

Oral hygiene of the patient admitted in an intensive care unit: integrative review

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Received: 05/25/2016.

Accepted: 09/13/2017.

Published: 12/31/2017.

Suggest citation:

Nogueira JWS, Jesus CAC. Oral hygiene of the patient admitted in an intensive care unit: integrative review. Rev. Eletr. Enf. [Internet]. 2017 [cited __/__/__];19:a46. Available from: <http://doi.org/10.5216/ree.v19.41480>.

ABSTRACT

The oral health prevention and promotion for patients admitted to an intensive care unit is the nursing team's responsibility. An integrative review that aimed to identify the contributions of studies conducted by nurses about the oral care of patients admitted to these units. We selected 17 articles published during 2010 to 2016, indexed in the State National Library of Medicine (PubMed/MEDLINE) and *Biblioteca Virtual em Saúde* (BVS). We categorized the studies according to interventions for the dental biofilm control. Brushing was pointed as the best practice for the mechanical control and the 0.12% chlorhexidine gluconate for chemical control. The mechanical and chemical interventions combined were more effective for the prevention of respiratory infections. Comparative clinical studies should be conducted by nurses who work in the clinical practice, so they can trace effective measures for oral care.

Descriptors: Nursing Care; Critical Care; Oral Hygiene; Intensive Care Units.

INTRODUCTION

Within the attributions of a nursing team in an Intensive Care Unit (ICU), to perform oral hygiene (OH) is a very important intervention⁽¹⁻⁴⁾. Besides being a care that propitiates hygiene maintenance and comfort, it has been addressed as an infection control practice and a measure aiming at patient's safety⁽⁵⁻⁹⁾.

In the past decades, researchers have been dedicating themselves to study the relationship between the colonization of dental plaque and infections related to health assistance in patients critically ill. Within 48 hours of hospitalization, these individuals presented changes in the bucal microbiota, including the predominance of gram-negative bacterias and other virulent organisms. Therefore, the lack of attention with oral care results in the increase of the quantity and complexity of the dental plaque, which can become a habitat for potentially pathogenic microorganisms and, to propitiate the appearance of bacterial, oral,

digestive and respiratory infections^(5,9-13).

In this perspective, practices related to the mechanical and chemical control of the dental biofilm of the critical patient have been the target of many investigations, which results alert for the need to implement guidelines for oral health promotion for these individuals^(5,12,14-19).

The oral assessment, aspiration of secretions from the oropharyngeal and subglottal regions, the use of antiseptics to decontaminate the oral and oropharyngeal cavities, lubrication of lips and bucal mucous membranes, cleaning teeth with a soft or pediatric toothbrush, are among the recommended practices for oral care of patients admitted to ICU^(10,16-17,20-25).

Although evidence about oral care exist to direct practice, survey studies about the performance of intensive care nurses show an existing gap between the scientific recommendations and the real practice^(24,26).

Many nurses use equipment and solutions that have not been scientifically supported, like cotton swabs, gauze soaked in paraffin oil, spatule with gauze for mechanically clean teeth and sodium bicarbonate, hydrogen peroxyde for the chemical cleaning, within others⁽²³⁻²⁴⁾. Investigations conducted with ICU nurses in Croatia⁽¹⁹⁾, Turkey⁽²⁵⁾, Malaysia⁽²⁶⁾, Taiwan⁽²⁷⁾, Singapore⁽²⁸⁾ and Jordan⁽²⁹⁾ show a great percentage of professionals that are not executing oral care according to the last evidence.

On the other hand, a study developed in Israel in 2013 verified a significant increase in the use of recommended practices like the assessmentof the oral cavity and the use of the toothbrush. There was also a reduction in non evidence-based conducts as the use of a spatule involved with gauze and sodium bicarbonate solution⁽²⁰⁾.

Therefore, it is fundamental to know the elements and the gaps in nursing clinical practice related to OH care in the national and international scientific production. It is understood that this professional, as well as, the whole nursing team, should be compromised to provide care that is substantiated and systematic, based on the most actual and with proved guidance for adequate oral care, overall, in patients with self-care deficit. Thus, we question: what are the contributions from studies conducted by nurses about the oral care for patients admitted to the ICU?

Considering this question, the objective of our study was to identify, what are the contributions from studies conducted by nurses about the practices related to OH of patients admitted to the ICU.

METHODS

An integrative literature review, which method offers fast access to relevant results of the included studies and evidence to ground conducts or decision-making, propitiating critical knowledge. The steps that conducted our study were: theme identification, selection of the research question, establishment of inclusion and exclusion criteria, definition of the information to extract from selected articles, assessment of the included studies, interpretation of results and the review presentation⁽³⁰⁻³¹⁾.

