

ORIGINAL RESEARCH



Oral Health of Patients Hospitalized in the Intensive Care Unit

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ABSTRACT

Aim: Oral hygiene technique is an important factor in maintaining the health and comfort of hospitalized patients given the frequent presence of oral biofilm and pathogens brought on by mouth breathing. This is an important practice to assist patients in intensive care, in particular those who are intubated and under mechanical ventilation because the realization of oral hygiene reduces the patient's risk of complications and length of hospitalization. The objective of this research was to evaluate the oral health condition of patients hospitalized in an intensive care unit (ICU) and to clarify the importance of protocol standardization involving these patients' buccal hygiene.

Materials and methods: In this study, the sample consisted of 45 patients admitted to an ICU who were evaluated in relation to the oral biofilm score index.

Results: The results indicated that there was no significant difference in the biofilm score associated with the genre ($p=0.091$), age group ($p=0.549$), or teething profile ($p=0.207$). However, the biofilm score was greater in partial and fully edentulous patients when compared with dentulous patients.

Conclusion: Based on these results, it is recommended that care providers in ICUs complete the relevant oral health care training programs.

Clinical significance: When in the ICU, suitable dental conduct following a protocol of prevention of oral biofilm can lead to earlier diagnosis and can prevent the spread of pathogenic microorganisms, particularly those that are systemic in patients with low immunity.

Keywords: Chlorhexidine, Cross-sectional studies, Dental biofilm, Intensive care unit, Oral hygiene.

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INTRODUCTION

Oral health has been indicated as an important indicator for patients' quality of life and reestablishment.¹⁻³ In this regard, the joint action of professionals in the patient rehabilitation is of great relevance, as systemic treatments can reduce oral health quality and oral pathogen increase during hospital treatment.² Moreover, the presence of periodontopathogenic infections correlates with conditions, such as cardiac and respiratory diseases.⁴

Studies have indicated that patients under mechanical ventilation show deterioration in oral health.⁵ Considering that oral pathogens like bacteria and yeasts are more common during the intubation period, the situation will improve when the patient is extubated.⁶ In addition, studying the systematic promotion of good oral health in patients admitted to intensive care units (ICUs) is relevant to studies on ventilator-associated pneumonia.^{1,2,6-8}

The literature has indicated the possibility of developing ventilator-associated pneumonia^{1,2,5,7,9} and that bacterial oropharyngeal colonization is an important risk factor, indicating that care in oral intervention can prevent plaque buildup, promote improvement in immunity, and reduce the possibility of developing these infections.^{1,9-11}

Finally, it is important to evaluate the effect of research that can establish parallels between oral health factors including components of oral microbial flora immunity and dental plaque and how these variables may influence

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the prevention of systemic diseases, such as pneumonia, in intubated patients.¹⁰

Beyond that, the literature has shown that the plaque index and the deposition of biofilm are also variables that present greater expression with increased time in an ICU environment.¹² The literature recommends that oral hygiene protocols be instituted for patients with mechanical ventilation.^{5,9}

However, the literature is scarce regarding evaluations of the presence of biofilm in patients admitted to ICUs; this research seeks a relationship between different types of edentulous patient conditions and how these and other factors, such as gender, affect the dental element. Prior to this, it is essential to track the factors that contribute to periodontal disease. The aim of this study is to present the oral features of patients hospitalized in the ICU and to clarify the importance of standardized protocols for oral hygiene and for patient assistance. This study's aim is to eliminate and/or stabilize outbreaks of food-borne infections by instituting control of all etiological agents involved in the development of periodontal disease, as shown by the relevance of a surgeon-dentist's presence in a dental hospital.

MATERIALS AND METHODS

This was a nonexperimental, descriptive cross-sectional study aiming to map the oral standards for patients hospitalized in the ICU. This research used standardized questionnaires for anamnesis, which favored the preservation of multiplicity of information, avoiding targeted responses and distortion of the real situation. The data from this research were expressed in absolute and relative frequencies among patients admitted to the ICU.

This survey was submitted and approved by the Human Research Ethics Committee at the Sacred Heart University (SHU) of Bauru-São Paulo, Brazil (notion 616.4542014) and clinical director of Hospital Beneficence Portuguese of Bauru/São Paulo. The study was conducted on patients admitted to the ICU of the Hospital Beneficence Portuguese, through clinical examination, from July to October 2014.

