

Maristela Kapitski da Cruz¹, Teresa Márcia Nascimento de Moraes², Deny Munari Trevisani³

Clinical assessment of the oral cavity of patients hospitalized in an intensive care unit of an emergency hospital

Avaliação clínica da cavidade bucal de pacientes internados em unidade de terapia intensiva de um hospital de emergência

1. Prefeitura Municipal de Colatina - Colatina (ES), Brazil.
2. Instituto de Saúde Odontológica - Barretos (SP), Brazil.
3. University Center, Fundação Educacional de Barretos - Barretos (SP), Brazil.

ABSTRACT

Objective: To describe the oral health status of patients hospitalized in an intensive care unit.

Methods: Clinical assessment of the oral cavity was performed in 35 patients at two time-points (up to 48 hours after admission and 72 hours after the first assessment) and recorded in data collection forms. The following data were collected: plaque index, condition of the mucosa, presence or absence of dental prosthesis, number of teeth present, and tongue coating index.

Results: The prevalence of nosocomial infection was 22% (eight patients), with 50% respiratory tract

infections. All patients exhibited oral biofilm, and 20 (57%) showed biofilm visible to the naked eye; tongue coating was present on more than two thirds of the tongue in 24 patients (69%) and was thick in most cases. A significant increase in plaque index ($p=0.007$) occurred after 72 hours, although the tongue coating index was $p<0.001$ regarding the area and $p=0.5$ regarding the thickness.

Conclusion: The plaque and tongue coating indices increased with the length of hospital stay at the intensive care unit.

Keywords: Dental plaque; Pneumonia; Oral hygiene; Emergency service, hospital; Intensive care units

INTRODUCTION

Periodontal status affects the overall health status of individuals, especially because of the migration of oral microorganisms to extraoral infection foci, establishment of a chronic systemic inflammatory condition, and continuous release of chemical mediators and by-products of inflammation, which may affect the onset and progression of systemic diseases when at high concentrations in the blood.⁽¹⁾

Each cubic millimeter of biofilm contains approximately 100 million microorganisms (bacteria, fungi and viruses) that may serve as a reservoir of potential pathogens. Such microorganisms can reach the bloodstream and/or be directed to the saliva and inhaled, causing infections at a distance. It must also be noted that low salivary flow, decreased cough reflex, limited ability to perform dental hygiene, and physical impairment are common in critically ill patients. Furthermore, factors that alter the body microbiota and weaken the immune response are also present in such patients, making them potential victims of respiratory infections. Nosocomial pneumonia (NP) is a common cause of morbidity and mortality in critically ill patients, corresponding to 10% of infections in intensive care units (ICU) - the most common in that setting.⁽²⁾

Conflicts of interest: None.

Submitted on February 17, 2014
Accepted on November 9, 2014

Corresponding Author:

Maristela Kapitski da Cruz
Prefeitura Municipal de Colatina
Rua Adwalter Ribeiro Soares, 66 - Centro
Zip code: 29700-210 - Colatina (ES), Brazil
E-mail: maristelak.cruz@gmail.com

Responsible editor: Thiago Costa Lisboa

DOI: 10.5935/0103-507X.20140058

NP or hospital pneumonia is an infection of the lower respiratory tract, diagnosed 48 hours after admission of the patient and neither present nor incubated when the patient was admitted to the hospital.^(3,4) Among patients affected by that type of pneumonia, 20 to 50% eventually die.⁽⁵⁾

This study aimed to clinically analyze the oral health status of patients hospitalized in an ICU, initially within 48 hours of admission, followed by a second assessment 72 hours after the first assessment.

METHODS

This was an observational study with data collected at the ICU of *Santa Casa de Misericórdia de Barretos* (SCMB), which has ten beds. The study was approved by the Research Ethics Committee of the University Center of the *Fundação Educacional de Barretos* (UNIFEB), in the city of Barretos (SP) under approval number CAAE - 0007.0.156.000-11. All participants or their legal guardians freely signed the Informed Consent Form. The study was conducted during the period from March to April 2012. The SCMB provides care in all medical specialties except oncology for a population encompassing the 19 municipalities of the 5th Regional Health Department of São Paulo State (DRS-5), headquartered in the city of Barretos. All patients selected for the study were assessed by a dentist regarding the inclusion and exclusion criteria.

The study participants were patients admitted to the SCMB ICU, older than 18 years of age and with a compromised level of consciousness, incapable of self-care and without impaired mouth opening. Patients transferred from other clinics or hospitals and patients with tracheostomy were excluded.

