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Comparison of honey and chlorhexidine for oral hygiene and oral health improvement

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Abstract

Background: Patients admitted to the Intensive Care Unit (ICU) are at high risk of oral health impairment due to decreased levels of consciousness, the use of mechanical ventilation, and limited self-care ability. Poor oral health conditions can serve as a source of microbial colonization and increase the risk of infection, including ventilator-associated pneumonia. Therefore, effective oral hygiene measures constitute an important component of nursing care for critically ill patients.

Purpose: To compare the effectiveness of honey and Chlorhexidine in oral hygiene procedures on the oral health status of ICU patients.

Method: A quasi-experimental design using a two-group pretest–posttest approach. Sampling was conducted using accidental sampling of ICU patients at Sari Asih Serang Hospital who met the inclusion and exclusion criteria. Oral health status was assessed using the Oral Assessment Guide (OAG) instrument. Data analysis was performed using the Wilcoxon test to assess pre- and post-intervention changes, and the Mann–Whitney test to compare the effectiveness between the two groups.

Results: The study findings demonstrated that oral hygiene procedures using both honey and Chlorhexidine significantly improved the oral health status of ICU patients. However, no statistically significant difference was found between the use of honey and Chlorhexidine in improving patients' oral health status.

Conclusion: Honey demonstrates potential as an effective and safe alternative oral hygiene agent for ICU patients. Its use may be considered as part of evidence-based nursing interventions to maintain oral health and prevent infectious complications in critically ill patients.

Keywords: Chlorhexidine; ICU; Honey; Oral Hygiene; Oral Health.

INTRODUCTION

The Intensive Care Unit (ICU) is an intensive care setting for patients in critical condition requiring close monitoring and intervention. ICU patients generally experience decreased consciousness, limited mobility, and dependence on respiratory support such as endotracheal intubation, rendering them unable to perform self-care independently. One aspect of basic care that is often overlooked is oral health; however,

the oral cavity serves as a primary reservoir for pathogenic microorganisms with the potential to cause respiratory tract infections and systemic infections.

Oral health impairment is a global health problem with a high prevalence. The World Health Organization reports that more than 3.5 billion people worldwide experience oral health disorders (World Health Organization, 2022). In ICU patients, this

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problem is further complicated by hyposalivation, oral trauma, and alterations in microflora resulting from intubation. Studies have shown that the majority of ICU patients experience xerostomia, opportunistic infections, and mucosal trauma, necessitating oral hygiene as the primary intervention (da Silva, Fernandes, da Silva, Duarte, da Câmara, de Sousa Lopes, & Da Silveira, 2025; Wanderley, Rodrigues-Oliveira, Nascimento, Cardoso, Brandão, Santos-Silva, & Prado-Ribeiro, 2025).

Tracheal intubation impairs normal oromotor functions such as chewing, swallowing, and oral self-cleaning, thereby promoting plaque accumulation and the colonization of pathogenic bacteria. The dry oral environment and diminished swallowing reflex create ideal conditions for the growth of Gram-negative bacteria implicated in nosocomial infections, including ventilator-associated pneumonia (VAP) (Damasnyah, Yunus, Monoarfa, & Taliki, 2024; Nurjannah & Syafriati, 2023). Therefore, oral hygiene is an essential nursing intervention that plays a critical role in the prevention of complications and the recovery of ICU patients.

In clinical practice, 0.2% chlorhexidine gluconate is used as the standard antiseptic agent in oral hygiene owing to its antimicrobial efficacy. However, prolonged use of chlorhexidine has been reported to cause adverse effects such as mucosal irritation, taste alteration, and potential antimicrobial resistance. This has prompted the search for safe and effective natural alternatives. Furthermore, while chlorhexidine is effective, its long-term use is associated with several adverse effects, including extrinsic tooth staining, taste disturbances, and potential irritation of the oral mucosa (Sharma & Singh, 2025). One of the most extensively studied non-pharmacological agents is honey, which possesses antibacterial, anti-inflammatory, and antioxidant properties (Musdalipah, 2022; Putri, Wulandari, & Widada, 2024).

Several studies have demonstrated that honey exhibits efficacy comparable to chlorhexidine in oral health care, including in reducing plaque, maintaining mucosal moisture, and preventing infection in intubated patients (Adini, Santoso, Sarkum, & Sudirman, 2018; Nurjannah et al., 2023). Nevertheless, studies directly comparing honey and chlorhexidine in ICU patients remain limited, particularly in Indonesia. Therefore, an experimental study is needed to analyze the differences in effectiveness between honey and chlorhexidine in

oral hygiene procedures on the oral health status of ICU patients, as a basis for the development of evidence-based nursing practice.

