

Prevalence of oral manifestations in soft tissues during early childhood in Brazilian children

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Abstract: This study aimed at assessing the prevalence of soft tissue oral manifestations in children during early childhood, according to age group, gender, and site in the oral cavity, and at correlating these oral manifestations with systemic alterations. A cross-sectional study was conducted involving 586 children from 0 to 3 years of age (12.4 ± 11.8 months), 316 (53.9%) male and 270 (46.1%) female, in the city of Mauá, SP, Brazil. Examination was performed by a single examiner (Kappa Index = 0.90) according to World Health Organization criteria (WHO, 1997). The prevalence of oral manifestations in the soft tissues of children during early childhood was 34.8%. The age group showing statistical significance was 0-1 months old (56.4%). Epstein's pearls were significantly present (43.2%) in 0-1-month-old babies, and gingivitis in 12-24-month-olds (15.9%). The palate was the most affected region (16.7%). Infectious alterations were the most prevalent systemic alteration (20%). An association was observed between the presence of systemic alterations and the occurrence of oral manifestations. The prevalence of oral manifestations was 34.8%, regardless of gender, and was manifested mostly in 0-1-month-old babies. The palate was the most prevalent region, and the majority of oral manifestations were associated with systemic alterations.

Keywords: Child; Diagnosis, Oral; Pathology; Prevalence.

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Introduction

In order to achieve and maintain oral health during early childhood, it is important for the pediatric dentist to know how to diagnose and treat oral manifestations, whenever necessary. A baby presents unique and transitional anatomical structures that are typical of this age of life. Aside from the characteristic physiological alterations occurring in this age group, there are specific developmental alterations and diseases.^{1,2,3,4}

Numerous studies have proven the importance of the dentist during the diagnostic process of many systemic diseases. The first manifestation of systemic alterations often occurs in the oral cavity.^{5,6}

There are many reports in the literature regarding dental caries^{7,8} and periodontal disease;^{9,10} however, there are few studies related to the prevalence of soft tissue manifestations, and they address varied methodological criteria. The effort being made to offer an appropriate system for collecting data is insufficient, resulting in a series of methodological problems that often yield incorrect and inconsistent results. Epidemiological studies conducted in

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the past have shown a considerable discrepancy in the prevalence of soft tissue lesions in the oral cavity.^{11,12,13,14}

The purpose of this study was to assess the prevalence of oral manifestations in the soft tissues of Brazilian children from 0 to 36 months old, according to age group, gender, and location, and to correlate these manifestations with the presence of systemic alterations.

Methodology

This cross-sectional survey was first conducted with a sample composed of 706 children treated at the *Unidade de Saúde* (Municipal Health Unit - HU) of Mauá, State of São Paulo, Brazil, from May to December 2007, following approval by the Research Ethics Committee (EC/CSU-072/06). The inclusion criteria were children from 0 to 36 months old, of both genders and all ethnicities. The exclusion criteria were children with nasal/labial cleft, children undergoing dental restorative treatment who were not participating in the orientation groups, children with dental urgencies, and children whose legal guardians did not agree to sign the consent term. The final sample resulted in 586 children (12.4 ± 11.8 months), 316 (53.9%) male and 270 (46.1%) female. Diagnosis of systemic alterations was determined by a pediatrician.

The clinical examination of babies under 12 months old was conducted in the knee-to-knee position, under the operating light of the dental chair, whereas the remaining children were examined in the dental chair. In the maternity ward, the procedure was conducted in the maternity crib, using a penlight. The examination was conducted by a single, previously trained examiner (Kappa=0.90). The spreadsheet data from the epidemiological survey and the photos of the oral manifestations, duly authorized by the legal guardians, were collected by the HU dental nurse, and the data from the maternity were collected by the neonatal nurse.