The electronic search strategy was conducted in the databases State National Library of Medicine

(PubMed/MEDLINE) and *Biblioteca Virtual em Saúde (BVS)*. We used the controlled descriptors (Decs/Mesh): oral hygiene; oral care; intensive care unit, nursing, nurse; nursing care; mouth care, critical care; procedure; technique and their combinations in Portuguese and English using the boolean operator terms AND and OR. We considered the period of 2010 to 2016.

We located the documents using bibliographic exchange, accessing the available online archives or by contacting the authors via e-mail. We adopted as inclusion criteria: studies where the nurse is the primary or second author; approaching OH practicing for middle-age and old adults, dependents on ICU care; published in Portuguese, English or Spanish.

The exclusion criteria were: editorials, reflexive articles, publications in formats like a thesis, dissertations, monographs, any review style and, articles related to the point of view or knowledge from the nursing team about OH.

For the bibliographic data collection, we used a form to extract information about author's identification, the database from where the article was found, study objective, methods, type of research, results, conclusions, and level of evidence. The classification for the level of evidence was conducted using the assessment criteria established from one to seven, as:

- Evidence level 1: resulting from systematic review or meta-analysis of randomized clinical trials;
- Evidence level 2: evidence derived from at least one well-designed randomized controlled trial;
- Evidence level 3: well-designed non-randomized clinical trials;
- Evidence level 4: well-designed cohorts or case-control studies;
- Evidence level 5: originated from systematic review of descriptive and qualitative studies;
- Evidence level 6: derived from a unique descriptive or qualitative study;
- Evidence level 7: from the opinion of authorities and/or reports of specialists' committees⁽³²⁾.

Thus, we identified 502 studies. After excluding repeated and duplicate articles (the same publication, but from different databases) or the ones not meeting the inclusion criteria, we included 20 studies for synthesis. These were pooled in categories, having as parameter the methods for oral biofilm control used by nurses. The identification, inclusion and exclusion process is presented in Figure 1.