The collected data were obtained from the characteristics observed in the oral clinical examination, disregarding the period of hospitalization, held at the first assessment by the hospital dentistry service. The patients interned in the ICU were evaluated for biofilm, number of teeth and edentulism, usage of prosthodontics, and the location of the same.

The modified Simplified Oral Hygiene Index has been applied to measure the degree of oral hygiene,¹³ assigned according to the presence or absence of residues on each third of the vestibular faces of the preselected dental

elements (bilateral upper and lower first molars; central incisor: upper right and lower left). For these measures, index 0 indicates that the biofilm is absent, index 1 indicates that biofilm coats up to one-third of the surface, index 2 indicates that biofilm coats between one-third and two-thirds of the surface, and index 3 indicates that biofilm coats over two-thirds of the surface.

Among patients with dentures (removable and/or total) admitted to the ICU, a protocol was adopted to guide nursing staff on the removal of the dentures, maintaining hygiene for prosthetics and for parts delivered to relatives, and suspending the use of dentures during the ICU stay.

The data resulting from the compilation of the important variables were organized into a table in Excel format (Microsoft Office Excel, Redmond, WA, United States), submitted to SigmaPlot software (SigmaPlot, San Jose, CA, USA) version 12.3, and analyzed in relation to the normal distribution. The most appropriate statistical test was adopted, with a significance level of 5%, as the initial results were found. The results were also presented as a percentage of the sample and arranged in tables in order to facilitate visualization and analysis.

Additionally, for mechanical ventilation factor analysis, dental element factor and type of dentition, tests were conducted using Kruskal-Wallis analysis of variance; factor analysis for patients' age, gender, edentulous status were conducted via two-way analysis of variance tests.

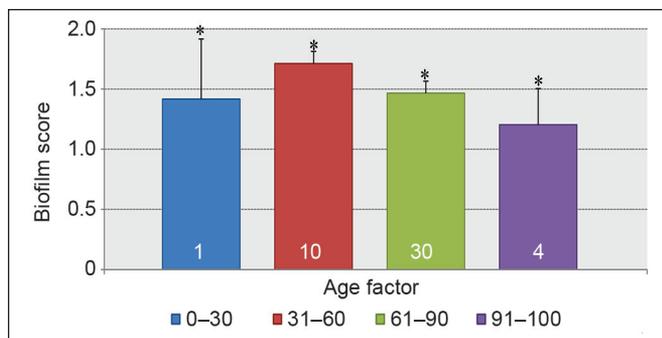
RESULTS

This study involved 45 adult patients, 19 male (42.23%) and 26 female (57.77%). The age ranged between 22 and 95 years, and at least 75% of the patients were over 61 years.

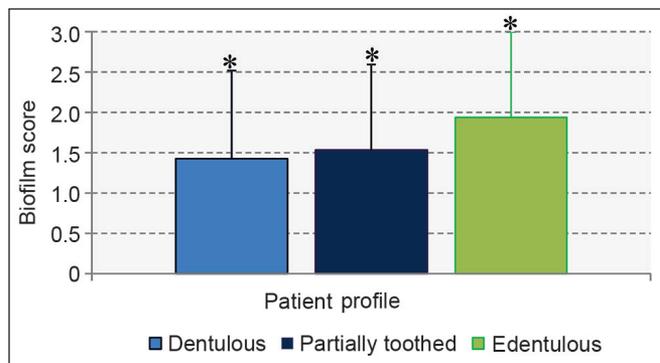
For presentation of the results with the aim of analyzing the clinical conditions of the patients' oral cavities, the results are associated with clinical conditions and oral biofilm during hospitalization in intensive care.

In an analysis assessing biofilm index in relation to gender (male and female) and age (0-30; 31-60; 61-90; 91-100 years), the two-factor analysis of variance found no significant difference for gender ($p=0.091$) or age group ($p=0.549$). The highest average biofilm index was found for patients ranging in age from 31 to 60 years (average: 1.713), as shown in Graph 1. The largest average biofilm index was in female patients (average: 1.617), which was much higher than in male patients (average: 1.283).