The patients selected for the study were clinically assessed by a dental surgeon, and the corresponding demographic data were collected from their medical records. Clinical assessment of the oral cavity was performed at two different time points: initially, within 48 hours of admission, followed by a second assessment 72 hours after the first assessment. Data were recorded on data collection forms. The assessments were performed in critically ill patients and considered the plaque index (PI), condition of the mucosa, presence or absence of dental prosthesis, number of teeth present, and tongue coating index. The extraoral examination was based on the diagnostic criteria and the World Health Organization codes, observing the lip edges and labial commissures.⁽⁶⁾

The assessment of the oral mucosa and soft tissues inside of the mouth observed the following order: labial

mucosa and upper and lower labial sulci; labial area of the commissures and buccal mucosa in the right and left sides; alveolar margins; upper and lower gums; palate; tongue; and mouth floor.

The examination was performed systematically, starting from the upper right side, proceeding to the anterior upper side, posterior upper left side, posterior lower left side, and anterior lower side and ending at the posterior lower right side. The PI was assessed according to Silness & Løe, based on the amount of plaque found: no plaque identified upon naked-eye inspection, only detected when using the periodontal probe in the dentogingival area; plaque identified upon naked-eye inspection; and detection of bacterial plaque visible to the naked eye surrounding the tooth, including in the interdental spaces, possibly with tartar. The classification of patients regarding the tongue coating index, according to area, was as follows: without tongue coating, subclinical tongue coating, tongue coating on up to one third of the tongue, on up to two thirds of the tongue, and on more than two-thirds of the tongue. Tongue coating was classified according to thickness as follows: thin tongue coating with visible lingual papillae and thick tongue coating with no detectable lingual papillae. The patients were classified regarding dentition as follows: toothed, with 14 or more teeth present; partly edentulous, with up to 13 teeth present; or edentulous. The patients were classified regarding the presence of prostheses as follows: presence of complete dentures, presence of removable partial denture, presence of fixed partial denture, presence of orthodontic braces, absence of prosthesis or any dental device.

The results were expressed descriptively as number and percentage. The results from the initial clinical assessment of the oral cavity (within 48 hours of admission) and after 72 hours were compared using the McNemar test.

RESULTS

This study included 35 patients admitted to the SCMB ICU who met the inclusion but not the exclusion criteria of the research study. The general data on the patients are outlined in table 1.

Eleven patients (33%) were intubated, and the prevalence of hospital infection was 22% (8 patients), with 50% respiratory system infections and 50% bloodstream infections. Ulcers were observed in six patients (17%), candidiasis was observed in two (5%), and four patients (11%) showed some type of abnormality, while no abnormal condition was observed in 23 patients (66%).

Table 1 - General sample data

General data	N (%)
Gender	
Male	15 (43)
Female	20 (57)
Ages (years)	49±12.5
Reason for hospitalization	
Circulatory diseases	16 (45)
Respiratory tract diseases	9 (25)
Accidents	5 (17)
Digestive tract diseases	3 (11)
Liver diseases	1 (3)
Endocrine disorders	1 (3)

Regarding the PI, all patients exhibited oral biofilm in the first assessment, with 20 patients (57%) showing biofilm upon naked-eye inspection and 13 patients (37%) showing significant plaque, inclusively in the interdental spaces, possibly with tartar; biofilm was detected when using the periodontal probe in 2 patients. An increase was observed 72 hours after the first assessment. All patients exhibited oral biofilm, with 12 patients (34%) showing biofilm upon naked-eye inspection and 23 patients (65%) showing significant plaque, inclusively in the interdental spaces, possibly with tartar, as outlined in table 2. That variation was statistically significant, with a p-value of 0.007.

Table 2 - Plaque index assessment 72 hours after the first assessment

First assessment	Assessment after 72 hours		
	Intensity 2	Intensity 3	Total
Intensity 1	2 (5.7)	0 (0)	2 (5.7)
Intensity 2	10 (28.6)	10 (28.6)	20 (57.1)
Intensity 3	0 (0)	13 (37.1)	13 (37.1)
Total	12(34.3)	23 (65.7)	35 (100)

Intensity 1 - no plaque identified upon naked-eye inspection. Plaque is detected when using the periodontal probe in the dentogingival area; intensity 2 - plaque identified upon naked-eye inspection; intensity 3 - bacterial plaque detected surrounding the tooth, including in the interdental spaces, possibly with tartar. McNemar test p=0.007.

Tongue coating was present on more than two thirds of the tongue in 24 patients (69%), up to 2/3 in 4 patients (11%), up to 1/3 in 1 patient (3%) and was subclinical in 6 patients (17%). We also observed an increase in this parameter 72 hours after the first assessment because tongue coating was already present on more than 2/3 of the tongue in 29 patients (82%), with p<0.001 (Table 3).

