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Oral mucosal lesions' impact on oral health-related quality of life in preschool children

Luísa Jardim Corrêa de Oliveira[1], Dione Dias Torriani[1], Marcos Britto Correa[1,2], Marco Aurélio Peres[3], Karen Glazer Peres[3], Alicia Matijasevich[2,4], Iná da Silva dos Santos[2], Aluisio J.D. Barros[2], Flávio Fernando Demarco[1,2] and Sandra Beatriz Chaves Tarquinio[1]

[1]Postgraduate Program in Dentistry of Federal University of Pelotas (PPGO-UFPel), Pelotas, Brazil, [2]Postgraduate Program in Epidemiology, Federal University of Pelotas (PPGE-UFPel), Pelotas, Brazil, [3]Australian Research Centre for Population Oral Health (ARCPOH), The University of Adelaide, Adelaide, SA, Australia, [4]Department of Preventive Medicine, Faculty of Medicine, University of São Paulo, São Paulo, Brazil

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Abstract – *Objectives:* The aim of this study was to assess the prevalence of oral mucosal lesions and their impact on oral health-related quality of life (OHRQoL) in children aged 5 years. *Methods:* A sample of 1118 children from Pelotas' birth cohort, born in 2004 (response rate of 85.8%), were selected to participate in the study. Data were collected using a questionnaire applied to mothers and from the oral examinations of the children. OML were identified by type, site, and size. Early Childhood Oral Health Impact Scale (ECOHIS) was used to assess caregivers' perception on children's OHRQoL. Descriptive, bivariate, and multivariate Poisson regression analyses were carried out, considering the impact on OHRQoL (total ECOHIS score) as the outcome. *Results:* The prevalence of the OML was 30.1% (95% CI 27.5–32.9). Ulcers were the more prevalent type of lesion (29.4%), and the most affected site was the gums (31.0%). In bivariate analysis, there was a positive association between the presence of OML and OHRQoL impact measured by the following: mean overall score of ECOHIS ($P < 0.001$); extent ($P < 0.001$); prevalence ($P = 0.030$); and intensity ($P = 0.010$). After adjustments for sociodemographic and oral health variables, children with OML presented higher impact on OHRQoL [rate ratio (RR) 1.38 95% CI 1.11; 1.72] comparing with their counterparts. Analyzing specific domains, children with OML also presented higher impact on children symptoms (RR 1.46 95% CI 1.20; 1.66) and family functional (RR 3.14 95% CI 1.59; 6.22) domains. *Conclusion:* Almost one-third of children presented with oral mucosal lesions, and these lesions impaired children's oral health-related quality of life.

Key words: health surveys; mouth mucosa; oral health; preschool children; quality of life

Flávio Fernando Demarco and Prof. Sandra Beatriz Chaves Tarquinio, School of Dentistry, Post-Graduate Program in Dentistry-Oral Diagnosis Area – Federal University of Pelotas, Rua Gonçalves Chaves, 457, room 607, Pelotas 96015-560, Brazil
Tel.: +55-5332256741 R. 133
Fax: +55-5332256741 R. 133
e-mails: ffdemarco@gmail.com, sbtarquinio@gmail.com

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Oral mucosal lesions (OML) are conditions occurring in the soft tissues of the oral cavity, expressed by diverse clinical presentations. Their origin may be infectious (viruses, fungi, and bacteria), neoplastic, arising from trauma or local irritation, being manifestations of systemic diseases (metabolic or immunologic), or they could be related to habits and lifestyle (1, 2).

Data regarding frequency of oral lesions in children present in the literature ranged from 10.26% (3) to 28.9% (4), being frequently generated from oral pathology services (5, 6). However, the lack of uniformity in the valuation criteria in epidemiological studies impairs the comparison of the prevalence of these results.

