



PREVALENCE OF CARIES AND ITS IMPACT ON ORAL HEALTH-RELATED QUALITY OF LIFE AMONG BRAZILIAN CHILDREN

PREVALÊNCIA DE CÁRIE E SEU IMPACTO NA QUALIDADE DE VIDA RELACIONADA À SAÚDE BUCAL EM CRIANÇAS BRASILEIRAS

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Received: 13 dec. 2024

Accepted: 21 may 2025

Editors-in-Chief: Dr. Leonardo Pestillo de Oliveira and Dr. Mateus Dias Antunes

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ABSTRACT: This study aimed to evaluate the prevalence of dental caries and its impact on oral health-related quality of life (OHRQoL) in 5-year-old Brazilian preschoolers. A total of 481 children were assessed using the Decayed, Missing and Filled Teeth Index (dmft/DMFT). Socioeconomic status and OHRQoL were measured through questionnaires (B-ECOHIS). Statistical analysis included chi-square or Fisher's Exact tests and multiple logistic regression (stepwise method). The prevalence of caries (dmft > 0) was 42.2%, with 37.2% of children having untreated caries in the primary dentition and 4.0% in the permanent dentition. The average B-ECOHIS score was 4.68. Children with caries had significantly higher B-ECOHIS scores (mean: 7.42; SD: 8.20) than those without caries (mean: 2.98; SD: 5.58). Regression analysis showed that low socioeconomic status, previous or current dental treatment, presence of cavitated lesions, and restored or missing teeth were significantly associated with a higher negative impact on OHRQoL.

KEYWORDS: Dental caries. Quality of life. Oral health.

RESUMO: Este estudo teve como objetivo avaliar a prevalência de cárie dentária e seu impacto na qualidade de vida relacionada à saúde bucal (QVRSB) em pré-escolares brasileiros de 5 anos de idade. Um total de 481 crianças foram avaliadas usando o Índice de Dentes Cariados, Perdidos e Obturados (ceo-d/CPO-D). O status socioeconômico e a QVRSB foram medidos por meio de questionários (B-ECOHIS). A análise estatística incluiu testes qui-quadrado ou exato de Fisher e regressão logística múltipla (método stepwise). A prevalência de cárie (ceo-d > 0) foi de 42,2%, com 37,2% das crianças apresentando cárie não tratada na dentição decídua e 4,0% na dentição permanente. A pontuação média no B-ECOHIS foi de 4,68. Crianças com cárie apresentaram pontuações significativamente maiores no B-ECOHIS (média: 7,42; DP: 8,20) do que aquelas sem cárie (média: 2,98; DP: 5,58). A análise de regressão mostrou que baixo status socioeconômico, tratamento odontológico anterior ou atual, presença de lesões cavitadas e dentes restaurados ou ausentes foram significativamente associados a um maior impacto negativo na qualidade de vida relacionada à saúde (QVRSB).

PALAVRAS-CHAVE: Cárie Dentária, Qualidade de Vida. Saúde bucal.

INTRODUCTION

Early childhood caries (ECC) affects the deciduous teeth of children under six years of age, being characterized by the presence of demineralized surfaces (cavitated or not), in addition to restored and/or missing teeth, affecting more than six hundred million children in the world¹. The presence of ECC is mainly related to consumption of sugar, a complex biofilm containing acidogenic bacteria and inadequate oral hygiene, associations with enamel defects, among other factors².

The dynamic process of caries consists of alternating periods of demineralization and remineralization, with a predominance of demineralization events on the tooth surface³. The clinical appearance of carious lesions varies according to the involvement of the structure and affected tissue (enamel, dentin, root), ranging from a very superficial opaque white spot to a soft consistency lesion with a high presence of microbial agents, such as, *Streptococcus mutans*, *Streptococcus sobrinus*, *Actinomyces spp.*, among others⁴. All these microorganisms contribute to the degradation of the mineralized tissue, observing a mineral loss that can progress to severe conditions that compromise the dental pulp and, consequently, the maintenance of the tooth in the oral cavity⁴.