The tongue coating was thick in 54% of the cases, with no detectable lingual papillae. A total of 58% of the patients showed thick tongue coating 72 hours after the first assessment, although the variation was non-significant (p=0.5), as shown in table 4.

Table 3 - Tongue coating area 72 hours after the first assessment

First assessment	Assessment after 72 hours		Total
	Tongue coating ≤1/3	Tongue coating >2/3	
Subclinical tongue coating	6 (17.1)	0	6 (17.1)
Tongue coating ≤1/3	0 (0)	1 (2.9)	1 (2.9)
Tongue coating ≤2/3	0 (0)	4 (11.4)	4 (11.4)
Tongue coating >2/3	0 (0)	24 (68.6)	24 (68.6)
Total	6 (17.1)	29 (82.9)	35 (100)

Result: McNemar test; Chi squared=2.545; Ds=6; p<0.001.

Table 4 - Tongue coating thickness 72 hours after the first assessment

First assessment	Assessment after 72 hours		Total
	Thin tongue coating, visible lingual papillae	Thick tongue coating, no detectable lingual papillae	
Thin tongue coating, visible lingual papillae	15 (42.9)	2 (5.7)	17 (48.6)
Thick tongue coating, no detectable lingual papillae	0	18 (51.4)	18 (51.4)
Total	15 (42.9)	20 (57)	35 (100)

Result: McNemar test; p value=0.5.

Twenty-one patients (61%) used no prosthesis or any dental device, 10 (31%) used complete dentures, 1 (3%) used removable partial dentures, 1 (3%) used fixed partial dentures, and no patient used orthodontic braces. Regarding the number of teeth present in the oral cavity, 14 patients (40%) were edentulous.

DISCUSSION

This study showed that patients had a significant accumulation of bacterial plaque and tongue coating, with an increase 72 hours after the first assessment, suggesting that the length of hospital stay is a key factor in the occurrence of that alteration.

The mouth serves as a potential reservoir of microorganisms,^(4,5,7-9) and aspiration of mouth contents is a factor promoting the occurrence of pulmonary infections, whose highest frequency occurs at the ICU, given the altered level of consciousness of patients, which

makes them more susceptible to aspiration of respiratory pathogens.⁽⁵⁾ That factor, associated with low salivary flow, decreased cough reflex, limited ability to perform dental hygiene, and physical impairment, renders critically ill patients potential victims of respiratory infections.⁽⁷⁾ Furthermore, they are also immuno-compromised because of disease or medication and thus vulnerable to colonization by multidrug-resistant microorganisms.⁽¹⁰⁾

A study analyzing samples of tracheal aspirate and microbiological dental biofilm from 30 patients diagnosed with NP showed that 70% of those microorganisms present in the tracheal aspirate were found in the oral biofilm, 63% in tongue samples, 73% in the ventilator tube, and 43% in all areas simultaneously.⁽¹¹⁾ This result highlights the importance of oral hygiene of patients hospitalized in the ICU because the accumulation of biofilm increases with the length of hospital stay, as shown in this study.

Nosocomial infections increase the length of hospital stay, morbidity and mortality rates, and hospital costs.⁽¹²⁾ NP occurs in five to ten cases per thousand hospitalizations, and the percentage of deaths, which would not have occurred in the absence of infection, ranges from 33 to 50%; NP also increases the length of hospital stay from 7 to 9 days as well as the treatment costs.⁽⁴⁾

The best way to promote oral health is to control biofilm and tongue coating using mechanical and chemical methods. Mechanical methods consist of brushing and using dental floss, interdental brushes, and tongue scrapers. Chemical methods of control are indicated for patients unable to perform the mechanical control of biofilm.⁽¹³⁾

Cytokines produced by the periodontal tissue in response to bacterial invasion seem to alter the respiratory epithelium, rendering it more susceptible to pathogen colonization and to the action of enzymes produced by periodontal disease. Such enzymes enable bacterial adhesion to and colonization of the respiratory epithelium and promote the destruction of acquired pellicle-forming salivary molecules that act in the elimination of bacteria.⁽¹⁴⁾

Oral microorganisms found in bronchoalveolar lavage, in blood culture, and in the tracheal secretions of patients diagnosed with NP, including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and Gram-negative bacilli, are also present in the oral cavity of apparently healthy patients and are involved in the onset of NP.⁽³⁾

In this study, 14 patients (40%) were edentulous, 11 (31%) had more than 14 teeth, and 10 patients (29%) were partly edentulous. Patients with natural teeth are more prone to accumulate biofilm, favoring the development of pneumonia more frequently than edentulous patients. Moreover, dental prostheses act as a potential reservoir of microorganisms if not cleaned properly.⁽⁷⁾

CONCLUSION

The results from this study suggest that the tongue plaque index and tongue coating increase with the length of hospital stay in the intensive care unit.