Various studies have shown that the use of chlorhexidine in oral hygiene can reduce oral bacterial counts and improve the oral health status of ICU patients. However, some studies have also reported adverse effects associated with repeated use. Research on honey in oral care has yielded promising results. Honey has been proven effective in reducing plaque, alleviating mucosal inflammation, and maintaining oral mucosal moisture in patients with impaired consciousness and in intubated patients. Several experimental and clinical studies report that the effectiveness of honey is comparable to chlorhexidine in preventing bacterial colonization and infectious complications. Nevertheless, studies directly comparing honey and chlorhexidine in the context of oral hygiene in ICU patients remain relatively scarce. This study therefore has scientific urgency in strengthening the empirical evidence on the effectiveness of both agents and in supporting the development of evidence-based nursing interventions in the care of critically ill patients.

RESEARCH METHOD

A quantitative quasi-experimental study with a two-group pretest–post-test design was conducted to compare the effectiveness of honey and chlorhexidine oral hygiene interventions on the oral health status of patients admitted to the Intensive Care Unit (ICU). Measurements were conducted before and after treatment in both groups. Full randomization was not performed due to the clinical conditions, hemodynamic stability, and characteristics of ICU patients. The research was conducted in the ICU ward of Sari Asih Serang Hospital. The population consisted of all patients admitted to the ICU during the research period, while the sample included patients who met the inclusion and exclusion criteria. Accidental sampling was applied, whereby eligible patients available during data collection were recruited as respondents.

Data collected included patient characteristics and oral health status. Patient characteristics comprised age, gender, medical diagnosis, and length of ICU stay. Oral health status was assessed using the Oral Assessment Guide (OAG), which evaluates the condition of the lips, oral mucosa, tongue, gingiva, teeth, and saliva. Assessments were conducted

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before the intervention (pre-test) and after treatment (post-test). The interventions were administered according to the standard operating procedures applied in the ICU ward. The first group received oral hygiene using honey, while the second group received chlorhexidine solution. All procedures were carried out with identical frequency, technique, and duration to maintain treatment homogeneity and minimize intervention bias. Data analysis consisted of

univariate and bivariate analyses. Univariate analysis described respondent characteristics using frequency distributions and percentages. Differences in OAG scores before and after treatment in each group were analyzed using the Wilcoxon Signed Rank Test, while differences between the honey and chlorhexidine groups were analyzed using the Mann–Whitney U Test. Statistical significance was set at $p < 0.05$.

RESEARCH RESULTS

Table 1. Demographic Characteristics of Patients

Variable	Results
Age (n/%)	
(Mean $\pm$ SD) (Range) (Year)	(48.5 $\pm$ 16.3) (15–75)
15–25	3/9.4
26–35	6/18.8
36–45	4/12.5
46–55	5/15.6
56–65	9/28.1
> 65	5/15.6
Gender (n/%)	
Male	20/62.5
Female	12/37.5

This table illustrates the demographic profile of patients in the ICU ward. The majority of respondents were male (62.5%) with an average age of 48.5 ± 16.3 years. The largest age distribution was found in the 56–65 year group (28.1%), while the smallest proportion was represented by the 15–25 year group (9.4%).

Table 2. Statistical Analysis of Honey and Chlorhexidine Interventions on OAG Scores

Variable / Comparison	Statistical Test	Result (p-value)	Remarks
Honey (Pre-Post)	Wilcoxon Signed Rank	$p < 0.001$	Significant
Chlorhexidine (Pre-Post)	Wilcoxon Signed Rank	$p < 0.001$	Significant
Honey vs Chlorhexidine	Mann–Whitney U	0.780	Not Significant

This table presents the statistical outcomes for the interventions. Both the honey and chlorhexidine groups demonstrated significant improvements in OAG scores ($p < 0.001$). However, the comparison between the two interventions yielded a p-value of 0.780, indicating that both treatments are relatively equivalent in their effectiveness for improving oral health status in ICU patients.

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DISCUSSION

This study involved 32 patients admitted to the ICU ward, divided equally into two intervention groups, each consisting of 16 respondents. Most respondents were male (62.5%), consistent with the epidemiological profile of ICU patients. Male patients have been reported to carry a higher risk of developing critical conditions due to lifestyle factors, cardiovascular disease, and respiratory disorders, making them more likely to require intensive care and mechanical ventilation. This condition limits patients' ability to perform self-care, including maintaining oral hygiene independently.

Furthermore, the majority of respondents were in the late adult to elderly age group. The aging process is known to be associated with a decline in salivary gland function, which plays an important role in maintaining the moisture and balance of the oral cavity (Potter, Perry, Stockert, Hall, & Ostendorf, 2025). In ICU patients, this condition is exacerbated by the use of endotracheal tubes, which cause the mouth to remain open for prolonged periods, thereby increasing the risk of mucosal dryness, secretion accumulation, and oral health impairment. This condition was reflected in the high Oral Assessment Guide (OAG) scores observed prior to the intervention.