Data from a systematic review with meta-analysis revealed that the global prevalence of ECC among five-year-old children ranged from 48%. The prevalence by continent was Africa: 30%; Americas: 48%; Asia: 52%; Europe: 43%; and Oceania: 82%⁵. Differences across countries explain 21.2% of the observed variance in Brazil, according to the latest national oral health survey (SB Brasil, 2010)⁶, the prevalence of dental caries in the primary dentition at five years of age was 53.4% and the average dmft (decayed, missing and filled primary teeth) score index was 2.43 teeth, predominating the decayed component in more than 80% of the index⁶.

The impact of oral diseases and disorders on people and society has been widely measured using oral health-related quality of life (OHRQoL)⁷. Assessing quality of life can help professionals detect other problems that are occurring in patients or be used as a relevant outcome measure after oral health interventions⁸. At this point, studies have also shown a negative impact on the OHRQoL in five-year-old children affected by caries through the B-ECOHIS (Brazilian-Early childhood Oral Health Impact Scale), being even worse when there are lesions are untreated and with clinical consequences⁹⁻¹¹. There is also evidence of a high frequency of difficulty eating, sleeping and smiling, both due to pain and aesthetic discomfort^{12,13}. All the mentioned factors affect the child's development and general health status and families¹⁴, compared to children with treated caries lesions, who show a significant improvement in OHRQoL¹⁵.

Dental caries is a public health problem that can affect several aspects of a person, not just their oral health¹⁶. This cross-sectional study assessed the prevalence of caries in primary dentition and its impact on oral health-related quality of life. The attempt is to generate new policies for comprehensive care programs aimed at this population, as well as to motivate the adoption of healthy habits early on, in addition to adherence to guidelines for those responsible for them.

METHODOLOGY

STUDY DESIGN AND PARTICIPANTS

This cross-sectional study was approved by the Research Ethics Committee of the Araraquara School of Dentistry-UNESP (protocol #27/11). The study was reported according to the STROBE

statement. Data collection was carried out in two stages: a) semi-structured questionnaires applicable to guardians; b) intra-oral clinical examination of the children.

The target population of this study was composed of all preschool children enrolled in 36 public schools from Araraquara, SP (n=749). In 2012 (March to June), all of them were invited to participate. This sample size was enough to estimate the prevalence of caries considering data from a previous study. The sample size was calculated based on the caries experience of previous studies conducted in the municipality of Araraquara¹⁷, considering a sampling error of 15% (0.24 decayed, missing and filled teeth), an average ceo-d of 1.62, a standard deviation of 2.51, 95% confidence level and a sample loss of 20%, totaling 504 preschoolers, but the final sample was 481.

The children's parents signed the Informed Consent Form to have their children examined in the school environment and received two questionnaires about socioeconomic profile and Oral Health-Related Quality of Life (OHRQoL) (B-ECOHIS)¹⁴.

Within the inclusion criteria, participants had to be from Araraquara; presence of at least 16 fully erupted deciduous teeth in the oral cavity. The reasons for non-inclusion were: students with dental hypoplasia and defects in the development of dental enamel caused by imperfect amelogenesis; children with any syndrome linked to tooth enamel malformation; children who used fixed orthodontic appliances; and children whose parents did not agree to allow them to participate in the study.

Opinion number approved by the Research Ethics Committee of the Araraquara School of Dentistry-UNESP (protocol #27/11).

DATA COLLECTION

The clinical exam was performed under natural light, in the school environment, with the help of a wooden spatula, oral mirror, and probe recommended by the World Health Organization. After cleaning and drying the teeth with sterile gauze, a complete inspection was carried out by means of the following indexes: dmft (decayed, extracted or filled deciduous teeth) and DMFT (decayed, missing or filled teeth)¹⁸. Two calibrated examiners (kappa intra: 0.92 and interexaminer: 0.90) performed the exams. The calibration process was made with photographs and patients.