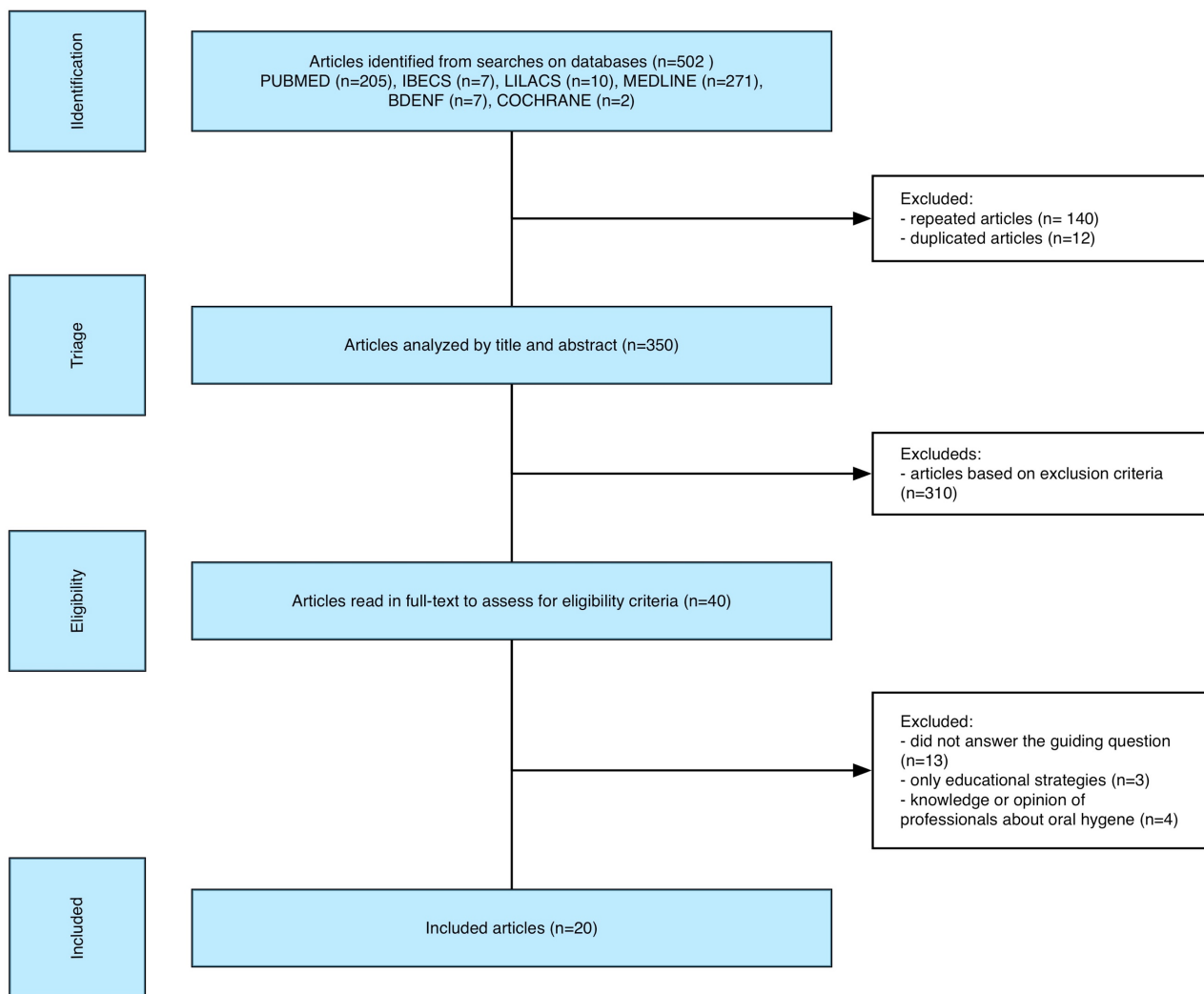


Figure 1: Flow-chart of the study selection for the integrative literature review, created from PRISMA recommendations.

RESULTS

Based on the control methods for oral biofilm used by nurses, the articles were distributed in three categories: nursing practices related to the mechanical control of the dental biofilm; nursing practices related to the chemical control of the dental biofilm; nursing practices related to the mechanical and chemical control of the dental biofilm.

Following, the Chart 1 represents the main information extracted from the selected articles referring to the control method of oral biofilm used by nurses.

Chart 1: Distribution of nursing practices related to the oral biofilm control, classified in accordance with the publication, design, level of evidence (LE) and conducted interventions.

Nursing Practice	Authors/Title/Country/Publication year	Design	LE	Intervention
Mechanical Control of the Dental Biofilm	Jones DJ, Munro CL, Grap MJ, Kitten T, Edmond M. Oral Care and Bacteremia Risk in Mechanically Ventilated Adults. The United States, 2010 ⁽³³⁾	Descriptive pre- post-intervention	6	Relationship of brushing with transitory bacteremia Material: pediatric toothbrush + toothpaste
	Biosca AR, Saperas LA, Grau NG, Rico LR Guillén MCV. Prevención de la neumonia asociada a la ventilación mecánica: estudio de dos métodos de higiene oral. Spain, 2011 ⁽³⁴⁾	Descriptive prospective longitudinal randomized, single-blind	6	Electrical tooth brush + 0.12% CHX X Not brushing + 0.12% CHX
	Johnson K, Domb A, Johnson R. On evidence based protocol doesn't fit all: Brushing away ventilator pneumonia in trauma patients. The United States, 2012 ⁽³⁵⁾	Descriptive pre- post-intervention	6	Pediatric toothbrush + toothpaste or foam dressing when brushing was counter-indicated
	Khalifehzadeh A, Parizade A, Yousefi H. The effects of an oral care practice on incidence of pneumonia among ventilator patients in ICU of selected hospitals in Isfahan, 2010. Iran, 2012 ⁽³⁶⁾	Randomized controlled trial	2	Brushing + 0.12% CHX X Cotton ball + 0.12% CHX It does not report the type of toothbrush
	Prendergast V, Ingali RH, Ulf J, Stefan R. Comparison of Oropharyngeal and Respiratory Nosocomial Bacteria between Two Methods of Oral Care: A Randomized Control Trial. The United States, 2012 ⁽³⁷⁾	Randomized controlled trial	2	Pediatric toothbrush + toothpaste + water-based lubricant X Electrical tooth brush + toothpaste + tongue scraper + moisturizer
	Nasiriani K.; Torki F.; Jarahzadeh, MH; Rashidimaybodi R. The effect of brushing with a soft toothbrush and distilled water on the incidence of ventilator associated pneumonia in the intensive care unit. Iran, 2016 ⁽³⁸⁾	Randomized controlled trial Double-blind	2	Pediatric toothbrush + distilled water + CHX + cotton swabs + oropharyngeal aspiration X saline solution + CHX + cotton swabs + oropharyngeal aspiration It does not report the CHX concentration
Chemical Control of the Dental Biofilm	Hsu SP; Liao CS; Li CY; Chiou AF. The effects different oral care protocols on mucosal change in orally intubated patients from an intensive care unit. Taiwan, 2010 ⁽³⁹⁾	Quasi- experimental	3	Mouthwash with gree tea X Boiled water
	Berry, AM; Davidson PM; Masters J; Rolls K; Ollerton R. Effects of three approaches to standardize oral hygiene to reduce bacterial colonization and ventilator associated pneumonia in mechanically ventilated: a randomized control trial. Australia, 2011 ⁽⁴⁰⁾	Comparative Randomized single-blind	2	Mouthwash with 0.12% CHX X Sodium bicarbonate X Esterile water
	Berry AM. A comparison of Listerine and sodium bicarbonate oral cleansing solutions on dental plaque colonization and incidence of ventilator associated pneumonia in mechanically ventilated patients: a randomized control trial. Australia, 2013 ⁽⁴¹⁾	Comparative randomized prospective single-blind	2	Mouthwash with Listerine X Sodium bicarbonate X Esterile water
	Souza AF, Guimarães AC, Ferreira EF. Avaliação da implementação de um novo protocolo de higiene bucal em um centro de terapia intensiva para a prevenção de PAMV**. Brazil, 2013 ⁽⁴²⁾	Experience report	6	Substitution of the 0.05% cetylpyridinium chloride per 0.12% chlorhexidine solution
	Krezri HD, Gorji MAH, Morad A, Gorj H. Comparison of the antibacterial effects of Matrica & Persica™ and chlorhexidine gluconate mouthwashes in mechanically ventilated ICU patients: a double blind randomized clinical trial. Iran, 2013 ⁽⁴³⁾	Randomized controlled trial Double-blind	2	Mouthwash with Pérsica™ 10% X 0.12% CHX X Matrica 10% X Saline solution
	Ozden D, Turk G, Duger C, Guler EK, Tok F, Gulsoy Z. Effects of oral care solutions on mucous membrane integrity and bacterial colonization. Turkey, 2013 ⁽⁴⁴⁾	Experimental Controlled Randomized	2	0.5% Sodium bicarbonate X 0.2% CHX X Saline solution

