=19.16, p=0.001). - In terms of pneumonia incidence, there was a statistically significant difference between the groups in day third ( $\chi = 5.83$ , p = 0.05) and on day sixth ( $\chi = 7.40$ , p = 0.02). There was a significant difference between groups in the progression of pneumonia over time. from day 1 until 6 (F=39.90; p=0.001), as well as between groups over time (F=5.14, p=0.03).	Google Scholar
5.	Acta Med Iran. 2021;59(6):351-356.	<i>Effect of Oral Care Protocol on Dental and Gingival Plaque Index in Patients With Endotracheal Tube Admitted to the Intensive Care Unit</i> (Ghaempanah A et al, 2021)	Design : Test try clinical double disguise Sample: 70 patients treated in the ICU in a way random Which shared into two; the experimental group and the control group. Variable: <i>Oral Care Protocol</i> , <i>Dental and Gingival Plaque Index</i> Instruments : 1) <i>Modified Gingival Index</i> (MGI), 2) <i>O'Leary dental plaque index</i> Analysis : Paired t-test, independent t-test, Fisher's exact test, and chi-squared test	- After the intervention, the mean gingival index in the experimental and control groups was 0.59±0.31 and 0.90±0.41, respectively, while the plaque index was 0.59±0.31 and 0.90±0.41, respectively. is 42.53±15.97 And 53.52±11.9. - Differences before and after intervention in each group and differences between the two groups in index gingiva and the dental plaque index was statistically significant (P=0.0001). Results show that health protocols mouth more effective in increase index gingiva and dental plaque index compared to routine methods.	Google Scholar

No.	Journal, Volume, ISSN, Url	Title, Author, Year Journal Publication	Method Review	Results	Database
6.	The Journal of hospital infection, 160, 12–18. <a href="https://doi.org/10.1016/j.jhin.2025.03.005">https://doi.org/10.1016/j.jhin.2025.03.005</a>	<i>Impact of single-use oral care sets on reducing ventilator-associated pneumonia among intensive care unit patients: a multi-center study</i> (Unahalekhaka, A. et al, 2025)	Design : Studies quasi-experimental, pre- and post-intervention. Sample : Four twelve unit intensive care unit (ICU) with high incidence of VAP from 14 level three referral hospitals under the Ministry of Health of Thailand Variable: <i>Oral care, Ventilator-associated pneumonia</i> Instruments : 1) <i>VAP surveillance form</i> , 2) <i>Self-administered questionnaire</i> Analysis: Chi-square test, Mann–Whitney U test, descriptive statistics .	- Before implementation package In oral care, there were 269 cases of VAP during 34,731 ventilator days, with a VAP rate of 7.74 per 1,000 ventilator days. The total antibiotic cost for VAP treatment reached 5,137,622 Thai baht.  - Following implementation, VAP cases decreased to 182 out of 34,309 ventilator days, with the VAP rate significantly reduced to 5.30 per 1,000 ventilator days – a 31.52% decrease. (P<0.05). Cost antibiotic treatment also decreased significantly to 2,101,940 Thai baht (P<0.05). Of the 220 ICU nurses surveyed, 96.3% agreed or strongly agreed that oral care devices help prevent infection related to care health (HAIs). Over 85% reported increased ease of use, increased patient comfort, and better compliance with <i>evidence-based guidelines</i> .	Science Direct
7.	Med Surg Nurs J. 2021;9(4):e114-194. <a href="https://doi.org/10.5812/msnj.14194">https://doi.org/10.5812/msnj.14194</a>	<i>Effects of a Comprehensive Oral Care Program and a Combined Toothbrush and Mouthwash Program with 0.2% Chlorhexidine on Oral Health in Mechanically Ventilated Intubated Patients: A Clinical Trial</i> (Salarzahi et al 2021)	Design: <i>Single-blind</i> clinical trial : 90 patient Which shared in three groups using mechanical ventilation. Variable : <i>Comprehensive Oral Care Program, Combined Toothbrush and Mouthwash Program with 0.2% Chlorhexidine</i> Instruments : <i>Beck Oral Assessment Scale</i> (BOAS) Analysis : Analysis of variance and chi-square	- Average oral health scores across the three group No showed significant differences before the intervention and on the second day of the study (P > 0.05).  - However, on the third to fifth day studies, score health The oral health of the two intervention groups showed a significant decrease compared to the control group, indicating an improvement in oral health in these groups (P = 0.001).  Average oral health scores in the group control increase during the research days. And difference subscale BOAS was seen on the lips, gums, and mucosa, as well as the tongue (p < 0.05).	Google Scholar
9.	International Journal of Nursin g Care, 8(2), 21-23. <a href="https://doi.org/10.37506/ijonc.v8i2.11279">https://doi.org/10.37506/ijonc.v8i2.11279</a>	<i>Effects of Oral Care Protocol &amp; Practices of Nurses on Oral Assessment Scores in the Ventilated Patients</i> (Ram et al, 2020)	Design : <i>Convenience sampling</i> and pre-post study design with educational intervention. Sample: 25 Patients using ventilators in the ICU Variable : <i>Oral Care Protocol, Oral Assessment Score</i> Instruments : <i>Beck Oral Assessment Scale</i> (BOAS) Analysis : Microsoft Excel	- existing <i>Oral Care Protocol was proven to be effective based on the BOAS score</i> . Findings This shows the need for repair in nursing practice .  Oral care education programs are planned and delivered to all Nurses working in the ICU showed significantly different BOAS scores before and after the educational intervention.	Google Scholar
10.	Risk Manage ment Healthc Policy. 2025;18: 1429-1440 <a href="https://doi.org/10.2147/RMH">https://doi.org/10.2147/RMH</a>	<i>A Survey Study of Oral Care Given by Nurses in Intensive Care Units</i> (Yavuz et al, 2025)	Design : <i>Cross-Sectional Study</i> Sample: 188 ICU Nurses in Eskisehir, Turkey Variable : <i>Oral Care, ICU Nurses</i> Instruments : <i>Self-administered questionnaire</i> Analysis : Statistics Descriptive, Chi-Square test	- Most nurses who perform <i>oral care</i> are satisfied with the level instructions oral hygiene they received, $X^2 = 12.29$ , $df = 1$ , $n = 188$ , $p < 0.001$ , and awareness factors regarding its benefits related to education SC, $X^2 = 6.55$ , $df = 1$ , $p = 0.010$ .  Nurses who spend more time A little For cleanliness mouth does inspection mouth less, $X^2 = 16.73$ , $df = 4$ , $p =$	Google Scholar