The WHO clinical diagnostic criteria were used to determine oral mucosal alterations,^{15,16} as used by other authors.^{12,17,18} The sequence of examinations of the oral mucosa includes: 1- upper lip (vermillion); 2- upper labial mucosa; 3- upper alveolar mucosa; 4- upper gingival/alveolar ridge; 5- hard palate; 6- soft palate; 7- oropharynx; 8- dorsum of the tongue; 10- ventral tongue; 11- floor of the mouth; 12, lower gingival/alveolar ridge; 13- lower alveolar mucosa; 14-

right and left buccal mucosa; 15- lower labial mucosa; 16- lower lip (vermillion); and 17- labial commissures.

For data analysis purposes, the 586 children examined were divided into 4 groups according to age: 0 to 1 month old (34%), 1 to 12 months old (19%), 12 to 24 months old (24.8%) and 24 to 36 months old (22.2%). The criteria for dividing the sample into age groups were based on major changes in the oral cavity and the appearance of oral manifestations: 0-1 months, newborn; 1-12 months, a period of neurophysiologic changes and feeding accompanied by tooth eruption; 12-24 months, eruption of primary molars; 24-36 months, a period in which the primary dentition is complete and stable.

Age groups, gender, oral manifestations and systemic conditions were compared using the Chi square and Fisher Exact tests (Minitab statistic software, version 14.2, Minitab Inc., State College, USA), together with a binary logistic regression model to identify predictors of oral manifestations, considered as independent variables (PASW Statistics v. 18.0.0, SPSS Inc., Chicago, USA).

All the tests were analyzed with a significance of $p < 0.05$.

Results

The oral manifestation distribution according to age and gender (Table 1) showed a statistically significant difference related to age. In the first month of life, a higher percentage of oral manifestations are observed, probably related to inclusion cysts.

Table 1. Distribution of oral manifestation cases according to age and gender.

	Oral Manifestation		Total N (%)	P
	Yes N (%)	No N (%)		
Age group				
0 Ø 1 month	111 (56.4)	86 (43.6)	197 (100)	< 0.001
1 Ø 12 months	18 (15.8)	96 (84.2)	114 (100)	
12 Ø 24 months	53 (36.6)	92 (63.4)	145 (100)	
24 Ø 36 months	22 (16.9)	108 (83.1)	130 (100)	
Gender				
male	108 (34.2)	208 (65.8)	316 (100)	0.727
female	96 (35.6)	174 (64.4)	270 (100)	
Total	204 (34.8)	382 (65.2)	586 (100)	

Chi square test ($p < 0.05$).

Table 2. Prevalence of oral manifestations according to age group.

Oral manifestation	Age group (months)				Total N (%)	p*
	0 Ø 1 N (%)	1 Ø 12 N (%)	12 Ø 24 N (%)	24 Ø 36 N (%)		
Epstein's pearls	85 (43.2)	2 (1.8)	-	-	87 (14.8)	< 0.001
gingivitis	2 (1.0)	3 (2.7)	23 (15.9)	12 (9.2)	40 (6.8)	< 0.001
ankyloglossia	13 (6.6)	5 (4.4)	4 (2.8)	2 (1.5)	24 (4.1)	0.024
Bohn's nodules	20 (10.2)	4 (3.5)	-	-	24 (4.1)	< 0.001
eruption gingivitis	1 (0.5)	-	15 (10.3)	4 (3.1)	20 (3.4)	< 0.001
dental lamina cyst	11 (5.6)	-	-	-	11 (1.9)	-
candidiasis	2 (1.0)	6 (5.3)	1 (0.7)	-	9 (1.5)	-
eruption cyst	2 (1.0)	-	5 (3.5)	1 (0.8)	8 (1.4)	-
primary herpes	-	-	3 (2.1)	1 (0.8)	4 (0.7)	-
traumatic lesions	-	-	2 (1.4)	2 (1.5)	4 (0.7)	-
geographic tongue	-	-	3 (2.1)	1 (0.8)	4 (0.7)	-
coated tongue	3 (1.5)	-	1 (0.7)	-	4 (0.7)	-
molluscum contagiosum	-	-	-	2 (1.5)	2 (0.3)	-
eruption hematoma	-	1 (0.9)	1 (0.7)	-	2 (0.3)	-
persistent frenum labialis	-	-	-	2 (1.5)	2 (0.3)	-
angular cheilitis	-	-	1 (0.7)	-	1 (0.2)	-
aphthous ulcer	-	1 (0.9)	-	-	1 (0.2)	-
total of patients	197 (100)	113 (100)	145 (100)	131 (100)	586 (100)	-

* Chi square test ($p < 0.05$).