Some types of oral mucosal lesions may cause pain and can lead to some difficulties in eating, speaking, and laughing (7, 8). Problems affecting the oral cavity may also provoke dental fear or dental anxiety in the children, and in a period of establishment of behaviors, they can produce long-term consequences, such as dental treatment

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avoidance, which can lead to more damages to the oral health, ultimately impacting in the oral health-related quality of life (9).

Many studies have demonstrated an impact of oral outcomes in oral health-related quality of life (OHRQoL), such as dental caries, dental traumatic injuries, and malocclusion (10–12). Recently, it has been reported that the OHRQoL of adolescents and adults could be impacted by the presence of the oral mucosal lesions (13–15), and a recent study has demonstrated the impact of the presence of fistula in preschool children (16). Data from population-based studies enable the generalization of the results for the aimed population, helping policy-makers for planning oral health strategies and services.

Therefore, the present study aimed to access the prevalence and the characteristic of oral mucosal lesions and their impact on OhRQoL in children aged 5 years from a birth cohort of Pelotas, Brazil.

Methods

This is a cross-sectional study nested in the Pelotas 2004 Birth Cohort. In 2004, 4231 children were recruited for a birth cohort study, comprising 99% of the children born from mothers living in the urban area of Pelotas, southern part of Brazil. After birth, these children were seen at 3, 12, 24, and 48 months, with follow-up rates above 90%. The details related to the methodology of the cohort study have already been published (17, 18).

In 2009, a comprehensive oral health assessment was carried out with a subsample of the cohort, including all those who were born between August and December, 2004 (n = 1303) (19). This strategy was used to assess children close to complete 5 years of age in fieldwork. This sample was sufficient to estimate rates of 50% for oral outcomes (unknown rates) with a sampling error of 3% points. In addition, the sample size was sufficient to test associations with a power of the least 80% to detect significant relative risk of two or more, considering a prevalence of 5% outcomes in those not exposed to different conditions of research and using a significant level of 5%.

The oral health assessment comprised a questionnaire applied to the children's mother and an oral examination of the child, which are both performed at their homes. The visits were previously scheduled by phone. When this schedule was not possible, the examiners went directly to the children's home. Losses were considered when the child and her mother were not found after three visits made in different periods of different days.

The fieldwork team was formed by eight dentists and eight scribes. Calibration process was performed at schools with 84 preschoolers of the same age, but they were not included in the sample. Interrater diagnostic reproducibility for the presence of oral mucosal lesions was assessed by κ coefficient. The lowest κ for the type of lesion was 0.6.

Information on family income and educational level were collected at the children's birth time. Family income at birth was assessed in Brazilian Real (1 USD = 2.4 BRL) and was then categorized into quartiles. Maternal schooling at children's birth was collected in years of formal education and was categorized into four groups according to completed years of study: ≤4 (first part of primary education), 5–8 (second part of primary education), 9–11 (uncompleted secondary education), and ≥12 (school grade/university degree).

The Early Childhood Health Impact Scale (ECOHIS) was a specific instrument developed to assess the perception of parents on OHRQoL of children. This questionnaire was proposed by Pahel et al. (20) and was validated in Brazilian Portuguese (21). It was structurally composed of 13 items distributed in two sections: the Child Impact Section (CIS), which had four domains (child symptom, function, psychological, and self-image/social interaction); and the family impact section (FIS) which had two domains (parent distress and family function). The Likert scale was used to record how often an event occurred in the children's life, considering the period from birth up to the moment of interview (0 = never; 1 = hardly ever; 2 = occasionally; 3 = often; 4 = very often; 5 = don't know). The ECOHIS overall scores were calculated as a sum of the response codes and were used as the main outcome of the study. The higher scores correspond to more OHRQoL impact. The prevalence of impact refers to the proportion of participants that reported 'often' or 'very often' for at least one daily life performances (22). Extent was considered as the number of performances (items of questionnaire) affected, that is, the number of questions answered as 'often' or 'very often' and can vary from 0 to 13. Intensity was used to classify participants according to the highest score reported in questionnaire, independent of number of questions (performances) affected, and it can range from 0 to 5 (23).