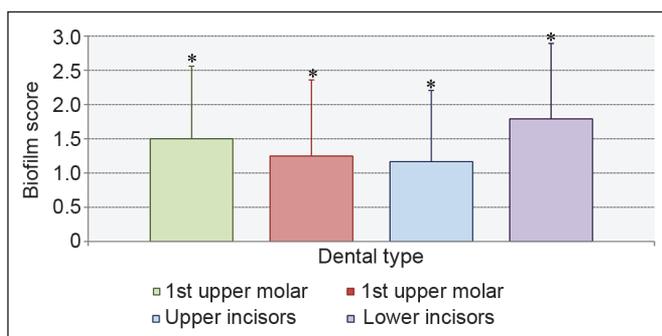
To verify possible correlations between the teething profile (dentulous, partially toothed, and edentulous patients) and the level of biofilm for each patient, Kruskal-Wallis test was applied. This test did not indicate a statistically significant difference between the groups



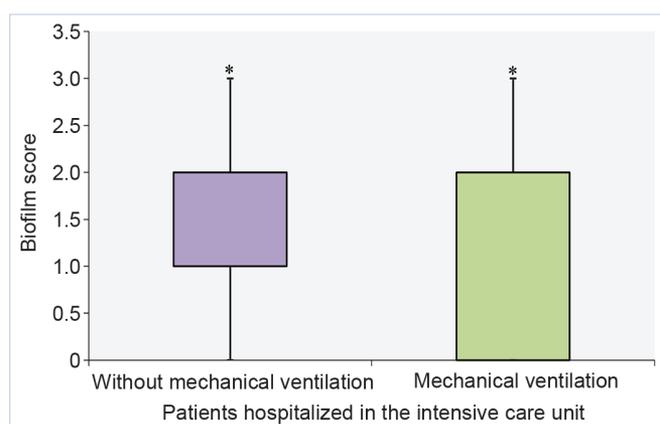
Graph 1: The analysis of the age factor. (*p>0.05; n=45 patients. Internal number bars indicate the number of patients per sample)



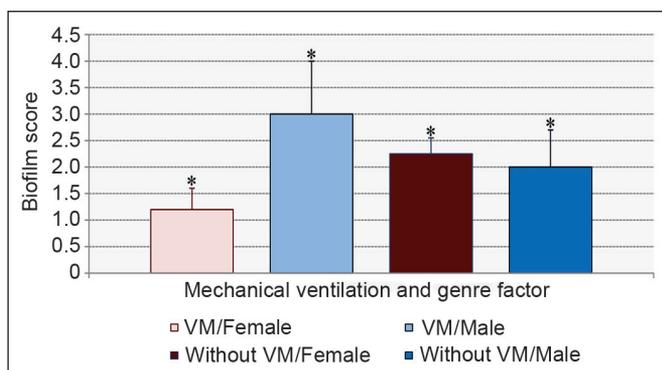
Graph 2: Patient profile analysis graph. (*p>0,05; n=45 patients)



Graph 3: Analysis of dental types. (*p>0.05; n=24 patients)



Graph 4: The mechanical ventilation factor. (*p>0.05; n=45 patients)



Graph 5: Analysis of edentulous patients. (*p>0.05; n=16 patients)

analyzed (p=0.207); however, a higher average biofilm index was observed when the patient had a loss of dental elements, as shown in Graph 2.

With respect to the analysis of patients with complete dentition (number: 24), the biofilm index was considered in four groups of dental elements (i.e., 1st upper molar, 1st lower molar, upper incisors, and lower incisors). The results indicated that there was no statistically significant difference between the different types of dental elements analyzed (p=0.189), but there was a tendency for lower incisors to have higher scores than first upper molars, as shown in Graph 3.

Considering the scores for bacterial plaque in patients with mechanical ventilation, when compared with patients without mechanical ventilation in the ICU environment,

the analysis revealed no statistically significant difference in mechanical ventilation factor (p=0.917), as shown in Graph 4.

Graph 5 shows a specific analysis of the edentulous patients (number: 16), for which there was no statistically significant correlation with mechanical ventilation factor (p=0.971) or genre (p=0.279). However, male patients, especially under mechanical ventilation, had higher average biofilm index values when compared with the other groups analyzed.

