

Caries progression as a risk factor for increase in the negative impact on OHRQOL—a longitudinal study

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Abstract

Objectives The aim of this study is to evaluate the association between caries lesions progression and oral health-related quality of life (OHRQoL) among Brazilian preschools, after 2 years.

Materials and methods At baseline, 163 children (3–4 years old) enrolled in 12 public primary care services in Porto Alegre/RS-Brazil were evaluated. After 2 years, 119 children were re-evaluated. Calibrated examiners employing the ICDAS criteria conducted clinical examinations. A socio-demographic questionnaire and the Brazilian version of the Early Childhood Oral Health Impact Scale were applied to the parents of the children at baseline and 2-year follow-up. Data analysis was performed using a hierarchical approach based in a conceptual framework testing by Poisson regression.

Results The number of surfaces that progressed from baseline to 2-year follow-up was associated with an increased negative impact on OHRQoL.

Conclusions Caries progression increased the negative impact on OHRQoL.

Clinical relevance The progression of caries lesions could negative impact on OHRQoL in Brazilian preschoolers.

Keywords Longitudinal studies · Quality of life · Dental caries · Preschool children

Introduction

Dental caries is a prevalent disease in preschool children and considered as a public health problem [1]. It has a negative impact on functional and psychosocial aspects of children's parents/guardians of the children, and consequently an impact on their quality of life [2–5]. The consequences of which include pain, decreased appetite, chewing difficulty, sleeping difficulty, changes in behavior, and poor academic performance [4]. Few longitudinal studies evaluated the impact of oral health-related quality of life (OHRQoL), before and after treatment, and demonstrated that there is an improvement in the impact on quality of life after treatment [5–7].

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Several instruments are used to evaluate the impact of OHRQoL, at different ages [8–11]. The questionnaires more used to evaluate the OHRQoL in children are ECOHIS—Early Childhood Oral Health Impact Scale [12], POQL—pediatric oral health-related quality of life [13], and the SOHO-5—scale of oral health outcomes for 5-year-old children [14]. The ECOHIS is based on the perception of parents about quality of life of their children, and a part of the questionnaire relates to the impact of oral health on the child, and the other evaluates the impact of children's oral conditions in their families [12]. The POQL utilizes the child as respondent when she/he has 8 years of age or older, and parents when the child is younger. The SOHO-5 aims to evaluate the quality of life for children 5 years old through child's own answers and their parents [14].

Most of the studies that evaluate the OHRQoL in preschool children present cross-sectional methodology, and the information on the questionnaire and on the oral health status are assessed at the same time [4, 15–17]. Studies assessing the impact of oral conditions on OHRQoL are usually based on convenience and not randomized samples [18, 19].

Recently, some longitudinal studies evaluated the OHRQoL in preschool children, especially in Brazil [5, 6]. However, the evaluation of these studies is based on the change of the impact of quality of life of parents and children after completion of the caries lesions treatment. Studies assessing the change of the impact in quality of life in relation to the early childhood caries progression in preschool children in the community are still scarce in the literature.

Given that, the natural history of caries increases its prevalence and severity in the course of time [20, 21], the aim of this study was to evaluate the impact of the caries lesions progression on OHRQoL among Brazilian preschools, after 2-year follow-up.

Materials and methods

Population and sample

Baseline All 674 children born in 2008 (3–4-year-old) and registered in one of the Grupo Hospitalar Conceição (GHC) primary health care services were eligible for the study. The GHC is constituted by 1 hospital and 12 Primary Care Services distributed in the north area of Porto Alegre, RS-Brazil (city with 1.5 million habitants). GHC is part of Ministry of Health, attends only patients from SUS (Brazilian Public Health Services), and is known nationally, because it is the biggest net of public health in south of Brazil. More than 50% of the Porto Alegre deliveries annually are attended in this hospital. GHC has the best database of registration of patients regarding

family's addresses, phone numbers, and family's components, and this database is considered a reference for Brazilian public health services.