The OML were identified by site, size, and type of alteration, according to Tarquinio et al. (1). Pigmented lesions were defined as displaying a color change in the oral mucosa, such as red, purple, brown, or black staining. The terms papule and nodule described solid and circumscribed elevation of the mucosa that could be superficially or deeply located. The lesions were also classified as white plaques, when an elevation of oral mucosa was observed, which has a height that is lower than its length. Vesicles and blisters described a circumscribed elevation of the oral mucosa containing liquid material inside it. A lesion was categorized as erosion when a partial loss of its epithelium was observed, without exposure of the connective tissue. Oral ulcers described open sores inside the mouth. Some lesions, such as petechiaes that were obviously caused by tooth brushing or bite trauma, were excluded from the study because of their high frequency and low relevance in terms of oral health. The developmental defects of the oral maxillofacial region (commissural lip pits, paramedian lip pits, double lip, fordyce granules, microglossia, macroglossia, ankyloglossia, fissured tongue, geographic tongue, and lateral soft palate fistulas) were also excluded from the evaluation, as our study relied on the type of lesions and not on the diagnosis. Moreover, the inclusion of this group, in which the majority of alterations does not require any treatment, would overestimate the prevalence of oral lesions in a children population. Oral mucosal lesion variable was categorized as present (any kind of lesion) or absent to verify the association with OHRQoL. The sites of OMLs were gum, tongue, upper and lower lips, buccal mucosa, palate, and mouth floor. The size was recorded in millimeters: ≤5, 6–20, and >20.

The prevalence of dental caries in primary dentition was measured using dmfs (decayed, missing, and filled surface) index that was later dichotomized into no (dmfs = 0) and yes (dmfs ≥ 1). The presence of malocclusion was assessed using WHO criteria (24) and was classified according into three categories (absent, mild and moderate, or severe).

Data were double-typed using Epi-Info 6.04 (The Epi-Data Association, Odense, Denmark), and the consistency of information was subsequently verified. For data analysis, the STATA software version 11.0 (Stata Corp., College Station, TX, USA) was used. Descriptive analysis was performed to describe the absolute and relative frequencies and calculate the prevalence of interest variables of the study. Bivariate analysis to test the associations of different ECOHIS variables with the presence of OML was performed using chi-squared test (prevalence and intensity) and Mann–Whitney *U*-test (mean score and extent). Multivariate Poisson regression models with robust variance were used to assess the association between OML and ECOHIS scores (overall scores and specific domains scores) and were adjusted for covariates. For each outcome, four different models were adopted: (1) unadjusted analysis; (2) adjusted for demographic variables; (3) adjusted for demographic and socioeconomic variables; and (4) model 3 added by clinical variables (dental caries and malocclusion). All variables were included in the models, independent of *P*-value. This strategy allowed for the estimation of rate ratios (RR) among comparison groups and their respective 95% confidence intervals (CI). It corresponds to the ratio of the arithmetic mean of ECOHIS scores between exposed and unexposed groups.

The Ethics Committee of the Federal University of Pelotas, protocol number 100/2009 on 29/06/2009, approved the project. All examinations and interviews were carried out after authorization by the parents of the participants through a consent letter. Children who had dental needs were referred to Pedodontics Dental Clinic, Dental School, Federal University of Pelotas.