Accordingly, Epstein's pearls (a subtype of inclusion cysts) were more prevalent in the first month of life (Table 2), insofar as they are typical of this age group. However, gingivitis was prevalent in the age group of 12-24 months, the period of tooth eruption.

Inclusion cysts are frequently found in the oral cavities of newborn infants and are sub-grouped according to their location (alveolar or palatal) and origin. Epstein's pearls are cystic, keratin-filled nodules observed along the mid palatine raphe, derived from entrapped epithelial remnants. Bohn's nodules are mucous-gland cysts, on the alveolar ridges in the vestibular and lingual surfaces. Dental lamina cysts are observed on top of the alveolar ridge of newborns, originating from remnants of the dental lamina.^{4,19}

No significant difference in the prevalence of oral manifestations was observed related to the child's sex.

Concerning the region of the manifestations, the palate presented the most oral manifestations (16.7%), followed by gingiva (11.4%), alveolar ridge (8.9%) and tongue (7.8%).

The oral manifestation distribution, according to the systemic alterations, is presented in Table 3, and the prevalence of systemic alterations, according to the oral manifestation, in Table 4.

Table 5 shows the results for the logistic regression, together with the odds ratio values for each variable, in relation to oral manifestations. The results of this regression established an independent association between age group (1-12 months, 12-24 months, and 24-36 months), systemic change and oral manifestations. Children aged 1-12 months, 12-24 months and 24-36 months were 8.2%, 30.4% and 11.3% more likely, respectively, to present oral manifestations than babies between 0-1 months. Furthermore, children who presented systemic changes showed a 174-fold greater risk of exhibiting oral manifestations, compared with children who presented no systemic change. The inclusion of all these variables in the model, including gender, did not effect any change in the associations between oral manifestations, systemic changes and age group identified in the univariate analyses.

Table 3. Distribution of oral manifestations according to cases of systemic alterations.

Systemic alterations	Oral manifestation		Total N (%)	P
	Yes N (%)	No N (%)		
Yes	57 (85.1)	10 (14.9)	67 (100)	
No	147 (28.3)	372 (71.7)	519 (100)	<0.001
Total	204 (34.8)	382 (65.2)	586 (100)	

* Chi square test ($p < 0.05$).

Table 4. Prevalence of systemic alterations according to cases of oral manifestation.

Systemic alterations	Oral manifestation		
	Yes N	No N	Total N (%)
Infectious alterations	20	-	20 (30.0)
Hematological alterations	14	3	17 (25.3)
Respiratory alterations	11	6	17 (25.3)
Congenital alterations	9	-	9 (13.4)
Gastrointestinal alterations	3	1	4 (6.0)
Total number of patients	57	10	67 (100)

Fisher Exact test ($p < 0.05$)

Table 5. Results of the logistic regression using oral manifestations as the dependent variable and the other variables as independent variables.