	Azimi M, Jouybari L, Moghadam S et al. Antimicrobial effects of chlorhexidine, matrica drop mouthwash (chamomile extract), and normal saline on hospitalized patients with endotracheal tubes. Iran, 2016 ⁽⁴⁵⁾	Randomized controlled trial Double-blind	2	Mouthwash with 0.2% CHX X Matrica (chamomile extract) - 1 drop X Saline solution
				It does not report the Matrica solution concentration
	Wong T, Schlichting AB, Stoltze AJ et al. No Decrease in early ventilator associated pneumonia after early use chlorhexidine. Am J Crit Care. The United States,2016 ⁽⁴⁶⁾	Cohort Retrospective	4	Early CHX (in the first 12 hours) It does not report the CHX solution concentration
Mechanical and Chemical Control of the Dental Biofilm	Yao LY; Chang CK, Maa SH, Wang C, Chen CC. Brushing Teeth Purified Water to Reduce Ventilator-Associated Pneumonia. Taiwan, 2011 ⁽⁴⁷⁾	Controlled Randomized single-blind	2	Oral cotton swabs+ electrical toothbrush + pediatric toothbrush + purified water X oral cotton swabs + purified water
	Cuccio L , Cerullo E, Paradis H et al. An Evidence-Based Oral Care Protocol to Decrease Ventilator-Associated Pneumonia. Iceland, 2012 ⁽⁴⁸⁾	Quasi-experimental	3	Toothbrush and 0.12% CHX every six hours It does not specify the toothbrush type
	Prendersgast V, Kleiman C, King M. The Bedside Oral Exam and Barrow Oral Care Protocol: Translating evidence-based oral care into practice. The United States, 2013 ⁽⁴⁹⁾	Case report	6	Electrical toothbrush + toothpaste + tongue scraper + moisturizer + 0.12% CHX + oral assessment
	Conley P, McKinsey D, Graff J, Ramsey AR. Does an oral care protocol reduce VAP in patients with a tracheostomy? Switzerland, 2013 ⁽⁵⁰⁾	Descriptive Prospective	6	Manual toothbrush + toothpaste + 0.12% CHX every 12 h
	Oliveira MS, Borges AH, Mattos FZ et al. Evaluation of Different Methods for Removing Oral Biofilm in Patients Admitted to the Intensive Care Unit. Brazil, 2014 ⁽⁵¹⁾	Controlled Randomized	2	(1) gauze and 0.12% CHX every 12 h (2) gauze and 0.12% CHX every 24 h (3) 0.12% CHX and brush every 12 h (4) 0.12% CHX and brush every 24h
	Cutler LR, Sluman P. Reducing ventilator associated pneumonia in adult patients through high standards of oral care: A historical control study. England, 2014 ⁽⁵²⁾	Historical control	4	Toothbrush +toothpaste + 1% CHX 1% (gel) + oropharyngeal aspiration

* CHX= chlorhexidine; ** PAMV= Pneumonia Associated to Mechanical Ventilation.