Results

The response rate for this study was 86.6% (n = 1129). However, 11 children were not orally examined due to their behavior in the examination; thus, only 1118 children (response rate of 85.8%) were examined. The prevalence of oral mucosal lesions was 30.1% (95% CI 27.5–32.9). Considering the response rate, the prevalence found for OML, and a type I error of 0.05, this sample presented a power of 80% to detect a difference of 0.75 in mean ECOHIS scores. Most of the participants were boys (52.3%), and a greater number of mothers had 5–8 years of study at participants' birth (40.2%). Children with dental caries were 48.4%, and majority of them did not present malocclusion (62.0%). Regarding OML features, most of lesions were ulcers (29.4%), followed by papules/nodules (21.9%), and pigmented lesions (13.0%). The sites more affected were gums (31.0%), tongue (23.9%), and lower lip (21.1%). The majority of OML had ≤5 mm (76.8%) (Table 1).

Mean ECOHIS score for the whole population was 2.15 (SD 3.80). Table 2 shows the distribution

Table 1. Descriptive analysis of sociodemographic and clinical variables of children and clinical characteristics of oral mucosal lesions. Pelotas, Brazil (n = 1128 children and 401 lesions)

Variables	*N* (%)
Children variables	
Sex	
Female	538 (47.7)
Male	590 (52.3)
Family income	
1st quartile (Up to 295.00 BRL)	284 (25.2)
2nd quartile (296.00–520 BRL)	288 (25.5)
3rd quartile (521.00–1000.00 BRL)	319 (28.3)
4th quartile (more than 1000.00 BRL)	238 (21.1)
Mother's education	
0–4 years	144 (13.1)
5–8 years	445 (40.2)
9–11 years	394 (35.6)
≥12 years	123 (11.1)
Oral mucosal lesions	
Yes	337 (30.1)
No	781 (69.9)
Dental caries	
Yes	543 (48.4)
No	580 (51.6)
Malocclusion	
Absente	633 (62.0)
Mild	119 (11.7)
Moderate or severe	268 (26.3)
Oral mucosal lesions variables	
Type	
Ulcer	118 (29.4)
Papule/nodule	88 (21.9)
Pigmented lesion	52 (13.0)
Erosion	37 (9.2)
Vesicles/blisters	24 (6.0)
White plaques	15 (3.7)
Indefinite	67 (16.7)
Site[a]	
Gum	122 (31.0)
Tongue	94 (23.9)
Lower lip	83 (21.1)
Buccal mucosa	53 (13.5)
Upper lip	31 (7.9)
Palate	11 (2.8)
Size[b]	
≤5 mm	274 (76.8)
6–20 mm	70 (19.6)
>20 mm	13 (3.6)

[a]Oral mucosal lesions in multiple sites were not included in this variable.
[b]Multiple lesions of the same type were not measured in size.

of the answers of children with OML for each question of ECOHIS, according to reported frequency (Likert scale). Items related to pain in the teeth, mouth or jaws were most frequently reported on the child impact section (43.1%), and the option *being upset* was more reported on the family impact section of ECOHIS (22.0%). The same was observed, considering all evaluated children wherein 36.0% reported impact on item related to pain and 16.6% reported impact on the option 'being upset' on family section. 'Don't know' responses were present for four children and were considered as missing data. These children were excluded from the analysis because imputation of values for these children did not meet the established criteria.

In bivariate analysis, there was a positive association between OML and OHRQoL impact measured in different ways (Table 3). Mean overall score of ECOHIS was higher in children with OML than in children without OML. Regarding extent, children with OML presented a higher number of ECOHIS items affected than children without OML. Furthermore, children with OML showed a greater prevalence and higher intensity of impact than children without OML. In this way, children with OML presented a greater occurrence of impact for all intensity categories.

The results of multivariable analysis are presented in Table 4. After adjustments for demographic, socioeconomic, and oral health variables, children with OML presented a higher impact on OHRQoL measured by overall ECOHIS score (RR 1.38 95% CI 1.11–1.72). Analyzing the results of multivariable models by ECOHIS domains, in CIS, children with OML had a greater impact in the symptom domain (RR 1.46 95% CI 1.20–1.66), even adjusted for all independent variables. A higher impact was also observed in children with OML on function and psychological domains. However, these associations were lost when oral health variables were included in the models. In FIS, a greater impact was observed in function domain (RR 3.14 95% CI 1.59–6.22) in children with OML.