Variables	Odds Ratio (95% CI)	p value
Systemic alterations	17.426 8.880- 34.197	<0.001
Sex (female)	1.044 0.700- 1.556	0.833
1 - 12 months	0.082 0.041- 0.162	<0.001
12 - 24 months	0.304 0.186- 0.497	<0.001
24 - 36 months	0.113 0.062- 0.206	<0.001

Discussion

In order to achieve and maintain oral health during early childhood, it is important for the pediatric dentist to know how to diagnose and treat oral manifestations in this age group. This study helps identify the oral soft tissue manifestations that are more prevalent in early childhood, mainly related to systemic changes, and determine the appropriate approach. The prevalence of oral manifestations in the soft tissue of children, as found in our study, was very similar to that reported in other studies; however, studies involving the age group from 0 to 36 months old are uncommon. In Spain,²⁰ 38.9% of 6 year-old children presented oral manifestations in soft tissues, whereas a prevalence of 32.9% was reported in 18 to 80 month-old children in South Africa.¹⁷ In Argentina,²¹ 33.8% of oral manifestations occurred in the age group from 0 to 15 years old, and 39%, from 4 to 13 years old, whereas the frequency of children age 0 to 12 years presenting oral mucosal diseases was 28.4% in Italy.²²

In other regions, an increase was observed in the prevalence of oral manifestations in soft tissues, from 52.57% in the age group from 0 to 12 years old²³ to 24.9% in the age group from 0 to 4 years old.¹⁸ In Brazil, the age group from 0 to 24 months old¹⁹ showed a prevalence of 21% for oral manifestations, whereas the prevalence in the age group from 0 to 5 years old was 2.30%.²⁴ In other countries, the prevalence was 4% in the age group from 5 to 17 years old,¹² compared with other studies, like NHANES III, where the prevalence for children from 2 to 17 years old was 9.11%.²⁵

Among cystic manifestations, the most prevalent were newborn cysts, with 20.8% in the age group from 0 to 36 months old. In relation to newborn cysts (Epstein's pearls, Bohn's nodules and dental lamina cysts), Epstein's pearls were the manifestation with the highest prevalence (14.8%). Similarly, Baldani *et al.*¹⁹ also observed that the newborn inclusion cysts (23.62%) were more prevalent than the other cystic lesions.

Notably, some authors observed a higher prevalence of gingival cysts than that observed in this study. One such case was Flinck *et al.*,⁴ who determined a prevalence of 74.9% for all the children assessed in the same age group from 0 to 1 month old. Corrêa *et al.*²⁶ determined a prevalence rate of 42.9% in the age group from 0 to 1 month old, similar to the rate found in the present study; however, Baldani *et al.*¹⁹ verified gingival cysts in 7.5% of the children in the age group from 0 to 24 months old.

Among the infectious manifestations, chronic gingivitis was confirmed as the most prevalent (6.8%) among all the children assessed, in that the most commonly affected age group was that of 12-to-24-month-olds (10.3%). However this manifestation was observed only in 1.5% of 0 to 24-month-olds,¹⁹ and the most commonly affected age group was also that of 12-to-24-month-olds (2.86%).

When considering candidiasis, 1.5% presented this infectious manifestation, in that the most commonly affected age group was 1-to-12-month-olds (5.3%). Another study²⁵ reported that 1.23% of the children assessed presented candidiasis in the age group from 0 to 7 years old. Candidiasis was slightly more prevalent among males (1.9%) than females (1.1%). Baldani *et al.*¹⁹ reported candidiasis in 2.50% of the age group from 0 to 24 months old, and males were

slightly more affected (2.78%), similar to the results found in the present study. Crivelli *et al.*²¹ observed candidiasis at a frequency similar to that determined in the present study; however, Kleinman *et al.*¹² determined a prevalence of only 0.01% in cases of children from 5 to 17 years of age. This is significantly lower than the percentage determined in the present study, although the age groups differed. The prevalence of candidiasis within a broad age group in some studies ranges from 12%¹³ to 0.57%.²⁴

It should be emphasized that few studies exist reporting or even including cases of molluscum contagiosum, a viral disease that affects the skin and mucosa of the entire body, with the exception of the palm of the hands and the sole of the feet.^{5,20,27,28} The present study observed that 0.3% of the children assessed presented this disease, in that the most affected age group was that of 24-to-36-month-olds (1.5%), although no statistically significant differences were observed in regard to gender.