DISCUSSION

The results showed that the OH of critical patients had been a study object of many researcher nurses. However, in Brazil, publications by these professionals are still lacking.

Nursing practices related to the mechanical control of the dental biofilm

This practice refers to the mechanical method used by nurses to remove dental plaque from the oral cavity. We identified six articles⁽³³⁻³⁸⁾, in which the authors recognized brushing as a relevant technique for the mechanical reduction of respiratory patogenic bacterias of the dental biofilm.

However, studies⁽⁵³⁻⁵⁴⁾ refer that there are authors claiming that the mechanical brushing action increases the chance of bacterial transport to the blood stream. Therefore, in these investigations, the individuals are healthy or have periodontitis and/or gengivitis.

This relationship of brushing with transitory bacteremia was the investigation theme in a study⁽³³⁾ with 30 patients in a general ICU under Mechanical Ventilation (MV) in a university hospital located in Texas. Before the intervention, the oral health of each individual was assessed regarding the microbiota, dental plaque scores, presence of bleeding and lesions. Participants received brushing for two minutes with a pediatric toothbrush and toothpaste twice a day. A group of blood sample for quantitative culture was collected. The first was taken before brushing, the second one after one minute and, the third one, after 30 minutes. The second group was obtained during programmed brushing 48 hours later. None of the individuals had bacteremia by positive blood culture before or after the brushing interventions. According to the authors, one limitation was the estimated sample size.

It is important to highlight that it is not recommended to use a toothbrush for patients with severe platelet disorders, due to the strength performed by the professional's hands, which can cause complications, like bleeding. On the other hand, a pediatric brush or a soft brush can facilitate the OH in intubated patients, as it reduces the risk of trauma and bleeding⁽¹⁶⁾.

Other revised articles presented the relationship between the mechanic brushing with the PAMV rates. One of them⁽³⁴⁾ is a longitudinal prospective study conducted with 147 patients in a general ICU under MV. The objective was to verify the reduction of the dental plaque index in patients who received OH with electrical brushing and its association with the reduction of PAMV rates. Participants were randomized in two groups, (1) 0.12% chlorhexidine; (2) electrical toothbrush and 0.12% chlorhexidine. There was no significant difference between the groups. The association of the electrical brush and chlorhexidine did not significantly decrease the level of dental plaque, and it did not reduce the PAMV incidence.

Other investigation⁽³⁵⁾ with a descriptive character assessed the PAMV rates after the implementation of an OH protocol with pediatric toothbrush and toothpaste for two minutes, in two types of ICU: Trauma and Surgical. The results showed a significant decrease only in patients admitted to the surgical unit. Such finding resulted in the researchers including 0.12% clorexidine every 12 hours in the OB protocol for the trauma ICU.

The patients admitted in the trauma ICU have their peculiarities. Normally, they present a systemic inflammatory response, such as at the beginning of the PAMV. For this reason, oral care practices cannot be framed in a unique protocol; the population characteristic is extremely important for standardization⁽³⁵⁾.

The relationship of the mechanical OH with the reduction in PAMV rates was also investigated in a randomized clinical trial⁽³⁶⁾ conducted with 54 patients with MV in a general ICU, in Iran. The participants were divided among intervention group (oral secretion aspiration associated with teeth and tongue brushing for three minutes and 15ml of chlorhexidine every 12 hours) and control group (teeth cleaning with a cotton ball + chlorhexidine twice a day). However, the two groups did not present a significant impact in reducing the PAMV rates.

On the other hand, another randomized controlled trial⁽³⁸⁾, also from Iran, showed a significant reduction ($P < 0.05$) in the PAMV incidence when conducting the mechanical removal of the dental biofilm twice a day. The study was developed with 168 patients admitted to the ICU, intubated, mechanically ventilated and who had at least 20 teeth. Participants were divided as intervention group (oropharyngeal aspiration, teeth cleaning, tongue and teeth brushing with a pediatric toothbrush and distilled water associated with a 20 ml application of chlorhexidine every 12 hours) and control group (oropharyngeal aspiration associated with a 20ml application of chlorhexidine in the whole oral region three times a day).