Discussion

The findings of our study show that almost 1/3 of the investigated children presented OML, which, in turn, was associated with negative OHRQoL, being important to know the characteristics of these lesions to better understand our findings. Moreover, until the present moment, the prevalence of oral mucosal lesions in children is not clear due to a lack of standardized methods of diagnosis criteria and the differences in the selection of the samples, impairing the comparison among the studies (3, 4). To our knowledge, this is the first population-based study, which considered the

Table 2. ECOHIS responses in children with 5 years old presenting oral mucosal lesions (OML), Pelotas, Brazil (n = 337); Pelotas, Brazil

Impact	Never *N* (%)	Hardly ever *N* (%)	Occasionally *N* (%)	Often *N* (%)	Very often *N* (%)	Don't know *N* (%)
Child impact section						
1. How often has your child had pain in the teeth, mouth or jaws	190 (56.4)	72 (21.4)	56 (16.6)	13 (3.9)	4 (1.2)	2 (0.6)
How often has your child. . .because of dental problems or dental treatments						
2. Had difficulty drinking hot or cold beverages?	301 (89.3)	12 (3.6)	18 (5.3)	3 (0.9)	1 (0.3)	2 (0.6)
3. Had difficulty eating some foods?	281 (83.4)	16 (4.8)	28 (8.3)	7 (2.1)	3 (0.9)	2 (0.6)
4. Had difficulty pronouncing any words?	318 (94.4)	5 (1.5)	6 (1.8)	3 (0.9)	2 (0.6)	3 (0.9)
5. Missed preschool, day care or school?	323 (96.1)	8 (2.4)	2 (0.6)	1 (0.3)	0	2 (0.6)
6. Had trouble sleeping?	296 (87.8)	23 (6.8)	11 (3.3)	3 (0.9)	1 (0.3)	3 (0.9)
7. Been irritable?	280 (83.1)	29 (8.6)	23 (6.8)	3 (0.9)	0	2 (0.6)
8. Avoided smiling or laughing?	317 (94.1)	12 (3.6)	4 (1.2)	2 (0.6)	0	2 (0.6)
9. Avoided talking?	330 (97.9)	5 (1.5)	0	0	0	2 (0.6)
Family impact section						
How often have you or another family member. . .because of your child's dental problems or treatments						
10. Been upset?	262 (77.7)	30 (8.9)	31 (9.2)	10 (3.0)	3 (0.9)	1 (0.3)
11. Felt guilty?	270 (82.8)	10 (3.0)	33 (9.8)	8 (2.4)	6 (1.8)	1 (0.3)
12. Taken time off from work?	321 (95.3)	8 (2.4)	6 (1.8)	1 (0.3)	0	1 (0.3)
13. How often has your child had dental problems or dental treatments that had a financial impact on your family?	326 (96.7)	4 (1.2)	3 (0.9)	2 (0.6)	1 (0.3)	1 (0.3)

1 = child symptom domain; 2, 3, 4, 5 = child function domain; 6, 7 = child psychological domain; 8, 9 = child self-image/social interaction domain; 10, 11 = parent distress domain; 12, 13 = family function domain.

prevalence of oral mucosal lesions in 5-year-old children and their impact on oral health-related quality of life. Population-based studies are critical to determine the distribution of diseases, conditions, and factors influencing the dynamics of outcomes in communities and populations (25). However, most studies that evaluate OML are performed in clinical services, where people seek treatment because they have some signals and symptoms. Thus, the findings of these types of studies might not reflect the real occurrence of the outcomes, and their findings cannot be extrapolated to the general population.