Two questionnaires were answered by parents/guardians: one referring to the socioeconomic profile; in addition to access to dental services and OHRQoL.

For OHRQoL, the "Early Childhood Oral Health Impact Scale" questionnaire in the Brazilian version (B-ECOHIS) containing 13 items was used. The questionnaire comprises two sections: 1) Child Impact Section (CIS) separated into nine items related to the domains: oral symptoms, functional limitations, psychological factors, self-image and social interaction; and 2) Family Impact Section (FIS) separated into four items related to the domains: parental distress and family function. The total score ranges from 0 to 52 points according to the 5-point Likert Scale: 0 = never; 1 = almost never; 2 = sometimes/from time to time; 3 = often; 4 = very often; 5 = I don't know. The higher the score, the greater the impact on quality of life. Additionally, the scores per domain were calculated through the sum of the scores. However, responses classified as "I don't know" were not included in the final sum. The impact on quality of life was classified according to the score obtained in the total score of the questionnaire, resulting in: no impact = 0; weak impact = 1 to 17.35; medium impact = >17.35 to 34.70; strong impact = > 34.70 to 52.

STATISTICAL ANALYSIS

Data were analyzed descriptively. To assess the association between oral health-related quality of life (dependent variable) and clinical and socioeconomic variables (independent variables), bivariate

analyses (chi-square or Fisher's Exact) and multiple logistic regression with stepwise procedure (only for variables that presented $p < 0.20$ in the bivariate analysis) were used. The odds ratio (OR) and the respective 95% confidence intervals (CI) were estimated for the variables that remained in the multiple regression model at the 5% level. The Mann-Whitney test was used to compare the B-ECOHIS measurements according to the presence/absence of decayed teeth. All statistical tests were performed using the SPSS program.

RESULTS

A total of 749 children aged 5 years old were invited to participate in the survey; 481 fulfilled the inclusion criteria and were included in the sample (response rate = 64%). Most were male (52.4%; $n=252$), of white ethnicity (68.6%; $n=330$) and belonging to Class C (51.6%; $n=248$). Regarding the profession of guardians, 90.6% ($n=436$) were active workers. Regarding the child's access to dental services, 61.3% ($n=295$) had previously undergone curative dental treatment. The sociodemographic data of the study population are shown in Table 1.

Table 1. Descriptive analysis of the study variables.

	n	%
Gender		
Male	252	52,4
Female	229	47,6
Ethnicity		
White	330	68,6
Brown	112	23,3
Black	15	3,1
Yellow	1	0,2
Not answered	23	4,8
Respondent's profession		
Private sector employee	129	26,8
Public sector employee	61	12,0
Liberal professional	31	6,4
Businessperson	17	3,5
Home workers	121	25,2
Retired or pensioner	7	1,5
Unemployed	32	6,7
Others	67	13,9
Not answered	16	3,3
Social class		
A2	9	1,9
B1	39	8,1
B2	140	29,1
C1	164	34,1
C2	84	17,5
D	37	7,7
E	1	0,2
Not answered	7	1,5
Dental treatment history		
Yes (bandage)	295	61,3
No	101	21,0
Yes (preventive)	80	16,6
Not answered	5	1,0

The caries prevalence ($dmft > 0$) was 42.2% ($n=203$), showing no significant difference in relation to gender (40.2% female and 44.0% male, $p=0.4434$). The caries index of children with low (75.5%; $n=136$) and high (24.4%; $n=44$) family income was, respectively: $dmft/DMFT=1.75/0.07$; $dmft/DMFT=0.79/0.02$. Among the examined children, 273 (56.8%) did not experience caries in deciduous and permanent teeth ($dmft+DMFT=0$).

