

Assessing the incidence of tongue coating in patients treated in intensive care units

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ABSTRACT

Objective: assessing the incidence of tongue coating in patients treated in the intensive care unit (ICU) of a hospital in Federal District, Brazil. **Material and Methods:** descriptive and prospective study with convenience cohort approved by the Research Ethics Committee. A single examiner conducted clinical examinations focused on evaluating the incidence of tongue coating in ICU patients for 5 weeks, at times scheduled by the ICU management board. Data were recorded in a standardized datasheet. **Results:** we assessed 152 male and female patients (57% women and 42% men), at mean age 64 years. Patients were hospitalized in the ICU, mostly under normal conditions ($p < 0.001$); the longest period in the ICU was 48 hours ($p < 0.001$). Most patients (56) presented coating throughout their tongues ($p < 0.001$). Associations between the length of hospital stay and the incidence of tongue coating were not statistically significant. **Conclusion:** the incidence of tongue coating remains high in patients treated in the investigated ICU. Thus, it is necessary developing educational and clinical strategies, as well as implementing specific and professional training protocols.

Keywords: Intensive Care Units; Hospital dentistry; Infection Control; Oral health; Biofilms.

Introduction

Actions focused on oral health promotion in intensive care units (ICUs) should be constantly taken to help eliminating possible infectious foci, inflammatory processes, microbial reservoirs and pain resulting from oral issues capable of affecting the systemic health of critically-ill patients and causing nosocomial (acquired after hospitalization) and ventilator-associated pneumonia (VAP).¹⁻⁴

ICUs still lack specific oral hygiene protocols focused on tongue cleaning, mainly on the cleaning of its posterior region, near the oropharynx and the vallate papillae.^{5,6}

The systemic condition, sedation, orotracheal intubation, tracheostomies and non-cooperation of patients, as well as the lack of professional training, are factors hindering effective actions focused on tongue coating removal and on oral health promotion.⁷⁻⁹

Difficulties faced by most health professionals working in intensive care units are associated with lack of standardized and effective clinical activities focused on oral hygiene, mainly on tongue cleaning. Lack of tongue cleaning contributes to the formation and development of tongue coating, which is a niche of gram-negative bacteria associated with systemic infections.¹⁰⁻¹²

Tongue coating basically results from food debris, desquamated cells, fungi, bacteria and from active enzymes participating in the digestion process. It is an important microbial reservoir of bacteria associated with hospital infections affecting ICU patients such as *Pseudomonas aeru-*

ginosa, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Escherichia coli*.^{11,13,14}

Interdisciplinary strategies adopted in ICUs, and trained professional performance, should focus on improving critically-ill patients' care and oral health. In other words, oral hygiene activities should prioritize tongue coating removal in order to reduce its association with pneumonia and with high mortality rates.^{4,9,15}

Thus, it is necessary formalizing effective protocols focused on oral health research, professional training and on the education of, and direct communication with, other health professionals about dental care in ICUs, besides standardizing preventive behaviors, providing health education and developing better elaborated protocols.^{6,16-20}

The aim of the current study was to assess the prevalence of tongue coating in patients treated in the intensive care unit of a hospital in Federal District, Brasilia, Brazil.

Material and Methods

Descriptive and prospective study with convenience cohort. Our research focused on assessing the prevalence of tongue coating in ICU patients. A single examiner assessed the patients for 5 weeks (clinical examinations 2 times a week) and recorded their data in a standardized datasheet.

We conducted the study in Federal District (Brazil), after it was approved by the Hospital's board of directors, by the head of the ICU and by the Research Ethics Committee of the Catholic University of Brasilia - number CAAE

78245917.0.0000.0029. Conscious patients, or their family members, signed the Informed Consent Form to participate in the study.

Inclusion criteria comprised male and female patients hospitalized in the ICU of the investigated hospital.

The following instruments were used to collect patient data:

- Medical records, and records provided by the interdisciplinary team working in the ICU, generated general identification data such as patients' sex, age, length of hospital stay and hospitalization condition (tracheostomized, orotracheally intubated, normal).

- The intra- and extra-buccal examinations were performed based on professional adaptation measures concerning the logistics and time factors (time scheduled to perform the dental evaluation procedures without hindering the daily routine and systematization in the ICU) of the healthcare given to patients.

Two dental surgeons (one examiner and one assistant) assessed the oral health condition of orotracheally-intubated patients. They counted on the interdisciplinary support provided by the physical therapy (tube stabilization and movement, besides the correct patient positioning) and nursing (nursing technicians) teams, who helped the surgeons with clinical assistance and constant suction (aspiration) procedures.