Ulcers were the most prevalent type of lesions in the evaluated children. Several studies had demonstrated that recurrent aphthous stomatitis (RAS) is one of the OMLs that commonly affect children (3, 4, 26). RAS is usually painful due to exposure of the connective tissue to their related inflammation process (2). A study carried out in Thailand showed that RAS-related impacts were common in 12- and 15-year-old schoolchildren, frequently affecting eating function, cleaning teeth, and emotional stability (14).

The second more prevalent type of lesion was papule/nodule. Although we did not work with the diagnosis of diseases, considering the high prevalence of caries in the sample, we can infer that these types of lesions could be parulides, associated with fistulas arising from pulpal necrosis. The higher prevalence of these lesions in gum, which is the preferential site for them, reinforces this affirmative. In the same manner, the majority of the ulcers had the chance to be RAS or herpetic gingival stomatitis, as they preferentially affect the nonadherent mucosal sites, such as tongue and labial mucosa (2), which were the second and the third more prevalent sites in this study, respectively.

The presence of OML in children observed in this study produced an impact on OHRQoL score, measured by different categorizations of ECOHIS. A recent population-based study evaluated the

impact of different OML in preschool children and found that the presence of fistula was the unique mucosal condition that has an impact on OHRQoL (16). These findings were reinforced by data from other age ranges as demonstrated by Suliman *et al.* (13) in a survey that analyzed mucocutaneous diseases carriers, and those having more than one type of OML were more susceptible to report oral impacts than those without OML or with only one type of OML. López-Jornet (15), also evaluated the impact on OHRQoL among adults in an oral pathology service in Spain and concluded that oral mucosal diseases had a negative impact on OHRQoL. A negative impact in OHRQoL was observed in adolescents presenting RAS (14).

Table 3. Association between oral mucosal lesions and oral health-related quality of life (OHRQoL) impact measured by overall, prevalence, extent and intensity ECOHIS scores in children with 5 years old, Pelotas, Brazil. Descriptive and bivariate analysis (n = 1.100)

ECOHIS score	Children with lesions Mean (SD)[a]	Children without lesions Mean (SD)[a]	*P*-value
Overall score	2.7 (4.4)	1.8 (3.4)	<0.001
Extent	1.6 (2.2)	1.1 (1.8)	<0.001
	n (%)[b]	*n* (%)[b]	
Prevalence	40 (12.1)	61 (7.9)	0.030
Intensity			
Never	54 (46.4)	436 (56.8)	0.010
Hardly ever	71 (21.4)	149 (19.4)	
Occasionally	67 (20.2)	122 (15.9)	
Often	25 (7.5)	31 (4.0)	
Very often	15 (4.5)	30 (3.9)	

[a]Mann–Whitney *U*-test to compare means.
[b]Chi-squared test to compare proportions.

In our study, it was observed that, after adjustments for covariates, the presence of OML remained associated with a higher impact on OHRQoL, as demonstrated for overall score, child symptom domains, and family function domain. It must be emphasized that child function domain, child psychological domain, and family distress domain were associated with OML even in the model 4 that have adjusted the findings for demographic, socioeconomic, and oral health variables. It is well known that children with dental caries/treatment experiences have worse OHRQoL indices, in comparison with those free of dental caries (27, 28). Less substantially, malocclusion also appears to have a negative impact on OHRQoL in the same age group evaluated in our study (28). For this reason, these two oral health variables were included in the model for adjustments, and even then, irrespective of the presence of caries and malocclusion, the OML significantly impacted the OHRQoL.

Regarding the impact on OHRQoL on overall population our findings differ on mean ECOHIS score from recent studies performed in preschool children in Brazil, wherein lower values for means were observed (28, 29). However, these studies assessed children in ages ranging from 2 to 5 years. As most of oral condition increases its prevalence with age, it is expected that a study only performed in 5-year-old children present high values for ECOHIS scores. In addition, our findings on the most affected domains agree with a recent study with Brazilian schoolchildren with the same age, wherein the item related to pain was the most affected on CIS and the items related to 'been upset' and 'felt guilty' were most reported in FIS (27).