Regarding herpetic gingivostomatitis, the study revealed that, among all the children assessed, 0.7% presented this disease, in that the most affected age group was 12-to-24-month-olds (2.1%). Santos *et al.*²³ determined a 0.6% prevalence of primary herpes, whereas Bessa *et al.*¹⁸ reported 0.4%. With respect to this manifestation, males were slightly more affected (1%). The absence of recurring lip herpes cases in this study can probably be attributed to the fact that the age group studied was very young. It is important to highlight that similar studies focused on different age groups, making direct comparison with the present study results difficult.

Among all the children examined, 4.1% presented ankyloglossia, and males were more frequently affected (5.4%). Messner *et al.*²⁹ observed a similar result of 4.8% cases among all the children assessed in the age group from 0 to 1 month old, whereas other authors reported a lower prevalence.^{4,11,19} Garcia-Pola *et al.*²⁰ also reported that males were slightly more affected.

The present study observed that 0.7% of the total number of children assessed presented traumatic lesions, in that the most affected age groups were those 12 to 24 months old (1.4%) and 24 to 36 months old (1.5%). Similar results were observed in some

studies,²¹ whereas a slightly higher prevalence was seen in others.^{13,17,18,23}

In relation to all the types of non-traumatic lesions that affect the mucosa, aphthous ulceration was the most prevalent.³⁰ In our study, 0.2% of all the children examined presented aphthous ulceration, in that the most affected age group was that of 1 to 12 months old (0.9%), and males were the most affected (0.3%). Similar results were observed in some studies,^{12,23} whereas the prevalence was higher in others,^{11,13,20} and, in one, females were slightly more affected than males.²⁰

According to the literature, a wide range of terminology is used in relation to the data observed: lesions,^{2,6,11,13,17,20,22,25} diseases,^{14,16} abnormalities,^{1,26} oral findings,⁴ conditions,^{16,23,24} oral pathologies,²¹ oral alterations,¹⁸ and oral changes.¹⁹ The term "oral manifestations" generally encompasses all of these classifications, and was used in this study.

Few epidemiological studies have correlated oral manifestations with systemic alterations. In the present research, 67 (11.4%) of the 586 children assessed presented systemic alterations. Notably, a very strong association was observed between the existence of a systemic alteration and the occurrence of oral manifestations ($p < 0.001$). A large percentage of mucosal lesions were related to systemic changes (85.1%), and were diagnosed following dental and medical evaluation, in contrast with another study,¹⁸ in which oral alterations were observed following the use of antibiotics. After diagnosis, specific prescriptions were given for systemic changes.

Immunosuppression (systemic alteration) predisposes a child to candidiasis, recurring aphthous ulceration, periodontal disease, herpes simplex and glandular alterations.²²

Crivelli *et al.*¹¹ and Arendorf and Vander Ross¹⁷ reported angular cheilitis in children of low socioeconomic conditions, resulting from malnutrition and folic acid, riboflavin and iron deficiencies. However, the research by Garcia-Pola *et al.*²⁰ found that children of higher socioeconomic conditions also presented this alteration. In this research, the children's socioeconomic condition was not assessed, although all of the children used public healthcare services.

The limitations of this study were that it was a convenience sample and had a cross-sectional design. Although based on the findings of the present study and those of other authors, it can be asserted that oral manifestations in newborns are not as rare as the sparse literature might suggest. However, it is necessary to standardize research methodologies, in order to enable the comparison and discussion of all the results obtained. Dental professionals who treat children in this age group must be able to diagnose and treat the oral manifestations whenever necessary, and to refer the child to a pediatrician for effective treatment, if the

presence of any systemic alteration is suspected. Thus, it is fundamental to understand the child in a holistic and dynamic manner, acknowledging the constant changes during his/her development and growth.

Conclusions

The prevalence of oral manifestations in the soft tissues of children during early childhood was 34.8%, and could be associated with systemic alterations. Systemic alterations are indicators of risk of oral manifestations, and children aged 12 to 24 months old show a greater chance of presenting these oral manifestations.

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