The analysis demonstrated that oral hygiene using honey significantly reduced OAG scores ($p < 0.05$). This reduction indicates an improvement in mucosal condition, increased salivary moisture, and overall oral cleanliness. Biologically, honey possesses natural antibacterial activity derived from its hydrogen peroxide content, flavonoids, and phenolic compounds capable of inhibiting the growth of pathogenic (Adini et al., 2018). The non-peroxide activity of certain types of honey, specifically through its high flavonoid content, plays a crucial role in reducing oxidative stress within the oral mucosa of intubated patients (Molan, 1999). This antioxidant capacity distinguishes honey from standard chemical antiseptics, which primarily focus on pathogen elimination rather than tissue protection. In addition, the hygroscopic properties of honey contribute to maintaining oral mucosal moisture, which constitutes one of the primary indicators in OAG assessment. Moist, non-irritated mucosa reflects good oral health status (Eilers, 1988). These findings are consistent with previous studies reporting that honey use is effective in reducing OAG scores and improving oral

mucosal conditions in ICU patients (Nurjannah et al., 2023; Shidiq, Awaludin, & Kurniawan, 2021).

In the group receiving chlorhexidine oral hygiene, the Wilcoxon Signed Rank Test also demonstrated a significant reduction in OAG scores ($p < 0.05$). These results confirm that chlorhexidine is effective in improving the oral health status of ICU patients. Chlorhexidine is a broad-spectrum antiseptic that acts by disrupting bacterial cell membranes, rendering it effective in reducing plaque and oral microbial colonization (Carranza, Newman, Takei, & Klokkevold, 2019). This efficacy is further enhanced by the substantive properties of chlorhexidine, namely its ability to bind to oral tissues and be released gradually, thereby providing a prolonged antimicrobial effect. This property is particularly beneficial in ICU patients who have limited frequency of oral hygiene procedures. Nevertheless, several literature sources report that prolonged use of chlorhexidine may potentially cause mucosal irritation and taste disturbances, making periodic monitoring of mucosal condition necessary (Reddy, 2017).

The between-group comparison using the Mann–Whitney U Test revealed no statistically significant difference between the honey group and the chlorhexidine group in reducing OAG scores ($p > 0.05$). Research comparing natural and synthetic agents has gained momentum. A clinical trial specifically comparing these two agents found that honey and chlorhexidine both significantly improved oral health scores, showing no significant difference in their clinical effectiveness (Abid, Rauf, Siddiq, Mazhar, Zaidi, & Zafar, 2025). These findings indicate that both interventions demonstrated equivalent effectiveness in improving the oral health status of ICU patients. Although their mechanisms of action differ — honey acts through natural antibacterial, anti-inflammatory, and mucosal moisturizing effects, while chlorhexidine functions as a broad-spectrum chemical antiseptic — this difference in mechanism does not necessarily produce different clinical outcomes provided that the goal of care is achieved (Untari, Kariasa, & Adam, 2019). Systematic reviews from the Cochrane Library confirm that while antiseptic mouthwashes are standard, the quality of nursing implementation is a key factor in preventing complications in ICU patients (Shi, Xie, Wang, & Zhang, 2020). Furthermore, the relatively homogeneous characteristics of ICU patients and their complete dependence on nursing care make the

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consistency and quality of oral hygiene implementation the primary determinant of intervention success. Accordingly, honey may be considered as an equivalent alternative to chlorhexidine in evidence-based nursing practice in the ICU, particularly with consideration of mucosal comfort and the individual needs of patients.

Furthermore, incorporating honey into oral hygiene protocols aligns with the global trend towards cost-effective and sustainable healthcare, reducing the hospital's dependency on expensive pharmacological supplies without sacrificing patient safety (Abuelgasim, Albury, & Lee, 2021). This economic perspective is particularly relevant for healthcare facilities in developing regions where access to specialized antiseptic solutions may be limited.

CONCLUSION

This study demonstrated that oral hygiene using both honey and chlorhexidine exerted a significant effect on the improvement of oral health status in ICU patients. The administration of honey was proven capable of improving oral cleanliness, maintaining mucosal moisture, and reducing signs of irritation, rendering it effective as an oral intervention in critically ill patients. These findings affirm the potential of honey as a safe and applicable natural agent in the oral care of ICU patients.

The use of chlorhexidine was also proven effective in improving oral health status through the control of oral microbial colonization, maintaining its relevance as a standard antiseptic agent in ICU nursing practice. The results of this study reinforce evidence that chlorhexidine continues to play an important role in the oral care of patients with self-care limitations.

The comparison of effectiveness between the two interventions revealed no statistically significant difference between honey and chlorhexidine in improving the oral health status of ICU patients. This equivalence in effectiveness indicates that honey may be considered as an alternative oral hygiene intervention equivalent to chlorhexidine. These findings provide a scientific contribution to the development of evidence-based nursing practice by opening opportunities for the integration of safe, comfortable, and effective non-pharmacological approaches into intensive nursing care.

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Comparison of honey and chlorhexidine for oral hygiene and oral health improvement

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