Table 4. Association of the presence of oral mucosal lesions and by overall and specific domains ECOHIS scores. Multivariate Poisson regression analysis

	Child impacts section Rate ratios (95% CI)					Family impact section Rate ratios (95% CI)	
	Ecohis	Symptom	Function	Psychological	Self-image/ social interaction	Distress	Function
Model 1	1.5 (1.2–1.9)	1.5 (1.3–1.8)	1.5 (1.1–2.1)	1.5 (1.1–2.1)	1.1 (0.6–2.2)	1.4 (1.1–1.8)	2.9 (1.5–1.6)
Model 2	1.5 (1.2–1.9)	1.5 (1.3–1.8)	1.5 (1.1–2.0)	1.5 (1.1–2.1)	1.2 (0.6–2.3)	1.4 (1.1–1.8)	3.0 (1.6–5.7)
Model 3	1.5 (1.2–1.9)	1.5 (1.3–1.8)	1.5 (1.1–2.0)	1.5 (1.1–2.1)	1.2 (0.6–2.3)	1.4 (1.1–1.8)	3.1 (1.6–5.8)
Model 4	1.4 (1.1–1.7)	1.4 (1.2–1.7)	1.3 (0.9–1.9)	1.4 (0.9–1.9)	1.2 (0.6–2.5)	1.3 (1.0–1.7)	3.1 (1.6–6.2)

Model 1: Crude analysis.
Model 2: Adjusted for demographic variable (sex).
Model 3: Adjusted for Model 2 + socioeconomic variables (family income and mother's education in quartiles after birth).
Model 4: Adjusted for Model 3 + oral health variables (dental caries and malocclusion).

There is a recent discussion in the literature about the best way of interpreting and showing OHRQoL data (23). The majority of studies measure OHRQoL in terms of mean scores and test the statistical significance of differences between means. These mean scores are obtained by the aggregation of questions (numerical codes of the responses), which generate findings that are meaningless and difficult to interpret, as a given score can be derived from different sets of responses with different items affected to a varying degree (23). In this study, different approaches were used to interpret scores format (estimates of prevalence, extent, and intensity), providing important complementary information with different points of view about the impact of OML in OHRQoL. Children with OML presented a higher number of ECOHIS-affected items than children without OML, which represent an impact in a greater number of children daily activities, that is, a greater extension of the impact. Furthermore, the maximum score of ECOHIS reported by mothers was greater for children with OML, indicating that the impact in OHRQoL was more intense in those children than in children without OML.

Albeit nested in a birth cohort, the main variables collected in the present study (OML and impact on OHRQoL) were assessed in the same moment, thus limiting the possibility to infer causal relationships. An inherent limitation to ECOHIS instrument is that the reported perception came from the parents, which can differ from the real impact suffered by the child. However, this is the validated method to evaluate OHRQoL in preschool children. Furthermore, the reference period of ECOHIS is the entire life of children. In this case, it is possible that the previous experiences of transitory oral mucosal lesions, such as ulcers, have produced an impact on children's OHRQoL in the past but were not present on the moment of examination, thus affecting our findings. Another limitation of this study to be pointed out is that the lesions were assessed according to type. However, this method has been used in Pelotas birth cohorts (1) to make the identification of lesions by fieldwork examiners, who were not specialists in oral pathology, easier. In fact, this calibration process, added to the sample size, confers reliability and external validity to our findings. On the other hand, precise clinical diagnoses would allow a better understanding about what specific lesions impact OHRQoL and about what could be the focus of future studies.

Conclusion

The scarcity of studies in relation to OML reflects the lack of importance that dental community gives to this kind of alteration and its consequences in children. Our study shed some light in the negative impact that these lesions can have in the children's OHRQoL, and the findings highlight the importance that clinicians and researches should consider OML when performing clinical examination on routine visits and when elaborating public oral health policies focused in children.

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