ACKNOWLEDGMENTS

To the *Programa Institucional de Bolsas de Iniciação Científica/Conselho Nacional de Desenvolvimento Científico e Tecnológico* (PIBIC/CNPQ).

RESUMO

Objetivo: Descrever a condição bucal de pacientes hospitalizados em uma unidade de terapia intensiva.

Métodos: A avaliação clínica da cavidade bucal foi realizada em 35 pacientes em dois momentos (até 48 horas após a internação e em 72 horas após a primeira avaliação), e anotada em fichas de coleta de dados. Foram observados: índice de placa, condição da mucosa, presença ou não de prótese dentária, número de dentes presentes e índice de saburra lingual.

Resultados: A prevalência de infecção hospitalar foi de 22% (oito pacientes), sendo 50% de infecções do aparelho

respiratório. Foi constatado que todos os pacientes apresentavam biofilme bucal, sendo que 20 (57%) apresentavam biofilme por meio da simples visão e, em 24 pacientes (69%), a saburra estava presente em mais de dois terços da língua, sendo espessa na maioria dos casos. Após 72 horas houve aumento significativo do índice de placa ($p=0,007$), no entanto, o índice de saburra quanto à área foi de $p<0,001$ e quanto à espessura de $p=0,5$.

Conclusão: O índice de placa e a saburra lingual aumentaram de acordo com o tempo de internação na unidade de terapia intensiva.

Descritores: Placa dentária; Pneumonia; Higiene bucal; Serviço hospitalar de emergência; Unidades de terapia intensiva

REFERENCES

1. Feres M, Figueiredo LC. Da infecção focal à medicina periodontal. *Periodontia*. 2007;17(2):14-20.
2. Paju S, Scannapieco FA. Oral biofilms, periodontitis, and pulmonary infections. *Oral Dis*. 2007;13(6):508-12.
3. Barbosa JC, Lobato PS, Menezes SA, Menezes TO, Pinheiro HH. Perfil dos pacientes sob terapia intensiva com pneumonia nosocomial: principais agentes etiológicos. *Rev Odontol UNESP*. 2010;39(4):201-6.
4. David CM. Infecção em UTI. *Medicina (Ribeirão Preto)*. 1998;31(3):337-48.
5. Morais TM, Silva A, Avi AL, Souza PH, Knobel E, Camargo LF. A importância da atuação odontológica em pacientes internados em unidade de terapia intensiva. *Rev Bras Ter Intensiva*. 2006;18(4):412-7.
6. Organização Mundial da Saúde. Levantamento epidemiológico básico de saúde bucal. Manual de instruções. 4a ed. Genebra: Organização Mundial da Saúde;1997.
7. Paju S, Scannapieco FA. Oral biofilms, periodontitis, and pulmonary infections. *Oral Dis*. 2007;13(6):508-12.
8. Nascimento DF, Silva AM, Marchini L. O papel das bactérias orais em doenças sistêmicas. *Rev ABO Nac*. 2006;14(2):117-22.
9. Munro CL, Grap MJ. Oral health and care in the intensive care unit: state of the science. *Am J Crit Care*. 2004;13(1):25-33; discussion 34.
10. Amaral SM, Côrtes AQ, Pires FR. Nosocomial pneumonia: importance of the oral environment. *J Bras Pneumol*. 2009;35(11):1116-24.
11. Oliveira LC, Carneiro PP, Fischer RG, Tinoco EM. A presença de patógenos respiratórios no biofilme bucal de pacientes com pneumonia nosocomial. *Rev Bras Ter Intensiva*. 2007;19(4):428-33.
12. Andrade D, Leopoldo VC, Haas VJ. Ocorrência de bactérias multirresistentes em um centro de terapia intensiva de hospital brasileiro de emergências. *Rev Bras Ter Intensiva*. 2006;18(1):27-33.
13. Gebran MP, Gebert APO. Controle químico e mecânico de placa bacteriana. *Tuiuti Ciênc e Cult*. 2002;3(26):45-58.
14. Almeida RF, Pinho MM, Lima C, Faria I, Santos P, Bordalo C. Associação entre doença periodontal e patologias sistêmicas. *Rev Port Clin Geral*. 2006;22:379-90.