A required sample size of 163 people was based on an estimated caries prevalence of 31% (using data from neighboring city) [22], bidirectional alpha of 0.05 and beta of 0.10. Assuming 20% non-response rate, the sample size was set in 208 dyads of mother-son. The sample selection was randomly performed using a table with random numbers maintaining the proportion of children born in each primary care services. The exclusion criterion was children/mother with cognitive diseases. Baseline data were collected between 2011 and 2012.

Follow-up Participants of the baseline study were invited to participate in the follow-up study 2 years later, in 2014. The list of telephone numbers and addresses of participants who attended in the baseline study was updated. Telephone contact was made with children parents, and they were invited to participate in the follow-up of the study. When it was not possible to make phone contact, a letter was sent by the health agents inviting them to participate again in the survey. Those who agreed to participate in the study were informed about its objectives of this and asked to read and sign a new informed consent. This study was approved by the

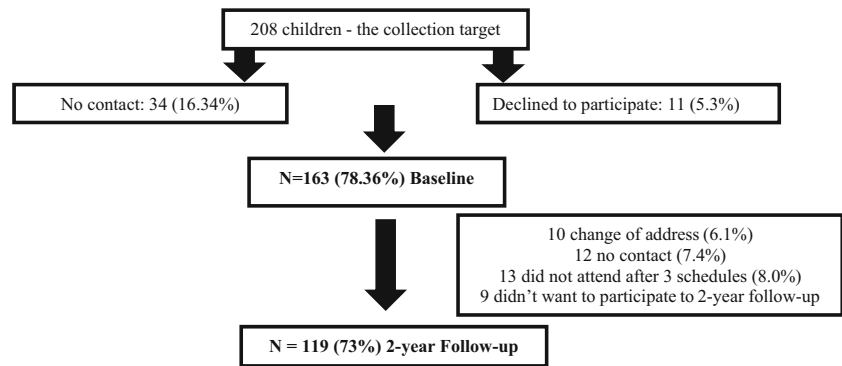
GHC Ethics Committee [GHC – 045-12] and CEP-UFRGS – 825-462 (Committee of Ethics of the Federal University of Rio Grande do Sul, Brazil). The flow diagram of the study sample was described in Fig. 1.

Measures

Oral examination

Baseline The ICDAS [23] was used for dental caries assessment. Both decay and presence of restorations index indices in relation to decay and to the presence of restorations and also teeth extracted due to caries and unerupted teeth were used. Three dentists (PBL, JTP, and IB) properly calibrated performed the dental examinations. The calibration was performed at the Pediatric Ambulatory of Federal University of Rio Grande do Sul. Ten children were examined and re-examined 2 weeks later. ICDAS scores for each tooth surface were considered as the analysis unit for non-weighted Kappa calculation.

All examinations were performed with a clean and dry dental surface [24]. Prophylaxis was conducted with toothbrushes and dental floss. After that, a dental examination was performed at home, using sterile dental mirrors and probes, an air compressor, and portable lighting. Personal protective equipment and infection control was used to ensure biosafety. All participants identified with caries lesions,

Fig. 1 Flow diagram of the study sample

restorative needs, or pain due to cavitated lesions were scheduled to receive care with dentists from the primary health care to which their families belong.

Follow-up Two dentists (FP and JTP) properly trained and calibrated performed the clinical examinations, at home, following exactly as the baseline examinations, using the ICDAS. Similarly, of the baseline, the participants identified with caries lesions, restorative needs, or pain due to cavitated lesions were scheduled to receive care with dentists from the public primary care services to which their families belong.

Assessment of oral health-related quality of life

Baseline The ECOHIS originally developed by Pahel et al. [12] and later translated and validated for Brazilian Portuguese language [25–27] was used. The B-ECOHIS (Brazilian version of ECOHIS) consists of 13 items, nine of which assess the impact of oral health on the child (the child subscale), and four assess their impact on the family (family subscale). On the child subscale, different domains are evaluated: symptoms (1 item), function (4 items), psychology (2 items), self-image, and social interaction (2 items); and family subscale, in which two domains are evaluated: parental anxiety (2 items) and family function (2 items). Parents were instructed to answer the B-ECOHIS.