The prevalence of tongue coating (biofilms)²¹ in critically-ill patients was clinically evaluated and oral hygiene actions were taken, whenever necessary. The evaluation criteria were: tongue coating all over the lingual dorsum, over 2/3 of the tongue and over 1/3 of the tongue; did not present tongue coating (not visible).²¹

Possible associations between the length of stay in the ICU and the incidence of tongue coating were performed in several possibilities: a) length of stay in the ICU and tongue coating divided into all categories; b) Length of stay in the ICU divided into all categories and presence of tongue coating (present or did not present); c) length of stay in the ICU divided into 1, 2, 3 days (or more) and presence of tongue coating divided into all categories; d) Length of stay in the ICU divided in 1, 2, 3 days (or more) and presence of tongue coating (present or did not present).

The oral hygiene protocol^{9,22-24} adopted in the ICU after the patients' oral health condition was evaluated comprised biofilm, tongue coating and food debris removal. Physical therapists positioned the patients at 45° in the ICU bed, assessed their sedation status and stabilized their orotracheal tube (artificial respiration), whenever necessary. The nursing team was responsible for interrupting patients' nasoenteral feeding, whenever necessary.^{4,25,26}

The procedures were performed in a standardized way: lip hydration with solid Vaseline and mouth expander (better visualization of posterior regions). Complete and remov-

able dentures were removed and manually cleaned^{27,28} with dental brush and 0.12% chlorhexidine. Initially, patients' teeth and dental prostheses (fixed or implants associated with fixed complete dentures) were manually cleaned with toothbrush and dentifrice under irrigation with 0.12% chlorhexidine solution and constant suction (dental surgical sucker and vacuum pump in the ICU). Clinical procedures focused on reducing or on eliminating tongue coating used the hemostatic clamp in association with gauze soaked in 0.1% chlorhexidine solution to perform movements from the back towards the tip of the tongue, under constant suction.^{9,29,30}

Data concerning every ICU patient were transcribed to individual standardized datasheets, based on the adapted clinical assessment sheet model.⁶

Data Analysis

The overall features of ICU patients, and the incidence of tongue coating, were subjected to descriptive analysis; the resulting data were expressed in numbers and proportions (percentages). Only the patients' age was expressed as mean and standard deviation, because it corresponded to numerical data.

The one-sample t-test was applied to proportions of each variable category in order to investigate whether there was significant difference between percentages. The significance level was set at 5% ($p < 0.05$).

Bonferroni's theorem was our instrument of choice to adjust the critical "p" level, whenever the analysis encompassed multiple t-tests applied to the same variable.

The statistical analysis was performed in the Statistical Package for Social Sciences software (SPSS), version 23.0 (IBM Corporation, Armonk, NY, USA).

Results

One hundred fifty-two (152) male and female patients (57% women and 42% men), in the age group 18 to 96 years (mean age 64 years), were assessed in the current study.

Based on results of the ICU stay analysis, 23% of the sample was hospitalized for 24 hours; 45%, for 48 hours ($p < 0.001$); 12%, for 72 hours; 6%, for 4 to 7 days; and 14%, for more than 7 days. Approximately 80% of the sample showed normal conditions and did not require respiratory-assistance devices ($p < 0.001$), 15% were tracheostomized and 5% were intubated.

Clinical evaluation results showed tongue coating all over the lingual dorsum of 56 patients ($p < 0.001$), over 2/3 of the tongue of 40 patients and over 1/3 of the tongue of 27 patients; 29 patients did not present tongue coating. It is noteworthy that 80% of the patients presented tongue coating in one-third of the posterior region of the tongue, whereas 20% of them did not.

Table 1. ICU patients' profile and incidence of tongue coating

General and oral features (n = 152)	n	%	p
Age (years)	64.1 ± 17.7 (22 – 96)		
Sex			
Male	64	42.11	
Female	88	57.89	
ICU Length of stay			
1 day	35	23.03 a	
2 days (48 hours)	69	45.39 b	< 0.001**
3 days (72 hours)	18	11.84 a,c	
4–7 days	09	5.92 c	
>7 days	21	13.82 a,c	
ICU admission condition			
Tracheostomized	22	14.47 a	
Orotracheally intubated	08	5.26 b	
Normal conditions	122	80.26 c	< 0.001**
Tongue coating			
Absent	29	19.08 a	
1/3 of the tongue	27	17.76 a	
2/3 of the tongue	40	26.32 a,b	
All over the tongue	56	36.84 b	< 0.001**

*The One-sample t-test between percentages was significant at 0.05 critical alpha level ($p < 0.05$).

**Bonferroni's theorem was used to adjust the critical alpha level. Different letters between percentages indicate statistically significant differences ($p < 0.01$).

Associations between ICU length of stay and the incidence of tongue coating were based on the most diverse possibilities: a) ICU length of stay and tongue coating divided in all categories (Chi-square: 6.529; $p = 0.877$); b) ICU length of stay divided in all categories and tongue coating classified as present or absent (Chi-square: 2.433; $p = 0.657$); c) ICU length of stay divided in 1, 2, 3 days (or more) and tongue coating divided in all categories (Chi-square: 2.812; $p = 0.840$); d) ICU length of stay divided in 1, 2, 3 days (or more) and tongue coating classified as present or absent (Chi-square: 1.739, $p = 0.416$), although without statistical significance.

