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Original Research Article

Oral evaluation of children and adolescents in intensive care unit

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Abstract

Introduction: Hospitalized children can present some complications if they do not present a correct oral care during hospitalization. **Objective:** This study aimed to perform an oral evaluation of children and adolescents hospitalized in an intensive care unit of a children's hospital at southern Brazil. **Material and methods:** 49 subjects were examined, aged from 0 to 17 years old, using the modified Oral Assessment Guide (OAGm). The lips, corner of the mouth, gums, oral mucosa, saliva, tongue, and teeth were examined. Each category was classified in a numeric scale from 1 to 3, where 1 means the better condition and 3 the worse. **Results:** The results showed alterations in the lips, tongue, oral biofilm, and saliva in most of the subjects. The OAGm value indicated a worse oral condition in older children. The OAGm values for children with teeth were higher than that for edentulous children, this difference was statistically significant ($p<0.05$). **Conclusion:** It could be concluded that children hospitalized in an intensive care unit show deficiency in oral health when assessed through OAGm.

Introduction

Patients hospitalized in an intensive care unit (ICU) show 70% of the microorganisms present in the dental biofilm and 63.33% in the tongue [16]. The accumulation of dental biofilm causes the deterioration of the membranes and the mucosa, leading to gingivitis and potential colonization of respiratory pathogens [2]. The aspiration of secretions colonized by oral microorganisms which accumulate above the cuff of the orotracheal tube is the main entrance of pathogens in the respiratory tract, and could result in pneumonia associated to ventilation [3, 13].

Considering the hospital environment, Silva *et al*. [15] demonstrated that from three days of hospitalization, hospitalized children showed an average of 67.7% of dental plaque index, from five days the value reached 100%, and the ideal value is a prevalence of 10%.

The composition of the dental plaque, presence of calculus and caries can influence the bacteria that colonize the oropharyngeal region, leading to complications in the patient's general condition [10]. Endogenous effects like fever and stress during this period also can compromise the oral health condition if associated with poor oral hygiene [20].

Other important factor to consider in patients hospitalized in ICU is the presence of saliva, since it has an important buffer capacity, decreasing the number of bacteria in the oral cavity and the quantity of acids over the dental surface, this way contributing to a better oral health [20]. The saliva promotes mechanical removal of dental plaque and microorganisms and contains a variety of 15 components from the innate and specific immunity, like lactoferrin and immunoglobulin A, which provide defenses against the microbial growth [11, 18].

Some patients can show important cases of hyposalivation due to endotracheal intubation. The presence of the tube makes the patient stays with the mouth opened for long periods, what can aggravate the situation, especially because the restrictions of oral feeding, medications like antihypertensives, benzodiazepines and diuretics [2, 8, 14, 20].

Considering the importance of the oral health, especially to hospitalized patients, and the lack of researches in child hospitals when compared to adult hospitals, the aimed of this study was to assess the oral cavity of children and adolescents hospitalized in the intensive care unit of a hospital located in Joinville, Brazil.

Material and methods

The target population of this study was formed by 67 subjects, with age ranging from 0 to 17 years, hospitalized in the intensive care unit of a child hospital located in the city of Joinville, southern Brazil. The subjects were evaluated for one year, from July 2013 to July 2014. The inclusion criteria were: the subject must he hospitalized in the intensive care unit, the patient's physician should agree with the participation of the subject in the study. All children's legal responsible signed an informed consent form. Patients were excluded from the study when their parents or legal responsible did not signed the informed consent form, or in isolation or no agreement by their physician, or using oxygen mask.

This study integrated the research project "Clinical assessment of oral diseases in hospitalized children and adolescents" which was approved by the local ethics committee (Ethics Committee approval #051/11). The oral exam was performed based on the Oral Assessment Guide (OAG) [4, 8], modified by the authors (removed the criteria swallowing and voice) to attend the needs of this specific research. For the oral exams, an experienced researcher trained two examiners to perform the exams. The examiners wore appropriate individual protection equipment, as determined by the intensive care unit. The oral exams were performed with the aid of sterile gauzes and wooden sticks.

Six categories were assessed (lips and corner of the mouth, gums, mucosa, saliva, surface of the tongue, and teeth). Each one was classified with scores from 1 to 3, when 1 means the best condition and 3 the worse. From the sum of the scores form each category, the individual score for each patient was obtained. The minimum value expected for edentulous patients was 5, indicating a healthier condition, and 6 for patients with teeth. The maximum value for edentulous patients should be 15, and for patients with teeth, 18, indicating poor oral hygiene and unsound mucosa. Table I shows in summary the assessment method of the OAGm.