The response categories of B-ECOHIS were coded as 0 = never, 1 = hardly ever, 2 = occasionally, 3 = often, 4 = very often, and 5 = I do not know. The child's and the family's scores ranged from 0 to 36 and 0 to 16, respectively. Scores of the B-ECOHIS were obtained through the simple sum of the responses obtained in the children's subscales and the parents', separately. Questionnaires with more than 2 "don't know" responses on the child's subscale and 1 on the family subscale were excluded from the sample. For the analysis of B-ECOHIS, we created a variable dichotomizing participants according whether they had or not negative impacts on oral health-related quality of life.

Follow-up The parents of the children were instructed to answer again the B-ECOHIS questionnaire [24]. Scores of the B-ECOHIS were obtained as the baseline, through the simple sum of the responses obtained in the children's subscales and the parents', separately. For the analysis of B-ECOHIS at the 2-year follow-up, we used the overall scores of B-ECOHIS. No questionnaire included missing values or items with "don't know" answers, and all parents have Portuguese as their native language; hence, no questionnaire was excluded from analyses.

Socioeconomic inventory

Follow-up Socioeconomic questionnaire provided information on child gender and age (collected in number and after categorized as average); maternal age (dichotomized according to the median ≤ 32 years and > 32); mother's education (collected in years, categorized as < 9 , 9–11, or > 11); marital status [not married (never married/divorced/widowed) or married/living together, including common-law-marriages]; and monthly family income [resulting from the cumulative collaboration of all residents in the household, collected in Reais-R\$, and categorized as the national minimum wages (MW) during the period of data collection averaged (R\$ 545,00) ≤ 3 or > 3 times the MW].

Conceptual framework Data analysis was performed using hierarchical approach based on the conceptual framework [28]. The model consists of variables distributed into three levels: socioeconomic factors, the baseline variables, and 2-year follow-up variables. The socioeconomic factors (mother's age, family income, mother's education, marital status) were considered as distal variables included in the first level of analysis. The second level of analysis was included in baseline variables (ECC and negative impact on OHRQoL). The third and most proximal level of analysis was the 2-year follow-up variables (ECC, presence or absence of caries progression and the number of surfaces that progressed in 2 years).

Statistical analysis

Descriptive analysis was performed to characterize the sample, and the continuous variables were described using mean and standard deviation. Categorical data were presented as absolutely and relatively percentages. The intra and inter-examiner reproducibility before and during the study were realized by Cohen's kappa coefficient, using tooth surface as the unit for analyses. The inter-examiner Cohen's Kappa value at baseline ranged from a minimum of 0.64 to a maximum of 0.73, and intra were 0.66 to 0.76 (IB), 0.68 (PBL), and 0.76 (JTP). The inter-examiner Cohen's Kappa value at 2-year follow-up was 0.73 (JTP, FP), and intra were 0.73 (FP) and 0.91 (JTP).

The dependent variable of the Poisson regression analysis was the overall B-ECOHIS scores at 2-year follow-up. The distribution of responses to the B-ECOHIS according to each domain was displayed by means and its respective standard deviation. Paired *t* test was used to compare mean values of B-ECOHIS domains at baseline and 2-year follow-up. Cohen's *d* test was performed to evaluate the standardized effect sizes between the mean values of B-ECOHIS domains at baseline and at 2-year follow-up.

Oral examination data were analyzed by considering the conversion of the ICDAS in $dmf-t = 0$ or $dmf-t \geq 1$. The equivalence of the ICDAS to the dmft was performed using the cut-off point $ICDAS \geq 3$, as cited in the literature [29]. ICDAS 0, 1, and 2 were considered $dmf-t = 0$ and $ICDAS \geq 3$ was considered $dmf-t = 1$. The caries progression variable was considered as the number of surfaces per child that showed progression of caries at 2-year follow-up, as described below. The surfaces were categorized into 1: ICDAS = 0; 2: ICDAS = 1, 2, 3; 3: ICDAS = 4; 4: ICDAS = 5, 6; 5: filled surfaces; and 6: ICDAS = 97. Any change of one score to another in the upward direction was considered as a progression. Each of the score changes received one point, and the total number of points resulted in the number of surfaces that have progressed in each child. The lesions that maintained the same ICDAS score or changed in the downward direction were considered as non-progression. The caries progression was also dichotomized as the presence or absence of progression.