The type of brush (electrical and manual) was another investigation object between the analyzed studies. One controlled randomized study⁽³⁷⁾ with 56 patients in a neurological ICU in the United States aimed to compare two oral health protocols during intubation and 48 hours after extubation. The isolated effects of the manual brushing were compared in conjunction with the electrical toothbrush, tongue scraping and moisturizing. The patients who received only the manual brushing with toothpaste presented a significant worsening of the oral health during the intubation and after extubation. The group who received the mechanical cleaning with the electrical toothbrush with the toothpaste, the tongue scraping and moisturizing, had their oral health stable and without significant alterations.

Within the six articles selected for this category, only three approached the tongue cleaning, in the mechanical control of the dental biofilm. The importance to clean this mouth area, to decrease tongue coating, has been the theme of interest for few researchers⁽⁵³⁻⁵⁴⁾, it can be considered a reservoir of pathogens related with the higher risk of infection development related to health assistance.

Therefore, within the options in the scientific literature about the oral care of the critical patient, the brushing, being with the electrical or pediatric manual brush, is the one that possibly brings more benefits to reduce the formation of dental biofilm^(16,34-36).

Another resource for the mechanical biofilm control is dental floss. But the use of this instrument in the critical patient was not investigated either approached by the selected studies of this category. We did not find articles addressing the mechanical control of the dental biofilm in patients with spontaneous ventilation admitted in the ICU.

Nursing practices related to the chemical control of the dental biofilm

This category is related to research addressing the solutions used by nurses for the chemical control of the dental biofilm. There was a variety of solutions found in the eight selected articles.

One of them was the green tea and the boiled water. Researchers conducted a quasi-experimental study⁽³⁹⁾ aiming to compare the green tea and boiled water efficiency for the OH of 81 patients with orotracheal intubation under MV. There were three groups formed: the control, one using green tea and, one using boiled water. They assessed and monitored the oral mucosa of the study participants for 14 days. The control group patients received only routine oral healthcare (brushing and toothpaste with fluoride) once a day. From the intervention groups, one received a green tea mouthwash and the other, a boiled water mouthwash. Both had oral care routine every four hours. The results showed that in the patients who received green tea or boiled water, the severity of the oral mucosa changes was significantly smaller in six aspects: labial and lingual mucosa, gingival staining, salivary state, amount of plaque and, gingivitis. However, they alert for one study limitation related to the brushing frequency. It was conducted in a once a day routine, and it changed to six times a day. Such practice could also have contributed to the improvement in the oral mucosa.

The chlorhexidine gluconate was another solution studied by researchers. Five studies looked at this drug compared to other products. In a randomized controlled trial⁽⁴⁰⁾ the sodium bicarbonate use was compared to the chlorhexidine for the microbial colonization of the dental plaque with respiratory pathogens and the incidence of PAMV. One hundred and nine intubated patients submitted to MV were separated into three groups:

1. Mouthwash with sodium bicarbonate;
2. Irrigation with 0.2% chlorhexidine and sterile water;
3. Mouthwash with sterile water.

All participants also used toothbrush and toothpaste. The hygiene frequency was three times a day. The results showed that the patients who had their mouth washed with sodium bicarbonate had more tendency to have their bacterial colonization reduced, but the results were not statistically significant.

The comparison of the chlorhexidine use with sodium bicarbonate was also investigated in an experimental randomized controlled trial⁽⁴⁴⁾ with 60 patients admitted to general ICU. The objective was to compare the influence of 0.5% sodium bicarbonate (1); 0.2% chlorhexidine (2); saline solution (3) in the oral mucosa integrity and bacterial colonization in individuals who were in MV. Regarding the oral mucosa integrity, there were no significant differences between the groups. In relation to the bacterial colonization, *P. Aeruginosa* remained constant in the saline group, and it increased in the others. However, the *A. Baumannii* showed a decrease only in the chlorhexidine group.

Meanwhile, there were other two articles^(42,46) that exclusively addressed the chlorhexidine used as a chemical agent to prevent PAMV. The first⁽⁴²⁾ is an experience report, which showed that the substitution of the solution used (0.05% cetylpyridinium chloride) by the 0.12% chlorhexidine gluconate in the OH protocol

incorporated in the prevention bundle for the PAMV had a significant impact on reducing the rates of this respiratory infection from 33.3% to 3.5%.