In addition to the record of the scores, other four criteria were assessed: intubation, period of hospitalization, age, and teeth eruption.

Data were tabulated with the aid of Microsoft Excel (Microsoft Corporation, Redmond, WA) and submitted to statistical analysis. The chi square test and Spearmean's correlation test were used, both with a significant level of $p=0.05$. The Student's t test was used to evaluate the differences of the means between groups.

Table I – Adopted criteria for the assessment of the oral cavity

Category	Method of assessment	Scores		
		1	2	3
Lips and corner of the mouth	Observation of the appearance of the tissues	Normal, smooth, red colored.	Dry, cracked, bloated	Ulcerated or bleeding
Tongue	Observation of the appearance of the tongue	Normal, firm and without cracks. Prominent papilla.	Loss of papilla. Smooth, brilliant, red colored or with Candida.	Ulcerated or cracked. Totally covered by gunk
Saliva	Observation of the quality of the saliva	Normal, thin and aqueous	Excessive and thick	Viscous or absent
Mucosa	Observation of the appearance of the tissues	Normal, pink colored and moist.	Red colored, covered by ulceration or Candida	Ulcerated, with or without bleeding
Gums	Observation of the appearance of the tissues	Normal, without bleeding or red colored	Edematous or red colored	Spontaneous bleeding
Teeth	Observation of the appearance of the teeth	Clean, without oral plaque, without caries	Oral plaque in located areas	Widespread oral plaque along the gingival margin. Caries

Results

It was obtained the signed consent form from 67 subjects, although it was not possible to perform the exams in 18 subjects. This is because 8 patients were in contact isolation, 2 were wearing oxygen mask, and other 8 patients were absent at the time of the exams (they had received medical discharge or were out for tests).

49 patients were examined, 19 females and 30 males. The mean age was 3 years old. The figure 1 illustrates the phase of the dentition the subjects were.

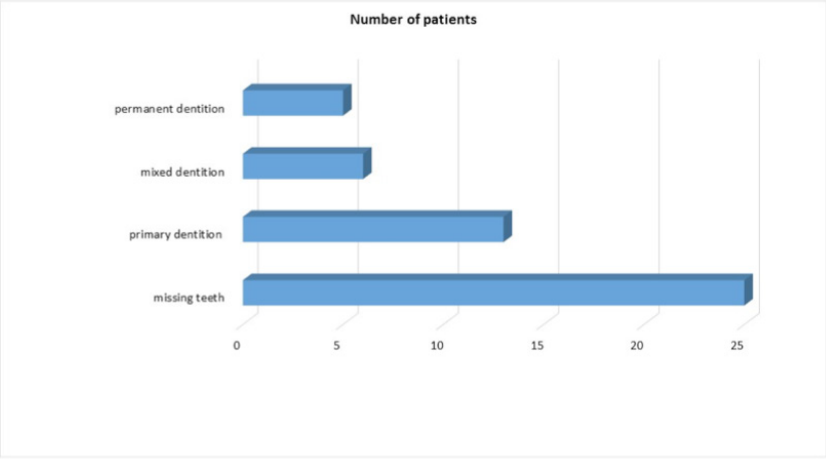

Figure 1 – Number of patients according to dentition

The scores showed in table II indicates the oral health condition of the patients in the 6 evaluated parameters. The evaluated parameter that showed more normality was the mucosa and gums (93% e 92% respectively), and only 2% of the evaluated had bad results in these two parameters. The parameter that showed higher alterations was the saliva, with 41% of the patients showing viscous or absent saliva.

In the four evaluated criteria (intubation, period of hospitalization, age, and dental eruption) a mean OAGm was calculated, according to the number of patients in each group, these values are described in table III.

Table II – Distribution (%) of the evaluation scores accordingly to the categories of the OAGm

Parameters	Scores		
	1	2	3
Lips	25%	61%	14%
Tongue	43%	33%	24%
Saliva	35%	24%	41%
Mucosa	93%	4%	2%
Gums	92%	6%	2%
Teeth	67%	12%	21%

Table III – Mean OAGm in evaluated groups

Evaluated group	N. of patients	OAGm
Intubated	17	8.7
Not intubated	32	8.56
≤ 5 hospitalizations	24	9.58
≥ 5 hospitalizations	25	8.08
<1 years old	25	7.7
1-4 years old	12	8.5
> 5 years old	12	10.83
With teeth	24	9.6
Edentulous	25	7.76
Overall average	49	8.63

Criterion 1 – Intubated

The mean OAGm of the patients was 8.63. Of the 17 who were intubated, the OAGm was 8.7, while of the 32 who were no intubated was 8.56. There was no significant difference (p=0.84) among the groups for this criterion. Regarding the lips and corner of the mouth, which were ulcerated for this group of patients, the results showed no significant difference (p=0.26), although there was a higher prevalence of dry lips (17/49 – 35%) than normal (9/49 – 18%). Comparing the presence of saliva in these patients, there was also no significant difference (p=0.52).