Data analysis was carried out by means of a hierarchical approach based on the conceptual framework adapted from Andersen and Davidson [28], to systematically explore the multitude of factors influencing oral health.

The hierarchical approach consisted of univariate Poisson regressions that were performed to measure the effect of each studied variable with respect to the studied outcomes. Subsequently, multivariate Poisson regressions were carried out inside each level. Variables were selected to be kept in the subsequent hierarchical levels if their *p* values remained <0.10 after adjustment for confounders inside their own

levels. Only the variables that had $p < 0.10$ with the outcome in the previous models were added in the final model of multivariate analysis. In this model, only those variables with a $p < 0.05$ were considered to be significantly associated with the outcome.

The results were expressed as exponentiated coefficients representing rate ratios (RR) with their 95% confidence intervals (95% CI). Data were analyzed using SPSS version 22.0.

Results

At baseline, 163 children were evaluated. After 2 years, 119 participated in the study, corresponding to 73% of the total population of baseline. The loss of 44 children is explained at the flow diagram in Fig. 1. At 2-year follow-up, the mean children age was 5.9 years old ($SD \pm 0.3$).

Table 1 shows the frequency distribution of variables at the baseline, and Table 2 displays 2-year follow-up variables distribution data.

All the parents interviewed in the study completed the B-ECOHIS questionnaire (response rate 100%), and no questionnaire was excluded from data analyses due to incomplete data. The items related to pain, difficulty in drinking hot or cold beverages, and difficulty in pronouncing words were the most frequently reported on child impacts section. Items related to the family feeling guilty and financial impact were frequently reported on the family impacts section of the B-ECOHIS. Parents reported more impacts related to the child ($ECOHIS \geq 1-41.2\%$) than the family ($ECOHIS \geq 1-22.7\%$). The highest score of impacts reported was 17 on the child impact section and 13 on the family impact section. No parents responded "I don't know" to one or more items, and most of the questionnaires were answered by mothers (96.6%).

The mean overall B-ECOHIS score of the questionnaires at baseline and 2-year follow-up was 0.40 ($SD \pm 1.46$) and 2.00

Table 1 Frequency distribution of variables at baseline

Variable	Frequency	
	<i>n</i>	%
Baseline		
Early childhood caries		
Caries-free (ICDAS 0)	12	10.1
Enamel lesions (ICDAS 1, 2 e 3)	76	63.9
Dentin lesions (ICDAS ≥ 4)	31	26.0
Overall B-ECOHIS at baseline (mean \pm SD)	0.40 (± 1.46)	
Negative impact on HRQoL		
No	103	86.6
Yes	16	13.4

Table 2 Frequency distribution of socio-demographic variables and clinical data at 2-year follow-up

Variable	Frequency	
	<i>n</i>	%
2-year follow-up socio-demographic variables		
Gender		
Male	50	42
Female	69	58
Mother’s education		
<9 years	23	19.3
9–11 years	51	42.9
>11 years	45	37.8
Income		
≤3 minimum wages	78	65.5
>3 minimum wages	41	34.5
Mother’s age		
≤32 years old	37	31.1
>33 years old	82	68.9
Marital status		
Married/living together	73	61
Not married	46	39
2-year follow-up clinical data		
Early childhood caries		
Caries-free (ICDAS 0)	9	7.6
Enamel lesions (ICDAS 1, 2 e 3)	57	47.9
Dentin lesions (ICDAS ≥ 4)	53	44.5
Caries progression		
Non-progression	12	10.1
With progression	107	89.9
Numbers of surfaces progressed per child (mean ± SD)	6.55 (±6.22)	
Total	119	100

(SD ± 4.18), respectively. Table 3 shows the B-ECOHIS means for each domain and the overall mean at baseline (only to those children who attended the follow-up) and 2-year follow-up. Comparing the values of the baseline and 2-year follow-up means for each domain and for general average, all comparisons showed a significant increase in the average ($p < 0.05$). Cohen’s *d* test showed a moderate to large effect for symptoms subscale.