DISCUSSION

Sacred Heart University's Committee of Ethics in Research approved this project, in accordance with international recommendations. The instrument for this research was built by the study's authors and was previously tested with three hospital dentistry professionals. Therefore, it was concluded that the instrument was appropriate for the proposed objectives. The present study is intended not to test theories, but rather to map the characteristics of ICU patients' general state of oral hygiene, especially the importance of oral health in the current context of hospital practice where oral conditions in the hospital environment is still incipient.

Numerous studies confirm that the high prevalence of periodontal pathology may have a negative influence on ICU patients' overall health, especially those who have systemic diseases, increasing the length of hospitalization and facilitating the development of systemic diseases, such as nosocomial pneumonia and cardiovascular diseases, in susceptible patients.¹⁴⁻¹⁶ From the results, it was observed that hospitals' lack of dental service, especially preventative care, control, and treatment of oral diseases,¹⁷ demonstrates that the oral care provided to hospitalized patients still is not desirable. However, specialized centers monitor the oral hygiene of patients admitted to the ICU, with an emphasis on the use of chlorhexidine 0.12%.⁵

The data presented are worrisome from a biological point of view; biofilm is home to a wide variety of microorganisms, and some of these produce a wide range of virulence factors that may cause injury to the patient's other tissues.¹⁴ One can deduce that negligence in the care of the mouth and its associated structures must be eliminated in hospital services. Such disharmony indicates a lack of understanding of biofilm control techniques and how a microbial conglomerate can serve as a reservoir of opportunistic bacteria that may trigger systemic diseases in immunocompromised patients.¹⁸

The responsibility for carrying out oral hygiene and maintenance procedures falls on a team largely consisting of professional nurses.⁵ This highlights the importance of oral hygiene protocols in ICU environments.^{2,5,10}

In this context, a recent study¹⁹ highlighted the importance of brushing with toothpaste and applying chlorhexidine 0.12% solution; this protocol may represent an effective method to reduce associated pneumonia among patients with mechanical ventilation and tracheostomies.

Follow-up care is also a relevant determinant.^{6,12} A recent study¹² indicated that a significant increase in plaque buildup and lingual coating occurs within the first 72 hours after evaluation, suggesting that the time of hospitalization should also be considered as an important factor.

Although the results of this study do not show significant differences among the groups evaluated, a greater accumulation of plaque was observed in patients with partial or full prostheses. This increases the need to rigorously clean all prostheses used by patients.¹² A systematic review emphasized the important role that the nursing staff has in maintaining inpatients' oral health as an effective method to reduce complications and medical costs. In addition, the use of chlorhexidine solution, brushing teeth, and washing with antibiotics or iodine are efficient methods according to the evidence.¹ However, regarding the use of chlorhexidine, this theme

is contradictory.^{4,20} A study²⁰ indicated that oral care with chlorhexidine can be effective for prevention of respiratory infections in patients undergoing cardiac surgery, but this appears to be of limited benefit to patients without cardiac surgical intervention.

Data presented in another study²¹ also demonstrated the importance and relevance of an oral hygiene program in patients with stroke in ICUs, indicating a significant reduction in plaque index and degree of *Candida albicans* colonization in saliva when compared with a control group ($p < 0.05$) that was not part of the protocol of care.

Hospital dentistry service should be encouraged,²² especially in intensive care, as this would benefit the treatment of oral pathologies. Early diagnosis and treatment performed by a dental surgeon contributes to the prevention of infections that are often unknown by the multidisciplinary professionals working in the ICU.

The limitations of this study relate to the fact that it was a cross-sectional study; further longitudinal studies should be carried out, following patients and applying a cleaning protocol in patients admitted to the ICU over a long period of time.

CONCLUSION

This study highlights the importance of oral health control in hospitals, especially in ICUs. In that circumstance, the presence of a dental surgeon on a multidisciplinary team in this unit contributes to improved overall care and prognosis, therefore, reducing the risk of nosocomial infection and morbidity in addition to improving the oral health of ICU patients.

CLINICAL SIGNIFICANCE

While staying in the ICU, a patient who follows a suitable dental protocol for the prevention of oral biofilm can allow for early diagnosis and can prevent the spread of pathogenic microorganisms and the development of systemic conditions in low-immunity frameworks.

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