On the other hand, a second study, a retrospective cohort⁽⁴⁶⁾ with 134 patients admitted to the ICU, revealed that the preventive chlorhexidine use in the oral region in the first 12 hours of orotracheal intubation and MV was not associated with a decrease of PAMV incidence. Nevertheless, the researchers did not report the solution concentration for the chlorhexidine used in the study.

The chlorhexidine is a chemical agent, and it has a broad microbial spectrum. Its efficacy has been demonstrated in 0.12% concentration to reduce the formation of oral biofilm. Moreover, there is a reduction of adverse events caused by the substance in higher concentrations., however, the daily use of this solution provoke undesirable adverse events as stains in the teeth and tongue, loss of palate and burning sensations in the oral mucosa. Therefore, other formulations have been developed to improve these aspects, keeping the adequate control of the oral biofilm formation^(5,10,12,14,17).

In Brazil, the National Health Surveillance Agency⁽⁵⁵⁾ indicates the use of 0.12% or 0.2% oral chlorhexidine gluconate as recommended measures for the prevention of hospital pneumonia and MV-related mortality with the objective to eradicate the oropharyngeal bacterial colonization and to reduce the pneumonia occurrence.

Yet, the investigatio of natural products with antimicrobial activity has been attracting the attention of many researchers, motivated by the resistance increase against traditional antimicrobial agents and adverse effects^(1,9).

Plant-based antiseptics⁽⁴³⁾, as the 10% PérsicaTM and 10% Matricaria were compared to the antibacterial effects of the 0.2% chlorhexidine gluconate in 80 patients in the general ICU. All solutions had a significant effect in reducing the *S.aureus* and *S Pneumoniae* in the oropharhyge of patients under MV. But the 0.2% chlorhexidine was the most effective mouthwash. The PérsicaTM was more effective when compared to 10% Matricaria.

The comparison of the antibacterial effects of the 0.2% chlorhexidine and the Matricaria (Chamomille extract)⁽⁴⁵⁾ was also conducted by a double-blind, randomized controlled trial with 39 adults patients hospitalized in an ICU, intubated and under MV for 48 hours. The participants were allocated into three groups (chlorhexidine, matricaria and saline solution). Oropharyngeal swabs were collected from all individuals before and after using the oral solutions. These were applied in the whole mouth, including teeth, tongue, pallate and cheeks three times a day for six minutes, with 10 milliliters of mouthwash. The results showed that the 0.2% chlorhexidine is more effective to prevent colonization of bacterias in the mouth when compared to Matricaria mouthwash and saline solution.

The Listerine® as a mouthwash was also assessed⁽⁴¹⁾ among the analyzed articles. This product contains the combination of three essential oils: eucalyptol, thymol and, menthol. A comparative controlled randomized trial⁽⁴¹⁾ with 398 adult patients in MV aimed to compare the effects of this product to sodium bicarbonate to reduce dental plaque colonization with respiratory pathogens and in the PAMV incidence.

Compared to the control group, both were not effective to reduce colonization, neither the PAMV incidence.

Therefore, within the studies selected for this category, we found a variety of solutions used by nurses to chemically control the dental biofilm of intubated patients and under MV. From those, the chlorhexidine in 0.12% and 0.2% concentrations was the drug that prevailed in the investigations. Only two studies used solutions that did not involve chlorhexidine.

Solutions used in tracheostomized patients under MV and conscient patients with spontaneous breathing but totally care dependent, but they were not investigated in the selected studies.

Nursing practices related to the mechanical and chemical control of the dental biofilm

This category refers to the chemical control of the dental biofilm associated to mechanic control conducted by nurses. We identified six articles regarding this category.

A single-blind randomized controlled trial⁽⁴⁷⁾ aimed to assess the OH effects using brushing and purified water on the PAMV rates in ICU patients during post neurosurgery. There were 53 participants divided into experimental and control. On the first group, the OH was conducted with cotonetes[®] (cotton swabs), electrical toothbrush (cleaning on the facial side of the teeth), peadiatric toothbrush (cleaning the lingual side of the teeth, gum, mucosas, and dorsal tongue) and purified water. In the second, corresponding to the control group, the hygiene was conducted only with oral cotonetes[®] and purified water. The results showed that the brushing twice a day with purified water significantly reduced the cumulative incidence of PAMV in the experimental group and increased it in the control group.

In another study⁽⁴⁸⁾, with a quasi-experimental design, the objective was to assess the OH effectiveness of toothbrushing associated to 0.12% chlorhexidine in patients under MV. The authors concluded that after the association of both interventions four times a day, there was a significant reduction (63%) in the PAMV levels in the three ICUs participating in the investigation.