Hierarchical approach—impact of oral health related on quality of life

In the first level of analysis, mother’s age was not associated with the outcome, and the following variables family income, mother’s education, and marital status were significantly associated with negative impact on OHRQoL and were kept in the subsequent level of analysis. In the second level, the ECC at baseline was not associated with the

Table 3 Mean values of B-ECOHIS domains at baseline and at 2-year follow-up ($n = 119$)

B-ECOHIS domains	Baseline	2-year follow-up	<i>p</i> value	Cohen’s <i>d</i>
SYD - mean (SD)	0.04 (0.23)	0.36 (0.76)	<0.001	0.56
FD - mean (SD)	0.03 (0.16)	0.15 (0.42)	0.004	0.37
PD - mean (SD)	0.02 (0.14)	0.09 (0.36)	0.029	0.27
SSD - mean (SD)	0.00 (0.04)	0.06 (0.29)	0.025	0.28
PDD - mean (SD)	0.06 (0.30)	0.18 (0.45)	0.009	0.31
FFD - mean (SD)	0.01 (0.10)	0.15 (0.56)	0.007	0.34
Mean- B-ECOHIS (SD)	0.03 (0.11)	0.15 (0.32)	<0.001	0.50

B-ECOHIS Brazilian version of Early Childhood Oral Health Impact Scale, *SYD* symptoms domain, *FD* function domain, *PD* psychology domain, *SSD* self-image/social interaction domain, *PDD* parental distress domain, *FFD* Family function domain

Student’s *t* test standard deviation, 95%; $p < 0.05$

outcome, and negative impact on OHRoL at baseline was associated with the outcome and kept in the subsequent level of analysis. Regarding the level three, number of surfaces progressed was the only variable maintained in the subsequent analysis (Fig. 2).

In the univariate analysis into the level, all variables were associated with negative impact on OHRQoL, with the exception of the mother’s age, baseline ECC, and caries progression dichotomized. Variables with $p < 0.10$ in the previous levels were added to the final model.

In the multivariate analysis, the variable that was significantly associated with negative impact on OHRQoL at 2-year follow-up in the final model was the number of surfaces progressed (Table 4), which means that for each surface that showed progression, there is a relative risk of increasing the negative impact on the quality of life of 7%.

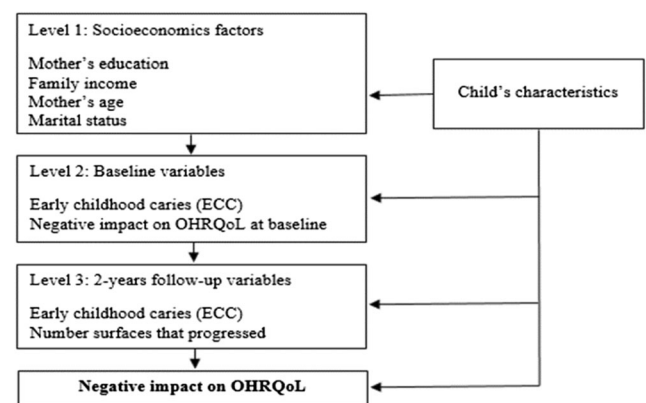


Fig. 2 The theoretical model adapted for this study

Table 4 Hierarchical approach—negative impact on OHRQoL by Poisson regression

Level	Unadjusted RR (95% CI)	<i>p</i>	Adjusted RR (95% CI)	<i>p</i>
Child characteristics				
Gender				
Female	1			
Male	0.93 (0.42–2.06)	0.864		
Level 1: socioeconomic variables				
Mother's education ^a				
<9 years	1			
9–11 years	0.37 (0.15–0.91)	0.031		
>11 years	0.43 (0.16–1.09)	0.077		
Income ^a				
≤3 minimum wages	1			
>3 minimum wages	0.31 (0.15–0.66)	0.003		
Mother's age				
≤32 years old	1			
>33 years old	0.92 (0.46–1.85)	0.827		
Marital status ^a				
Married/living together	1			
Not married	2.44 (1.18–5.04)	0.016		
Level 2: baseline variables				
Early childhood caries ^a				
dmf- <i>t</i> = 0	1			
dmf- <i>t</i> ≥ 1	2.75 (1.33–5.68)	0.006		
Negative impact on OHRQoL ^a				
No	1			
Yes	3.64 (1.79–7.37)	<0.001		
Level 3: 2-year follow-up variables				
Early childhood caries ^a				
dmf- <i>t</i> = 0	1			
dmf- <i>t</i> ≥ 1	3.12 (1.22–7.96)	0.017		
Caries progression ^a				
Non progression	1			
With progression	2.55 (0.64–10.15)	0.182		
Numbers of surfaces progressed per child ^a	1.09 (1.03–1.15)	0.01	1.07 (1.02–1.13)	0.005