No.	Journal, Volume, ISSN, Url	Title, Author, Year Journal Publication	Method Review	Results	Database
	<a href="#">P.S5 13905</a>			0.002, and there was an inverse relationship between the number of ICU patients per nurse and the time spent on oral care per patient, $X^2 = 33.24$ , $df = 8$ , $p < 0.001$ . Most nurses performed maintenance mouth for 2–5 minutes per patient per day ( $n = 72$ , 38.29%). - Regardless from specialization, a highly significant relationship was observed between duration of oral care and nursing experience in the ICU, $df = 4$ , $p < 0.001$ .	

## DISCUSSION

Effective oral care is a crucial component in preventing complications in mechanically ventilated patients, particularly infections such as Ventilator-Associated Pneumonia (VAP). Numerous studies have demonstrated the effectiveness of structured oral care protocols in improving the oral health status of intubated patients. Abdelaziz et al. (2023) reported a significant reduction in mean oral health scores after a three-day intervention, indicating an improvement in oral conditions. All subscales of the Beck Oral Assessment Scale (BOAS), especially the teeth and saliva components, showed the most notable improvements following the implementation of an oral care protocol.

However, Anggraeni et al. (2020) found that despite routine interventions using chlorhexidine gluconate, the oral health status of intubated patients continued to deteriorate. This finding highlights the importance of mucosal care as an integral part of oral care interventions. Therefore, the use of additional topical agents is recommended to maintain mucosal moisture, prevent tissue damage, and improve overall oral conditions.

Choi et al. (2022) also emphasized that professional oral care significantly improves the oral health status of ventilated patients, particularly in soft tissue health and plaque reduction. Meanwhile, Saklani et al. (2021) reported that a Need-Based Oral Care Protocol effectively improved oral health status and reduced the incidence and progression of pneumonia in patients undergoing mechanical ventilation.

Ghaempanah et al. (2021) demonstrated that the proposed oral care protocol had a significant impact on oral and dental health, particularly in reducing plaque accumulation and gingivitis. Therefore, the use of comprehensive oral care protocols is strongly recommended, especially for trauma patients treated in the ICU.

Unahalekhaka et al. (2025) added that the use of standardized disposable oral care kits effectively reduced the incidence of VAP and lowered healthcare costs. In addition, ICU nurses reported high satisfaction levels with the use of these kits, as they were perceived to enhance patient safety and adherence to clinical guidelines.

Similar findings were reported by Salarzahi et al. (2021), who stated that both comprehensive oral care programs and a combination of toothbrushing with chlorhexidine were equally effective in improving the oral health status of intubated patients. Comprehensive oral care programs were considered simple, practical, and easily implemented by ICU nurses as part of routine care.

Anggraeni et al. (2022) also explored the effectiveness of honey as an additional topical agent in oral care. Their findings showed that honey improved the oral health status of intubated patients, particularly in the lips, gums, mucosa, and tongue. The moisture maintained by honey helps prevent

infection and microbial colonization, making it a potential natural moisturizing agent for ICU use.

Meanwhile, Yavuz et al. (2025) emphasized the importance of training and certification for ICU nurses. Improvements in oral health assessment scores were observed following retraining programs. The study indicated that specialized nursing certification increases nurses' prioritization of oral care. In addition, nurse-to-patient ratios influenced the amount of time allocated for oral care delivery.

Based on these findings, it can be concluded that effective oral care protocols whether comprehensive or tailored to individual patient needs contribute significantly to improving oral health status and preventing serious complications such as VAP. The use of adjunctive agents such as honey and disposable oral care kits represents promising innovations. Nevertheless, successful implementation is strongly influenced by training, institutional policies, and the active involvement of healthcare professionals in applying evidence-based care standards.

## **CONCLUSION**

Structured and effective oral care is a vital intervention for preventing complications in mechanically ventilated patients, particularly Ventilator-Associated Pneumonia (VAP). Evidence shows that comprehensive or need-based oral care protocols significantly improve oral health, reduce microbial colonization, and enhance patient comfort and safety through the use of agents such as chlorhexidine, adjunctive topical agents like honey, and disposable oral care kits. Successful implementation depends not only on clinical interventions but also on nurse training, certification, supportive institutional policies, and adequate nurse-to-patient ratios. Therefore, evidence-based oral care protocols should be integrated into hospital Standard Operating Procedures (SOPs), tailored to individual patient needs, and supported by ongoing education and workforce management, while further research is needed to evaluate emerging innovations in VAP prevention.

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