A similar result was seen by a case-report study⁽⁴⁹⁾, that described the significant reduction of the PAMV rates (50%) and the hospital costs (65%), in a general ICU with 32 bed in the United States. These results occurred after the implementation of an oral assessment tool (Bedside Oral Exam) and of an evidence-based hygiene protocol, including the electrical toothbrush, non-foaming toothpaste, tongue scraper, swab soaked in 0.12% chlorexidine and, moisturizer for lips and mucosas.

The PAMV level in tracheostomized patients was also investigated by the research nurses. This was a prospective study⁽⁵⁰⁾ with 75 tracheostomized patients under MV. The objective was to assess the efficacy of an OH protocol to reduce PAMV. The mechanical control of the dental biofilm was done with manual toothbrush and toothpaste. The chemical control was done with 0.12% chlorhexidine after 30 to 60 minutes of brushing, every 12 hours. This intervention significantly decreased the PAMV rates. Withing the 20 articles selected for analysis, this was the only study that investigated the OH in tracheostomized patients.

The mechanical associated to a chemical intervention to reduce the oral biofilm was investigated by two other studies. The first, a randomized controlled trial with 48 patients in a general ICU⁽⁵¹⁾. Participants

were separated into four groups:

1. OH with gauze soaked in 0.12% chlorhexidine every 12 hours;
2. Gauze soaked with 0.12% chlorhexidine every 24 hours;
3. 0.12% chlorhexidine and brushing every 12 hours;
4. 0.12% chlorhexidine and brushing every 24 hours.

The results showed that the 0.12% chlorhexidine use associated with the mechanical action of the toothbrush or the gauze, in both experimental periods (12 and 24 hours) were effective for the dental biofilm control.

The second refers to a historical control study⁽⁵²⁾ with 1.087 ICU patients under MV for at least 48 hours. The objective was to implement and assess the impact of an OH measure package on the PAMV incidence and the costs related to it. Oral care involved toothbrushing with toothpaste twice a day; toothbrushing with 1% gel chlorhexidine four times a day and oropharyngeal aspirations. Such intervention caused a 50% reduction in the PAMV incidence, as well as, the decrease of costs associated with it.

Therefore, it can be said that the mechanical control of the dental biofilm associated to the pharmacological control can significantly reduce the PAMV rates in ICU patients.

CONCLUSION

The integrative review allowed us to build a synthesis of nursing practices related to OH for critical care patients. The small number of publications about the theme by Brazilian research nurses did not allow us to compare national practices conducted by these professionals with international practices. This was a study limitation.

However, considering the review findings, it was possible to elect and to recommend toothbrushing practice for the mechanical control of the dental biofilm. Within the studies selected for analysis, there were many types of toothbrushes being used by nurses as: pediatric, electrical or manual. Yet, the soft bristle or pediatric toothbrushes were the most recommended, sustained by studies of evidence level two.

Regarding the chemical control, the chlorhexidine gluconate, being in 1% gel or as a mouthwash (0.12% or 0.2%) was the most prevalent. Regardless of the lack of uniformity in relation to this drug concentration, the 0.12% was the most used. These results point that nurses are trying to follow the last evidence, which has been recommending the use of this anti-microbial and antiseptic product for patients under MV to prevent PAMV and possible systemic infections.

Moreover, it was evident that brushing or using chlorhexidine only does not significantly reduce the PAMV rates. Studies that had more effective results to reduce this respiratory infection did the mechanical control associated with the chemical for the dental biofilm.

One of the gaps found was that most articles were limited to oral care of intubated patients and under MV. Only one article investigated this practice in tracheostomized patients. No studies addressed the use of dental floss in ICU patients.

Regarding the OH frequency, we found divergencies. It is known that such fact is due to the diverse types of ICUs (surgical, general, neurological, trauma). The number of times that OH should be conducted will depend on the oral health conditions of each patient associated to their peculiarities.

Thus, it is indispensable to include protocols based on current evidence associated with an interdisciplinary action between nursing and odontology, so the patient can have his real necessities met. The interdisciplinarity of the critical patient care is essential to establish standardized conducts.

Regarding the relevance for the clinical practice, it can be said that this review collaborates with discussions regarding planning, intervention, and assessment of oral care of patients critically ill. It is important to highlight the conduction of more comparative clinical studies by nurses who work with this theme in the clinical practice, so it is possible to trace more effective oral care conducts, and the patients can receive a safe and quality assistance.

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