Unadjusted RR adjusted relative risk for variables of the same level, *adjusted RR* adjusted relative risk for variables of the previous levels

^a Variables included in the multivariate model

Discussion

This study aimed to evaluate the influence of past and current variables on caries progression showed influence on oral health-related quality of life of children and their families. In this study, the only variable that was associated with an increased negative impact on OHRQoL was the number of surfaces that progressed from baseline to 2-year follow-up. However, when comparing the averages of B-ECOHIS from baseline to the 2-year follow-up, there were a significant increase in all domains. This demonstrates that the natural

course of caries had a negative impact on quality of life of this sample, and the questionnaire used (B-ECOHIS) was able to represent this change (Table 5).

Observing the natural course of the disease, in this study, 89.9% of the children had, at least, one surface with progressive lesions and, on average, each child had 6.55 (±6.22) of progressive surfaces. This finding can be considered as a high rate of progression per child. That progression supports the hypothesis that caries is a chronic disease rarely self-limiting. Thus, an increased number of progressive surfaces increase the negative impact on OHRQoL. The evaluation of

Table 5 Hierarchical approach—negative impact on OHRQoL by Poisson regression

Level	Unadjusted RR (95% CI)	<i>p</i>	Adjusted RR (95% CI)	<i>p</i>
Child characteristics				
Gender				
Female	1			
Male	0.93 (0.42–2.06)	0.864		
Level 1: socioeconomic variables				
Mother’s education				
<9 years	1			
9–11 years	0.37 (0.15–0.91)	0.031		
>11 years	0.43 (0.16–1.09)	0.077		
Income				
≤3 minimum wages	1			
>3 minimum wages	0.31 (0.15–0.66)	0.003		
Mother’s age				
≤32 years old	1			
>33 years old	0.92 (0.46–1.85)	0.827		
Marital status				
Married/living together	1			
Not married	2.44 (1.18–5.04)	0.016		
Level 2: baseline variables				
Early childhood caries				
dmf- <i>t</i> = 0	1			
dmf- <i>t</i> ≥ 1	2.75 (1.33–5.68)	0.006		
Negative impact on OHRQoL				
No	1			
Yes	3.64 (1.79–7.37)	<0.001		
Level 3: 2-year follow-up variables				
Early childhood caries				
dmf- <i>t</i> = 0	1			
dmf- <i>t</i> ≥ 1	3.12 (1.22–7.96)	0.017		
Caries progression				
Non progression	1			
With progression	2.55 (0.64–10.15)	0.182		
Numbers of surfaces progressed per child	1.09 (1.03–1.15)	0.01	1.07 (1.02–1.13)	0.005*

Unadjusted RR adjusted relative risk for variables of the same level, *adjusted RR* adjusted relative risk for variables of the previous levels

**p* < 0.05

caries progression and its impact on quality of life of preschool children had not been presented in any other study. This kind of analysis was only possible, because data originated from an observational longitudinal study, which allows us to evaluate the natural history of caries in our sample.

Analyzing the results of Cohen’s *d* test, most of the differences were between small and moderate. But we can note that specifically regarding the symptoms subscale, there was a moderate to large effect, showing a clinically relevant significance for our findings [30]. These findings show the opposite of what is often suggested and advocated by many health professionals that caries in the deciduous dentition would

not negatively impact the life of the child and his or her family. We can also observe that the greater the number of progressive surfaces, the greater the negative impacts on oral health-related quality of life. Thus, other clinical relevance of these findings is to show the importance of preventing caries progression in young children to avoid a negative impact on their quality of life.