Discussion

Healthcare procedures applied to critically-ill patients are based on an integrative assistance model focused on daily actions beneficial to recovery and integral health. In addition, they help eliminating oral cavity inflammatory, infectious and painful processes that may affect the patients' systemic condition; thus, oral health promotion is an integral and necessary part of these procedures.^{1,3,11,22}

Female patients prevailed in our sample (88 women - 57.89% of the sample), whereas male patients comprised 64 individuals. Such specific condition may be explained by the fact that the assessed ICU is of general nature, since it hosts

patients with different systemic monitoring needs. This result does not corroborate most studies, which often have men as majority in their sample. It is consensus that men are less concerned about, and take less preventive measures towards, their general health; consequently, they are more susceptible to develop health issues that require medical interventions and hospitalization in intensive care units.^{5,6,15,19}

The human oral cavity may work as a potential microbial reservoir of gram-negative bacteria associated with pneumonia (ventilator-associated (VAP) and nosocomial pneumonia) caused by the aspiration of contents such as dental biofilm, tongue coating and food debris. ICUs are the places where such aspiration processes can be more often observed, given the possible changes in patients' consciousness levels and the lack of specific hygiene activities.^{9,14,16,26}

The 48-to-72-hour period after ICU admission is critical because it directly affects bacterial pathogenicity, in which gram-negative bacteria prevail. Based on our results, 69 patients ($p < 0.001$) remained in the ICU for 48 hours (two days), whereas more than 85 patients recorded critical ICU length of stay (48 to 72 hours). This outcome emphasizes the need of performing specific oral healthcare procedures and of providing better care to critically-ill patients based on interdisciplinary planning.^{1,4,8}

Most ICU patients are sedated to enable better behavioral

control and systemic assessment and to relieve them from any discomfort caused by hospitalization. Most patients ($n = 122$) assessed in the herein investigated general ICU were conscious (not sedated) and in normal conditions. Such scenario made it easy to clinically evaluate the incidence of tongue coating and enabled patients' effective participation in the study.^{19,26}

Most patients were mainly fed through oral feeding, which may have enabled high biofilm and tongue coating accumulation. Consequently, healthcare professionals must adopt specific hygiene procedures to clean the tongue of ICU patients.^{4,6,12,20,25}

Orotracheally intubated ($n = 08$) and tracheostomized ($n = 22$) patients, at different unconsciousness (sedation) levels, were also evaluated to assess the incidence of tongue coating in them, based on specific handling techniques, professional adaptation and interdisciplinary actions. Factors such as specific devices and the condition of ICU patients made it more difficult to evaluate the incidence of tongue coating in our sample.^{5,6,13,14}

Most of our patients presented tongue coating. It was found all over the tongue of 56 patients ($p < 0.001$), over 2/3 of the tongue of 40 patients and over 1/3 of the tongue of 27 patients. These findings emphasize the lack of daily clinical activities focused on tongue hygiene in the assessed intensive care unit, as well as the lack of educational and interventional protocols to be performed by health professionals working in it or by conscious patients themselves.^{2,7,8,18,20,25}

The present study also analyzed possible associations between ICU length of stay and the incidence of tongue coating. Based on the existing possibilities and statistical analyses, there was no direct association between these two variables; perhaps, the analysis should be applied to a larger sample.

Activities focused on cleaning the tongue of critically-ill patients should be constantly implemented and performed in intensive care units to help removing tongue coating and

reducing possible microbial reservoirs associated with hospital infections affecting the human respiratory tract.^{8,12,15,24,29}

There was lack of standardization of ICU patients' tongue hygiene protocols performed by the nursing team, nursing technicians and by patients themselves. Therefore, it is necessary taking educational measures to teach health professionals working in hospitals to perform specific dental care procedures under proper supervision.^{2,6,7,16,18,22}

Controlling the dental biofilm and tongue coating in ICU patients through the association between mechanical and chemical strategies is the best way to promote their oral health. Strategies such as toothbrushing in the posteroanterior direction with a toothbrush imbibed in 0.1% chlorhexidine solution, applying gauze imbibed in 0.12% chlorhexidine attached to a needle holder (movements towards the posteroanterior direction) and using wooden spatulas and tongue cleaners with saline solution can be adopted to disorganize and remove tongue coating in all patients (tracheostomized, intubated and normal condition).^{1-4,7,8,10-12,27-30}

It is necessary developing specific planning and performing clinical tongue coating removal activities to improve the daily assistance given to critically-ill patients in the investigated ICU in order to help reducing - to a certain extent - potential microbial reservoirs related to hospital infection cases.^{1,4,9,10,14,22,24,26,27}

Conclusion

The incidence of tongue coating in the herein assessed ICU patients was high. Therefore, it is necessary adopting educational and clinical strategies, as well as implementing specific protocols and professional training to improve the healthcare given to critically-ill patients.

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Mini Curriculum and Author's Contribution

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