Criterion 2 – Period of hospitalization

For the 24 patients hospitalized for less than 5 days, the mean OAGm was 9.58, and 8.08 for the patients hospitalized for more than 5 days. This difference was not statistically significant (p=0.57). For this group there was also no significant difference (p=0.17) regarding the prevalence or oral plaque.

Criterion 3 – Age

The 25 patients with less than 1 year old showed a mean OAGm of 7.79. The 12 patients from 1 to 4 years old, showed a mean of OAGm of 8.5, and the 12 patients older than 5 years old showed a mean OAGm of 10.83. For this criterion there was no significant differences (p=0.5681). Considering the prevalence of dental plaque between the subjects with less than 5 years old (not included the ones with no dental eruption), there was significant difference compared with the patients with more than 5 years old (p=0.012), thus, there was a bigger amount of dental plaque in the patients with more than 5 years old.

Criterion 4 – Dental eruption

The result of the mean OAGm of the children with teeth (9.6) was higher than the OAGm of the edentulous ones (7.76). However, with no significant differences between the groups means (p=0.99). The greatest OAGm was recorded for patients older than 5 years old. When comparing patients with and without teeth, there were significant differences regarding lips alterations (p=0.049). In edentulous children, the prevalence of dry lips was greater; in children with teeth there was a greater prevalence of dry and ulcerated lips.

Discussion

There is no universal and standardized method for oral assessment in hospitalized patients, neither for patients in critical condition. The OAG is a tool that have been used for nurses to assess, record, and notify alterations in the oral mucosa of oncologic patients, pediatrics and adults [2, 17]. There is another tool, like the Brushed System [7], that consider bleeding, redness, ulcerations, saliva, halitosis and external factors like debris.

The Bedside Oral Exam [14] assess swallow, lips, tongue, saliva, mucosa, gums, teeth or dentures and smell. These have been used to classify parameters and guide the oral care in patients in critical conditions. However, to assess the oral condition in a wide age range, like in this study, we made some modifications in the OAG. the criteria swallow and voice were removed because these criteria were not possible to be assessed in intubated patients and babies, and an evaluation of the dental plaque was added. It was considered necessary to perform a standardized assessment of the oral condition at the time the patient enter the intensive care unit, to diagnose oral alterations, providing preventive care and performing adequate treatment.

In this study, the major problems detected were related to dry or ulcerated lips, gunk in the tongue, large amount of dental plaque in teeth, and absence of saliva. Published studies similarly show that patients hospitalized in intensive care units had damages in the oral health, though, these studies are limited to the adult population [8].

The literature is consistent about the fact that the maintenance of the oral health in unsound conditions has been pointed as a factor that can influence the incident of nosocomial pneumonia and aspiration pneumonia [15]. The risk for ventilation pneumonia must be considered in children and preventive programs are needed [4]. Even if the oral problems in children are minor, it is necessary to assess and compare the oral conditions in children with other studies to establish the priorities and protocols for oral care in children.

The results indicated a minimum difference of the OAGm index between intubated patients (8.70) and not intubated patients (8.56). However, this result may be influenced by the size of our sample. Nevertheless the result is important, because the literature[15] show that patients submitted to mechanical ventilation are more likely to develop pneumonia associated to mechanical ventilation in terms of 7.7 to 40%. This occurs because the

endotracheal tube provides a surface for bacteria, which adhere and grow, creating biofilms that can be aspired to the inferior respiratory tract. Thus, it is important an intervention to eliminate the bacteria in the surface of the tongue.

This study showed a high frequency of patients with dry lips (61%) and absence of saliva in 41% of the patients, which may be related to the intubation, since they remain with the mouth opened, medications, and dehydration. It is known that the saliva secretion has an significant role in the maintenance of the oral health, once it contributes to the stability of the oral, pharyngeal and esophageal pH, and to the equilibrium of the microbiota. In addition, it has properties related to immunological processes and tissue reparation due to the presence of cytokines, antibodies, and tissue growth factors. Therefore, its relevance is not limited to the mouth, but saliva can be considered essential to the inflammatory healing of oral, esophageal, and gastric processes [6]. When suppressed or diminished, it causes the feeling of dry mouth, difficulties in swallowing and enhance the risk of development of opportunistic infections [12].