A cross-sectional study demonstrated that the presence of the severe dental caries was associated with a negative impact on OHRQoL of preschool children and their families [31]. However, the methodology used was different from the employed in this study. A recent longitudinal study showed

that the presence of incipient carious lesions at baseline in preschool children was not a significant predictor of worsening on oral health-related quality of life after 2-years follow-up. However, the presence of moderate and/or extensive caries lesions is a significant predictor of quality of life impairment [32].

The advantages of using the dmft index in data collection are the possibility of comparison with other papers in the literature and easier collection (shorter time and cost). In addition, studies that evaluated the impact of caries on oral health-related quality of life reported that non-cavitated lesions do not represent a negative impact on quality of life [19, 31, 32]. One possible disadvantage of using dmft when compared to the ICDAS is that the dmft only collects cavitated lesions, underestimating the real condition of the disease, however, when studying oral health-related quality of life that point does not seem to be relevant. Another disadvantage of using dmft, when compared to ICDAS in the particular case of this study, is that dmft combines cavities with restored teeth while ICDAS separates them. This may lead to misclassification in the case of dmft, as some restoration may be due to reasons other than caries cavities. This means that there are advantages and disadvantages of using each of the indexes, but in this study, our choice of dmft was justified by the outcome which was decreased in quality of life.

Socioeconomic variables of the sample showed no impact on OHRQoL. Some studies demonstrated that lower income [4, 26, 33] and low maternal education [16, 31] are factors that impact negatively on oral health-related quality of life. Other variables tested were not associated with the outcome, such as the presence of ECC at baseline and ECC after 2 years, the mean of overall B-ECOHIS at baseline, and the presence or absence of progression. Probably, these conditions are not perceived by children parents and do not negatively influenced the impact on OHRQoL.

Other important aspects of the methodology that could be discussed, the questionnaire (B-ECOHIS) used in this study is a validated [12, 25–27] instrument to be used with parents of children in preschool age, effective at parents' perceptions about the impact of oral conditions on their children's quality of life. In addition, it is widely used in other studies [4, 15–17]. One of the qualities of this study was the long period between the questionnaires, reducing the risk of response bias.

The use of instruments that relate the oral health to quality of life are important for planning dental services modifying the emphasis on purely biological approach and introducing the psychosocial factors [34]. Based on current knowledge related to cardiology and on the context of minimally invasive dentistry, the observation of the high number of progressive lesions and the significant increase in the negative impact of oral condition on child's quality of life and his/her family leads to a concern about the treatment of these families in order to paralyze the natural course of the disease. Measures

that prioritize education and prevention of caries in the first year of life of the child, preventing premature establishment of the disease, are needed [35, 36]. In this way, we must prevent progression of caries at a degree of severity that would cause negative impacts on children and families and reduce the need for more invasive procedures with greater cost to the health system [37] and also negatively impact on OHRQoL.

It should be emphasized that the sample of this study is enrolled to a public primary care services, and it does not positively influenced the course of the disease [38]. In Brazil, primary care is the priority of care in SUS health and is the entrance level of the patients in the system. From this point, when necessary, they are referred to other levels of care, such as medium complexity services, the dental specialties' centers created in 2004 [39]. With the implementation of the "Smiling Brazil" program occurred a representative increase in the number of oral health professionals working in the health system and its coverage in the country [40].

Perhaps, to belong to a primary health care and to have access to treatment does not mean improvement in oral health, in this population. However, not always these families seeking care for their children. A study demonstrated that a low rate of access to dental treatment for preschool children (13.3%) may contribute to the greater prevalence of severe tooth decay in comparison with the initial stages of caries [41].

Future research with longitudinal design focused on aspects involved in perceptions on oral health-related quality of life in preschool children will contribute to a greater understanding of impact of oral conditions.

Conclusions

This study revealed that the progression of caries in preschool enrolled in the primary health care can be considered as an important factor in the increase in the negative impact on quality of life related to the oral health.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Funding This study was not funded by any company.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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