The viscous saliva was found in 24% of the patients, indicating a decreasing in the secretion of the parotid gland, which respond promptly to mechanical and chemical stimulus with a fluid secretion that provides self-cleaning, and is also rich in bicarbonate, neutralizing acids. Probably in these cases of viscous saliva, there is a predominance of the secretion of the submandibular gland, part of the sublingual and minor glands. This salivary flow in rest is predominantly mucous. This viscous saliva has been related to bacteria aggregation and stagnation of organic matter, with formation of volatile sulfur compounds that causes a bad breathe. The decrease of the salivary flow has been related also to the occurrence of candidiasis and stomatitis [18]. The importance of the saliva to the pH maintenance of the superior gastrointestinal tract is primordial. Moreover, it has defense factors like antibodies, cytokines, and growth factors that act in oral inflammatory processes, oropharynges, esophagus, and stomach [5].

In relation to the tongue, 24% showed the tongue totally covered by gunk, what can be related to the salivary alterations, once it is kwon that in the presence of moderate hyposalivation, an increase of four times in the capacity of bacteria aggregation in a single peeled cell in the tongue dorsum ay occur [2].

Regarding the period of hospitalization, we did not found significant differences in the OAGm index between children with more than 5 days of hospitalization (8.08) and those who were hospitalized for less than 5 days (9.58) (p=0.17). This difference can be related to the fact that most of the children were edentulous, thus there was less surfaces for bacterial colonization, beyond the fact that the sample size was small [2, 6, 17]. The oral hygiene protocol of the hospital where the study was conducted consisted of mouth rinsing with Cepacol (Sanofi, Suzano, SP, Brazil) for awake patients and with 0.12% chlorhexidine solution for unconscious patients. Data in the literature [4] inform that adults hospitalized in intensive care unit with an oral hygiene protocol have an increase in their oral condition along the hospitalization period.

One of the possible risk factors to the decrease in the oral hygiene could be the period of hospitalization equal or longer than 5 days, which suggests that the longer the hospitalization period, the more likely the patient is to develop respiratory infections acquired in the hospital environment [12]. A prospective study [10] concluded that children with longer periods of hospitalization showed the presence of pathogen microorganisms in higher levels than the normal flora, representing a risk for the child.

Comparing the oral condition with the hospitalized patient's ages, a larger amount of plaque in children older than 5 years old and there was a tendency for the OAGm index to be higher in the older children (10.83 for the older than 5 years old; 8.50 for the ones between 1 and 4 years old and 7.79 for the younger than 1 year old), however, without significant differences (p=0.5681). In a similar way, the OAGm index was higher in children with teeth, thus older, than in edentulous children. We did not found any report in the literature assessing the oral condition in children hospitalized in intensive care units, to perform comparisons. Nonetheless, data from the literature show that the greater the age range, the greater the probability that oral alterations occurs in hospitalized patients [5].

For the oral assessment, the presence or absence of teeth must be considered, once the hygiene should be stricter in patients who have teeth in the oral cavity [1], since when the oral cavity is not cleaned, it can harbor pathogenic microorganisms [9]. The best way to remove the dental plaque is mechanically, through teeth and tongue brushing [10, 19]. Concerning the alterations in the mucosa and gums, these were absent in most of the evaluated subjects, which may be explained by the fact that most of the sample was formed by edentulous patients.

The data agrees with Araújo *et al*. [1], who affirmed the importance of the oral hygiene orientation and the conscious of the potential oral problems should be understood by all members of the hospital team, including physicians and nurses,

to obtain improves in the condition of the patients. In an exploratory study conducted in Porto Alegre, Brazil, interviewed nurses reported they had not received adequate formation to perform the oral care in hospitalized patients [18]. The oral exam should be part of the evaluation routine in intensive care units, to perform adequate oral care according to the age and oral alterations found in each patient.

Conclusion

The children hospitalized in the intensive care unit showed oral alterations when assessed with the OAGm. The most found problems were: dry or ulcerated lips, gunk in the surface of the tongue, large amount of dental plaque in teeth, and absence of saliva. The period of hospitalization and the fact that the patient was intubated did not interfere in the oral conditions.

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