The prevalence of untreated caries (presence of cavitated lesion) in primary dentition was 37.2% ($n=179$) and in permanent dentition was 4.0% ($n=19$). In table 2, it is possible to observe that the mean $dmft$ was 1.4 ± 2.32 . There was no significant difference in the $dmft$ index in relation to sex, ethnicity and social class.

Table 2. Caries experience in deciduous and permanent teeth in the study population.

	d	m	ft	dmft	D	M	FT	DMFT
Sum	518	24	133	675	26	0	3	29
% of sum	76.74	3.56	19.70	100.00	89.66	0.00	10.34	100.00
Mean	1.08	0.05	0.28	1.40	0.05	0.00	0.01	0.06
Standard deviation	1.98	0.26	0.81	2.32	0.31	0.00	0.10	0.33
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

With regard to data on quality of life related to oral health, the general mean (standard deviation) of the B-ECOHIS was 4.68 (SD=7.03). For children with cavitated caries lesions (CCL) (primary) the mean of the B-ECOHIS was significantly higher (± 7.42 ; SD 8.20) compared to children without (± 2.98 ; SD 5.58) ($p < 0.0001$; Mann-Whitney test).

Bivariate analyses showed a significant association ($p < 0.05$) between oral health-related quality of life in almost all study variables (ethnicity, social class, treatment history, $dmft$, current and past caries experience).

In the multiple logistic regression analysis (Table 3) it was possible to verify that preschoolers from low social classes, and with previous/current dental treatment, with cavitated lesion, with restored/lost teeth were more likely to have a greater impact on OHRQoL.

Table 3. Association analysis by bivariate* and multiple logistic regression** analysis between oral health-related impact of life and independent variables.

Variables	Impact on oral health related to the child's quality of life					
	No impact n (%)	With impact n (%)	P value*	OR**	P value**	
Sex	Male	152 (60.3)	100 (39.7)	0.430	--	
	Female	130 (56.8)	99 (43.2)			
Ethnicity	White	202 (61.0)	129 (39.0)	0.065	0.773	
	Too much	66 (51.6)	62 (48.4)			
Social class	High	135 (71.8)	53 (28.2)	0.000	0.484	
	Low	145 (50.7)	141 (49.3)			
Dental treatment history (previous/current)	Yes	87 (40.1)	94 (51.9)	0.000	1.00	
	No	192 (65.1)	103 (34.9)			
$dmft$					--	
Current experience	c	Absent	211 (69.9)	91 (30.1)	0.000	0.438
		Present	71 (39.7)	108 (60.3)		
Past experience	eo	Absent	256 (65.1)	137 (34.9)	0.000	0.357
		Present	26 (29.5)	62 (70.5)		

DISCUSSION

Dental caries is highlighted as one of the most frequent diseases affecting both adults and children and it is known that the behavior of the disease depends on several factors such as lifestyle, socioeconomic and demographic reality, educational level and access to health services¹⁹. In this way, the importance of identifying groups with greater vulnerability to the development of the disease is highlighted as of fundamental importance for prevention and treatment^{20, 21}.

It was found that the prevalence of dental caries among 5-year-old preschoolers in the city of Araraquara was 42.2% (n = 203), with 44.0% being male and 40.2% being female. Similar data can be observed in other studies, such as that by Scarpelli et al.¹⁴, who reported the presence of caries in 51.3% of boys and 48.7% of girls. Likewise, Fernandez et al.²² found a caries prevalence of 43%, with 49% in females and 51% in males. It can be assumed, based on the above results, that male children may be the most susceptible to caries lesions. However, there may be variation according to the region in which the studies are carried out. In the study by Martins-Júnior et al.²³ there were no major variations regarding gender, with 49.9% of children with caries being boys and 50.2% girls.

The average dmft index in this study was 1.4. Among all the children examined, 273 (56.8%) did not experience caries in deciduous and permanent teeth. The research conducted by Scarpelli et al.¹⁴, showed that 54% of the children examined had dmft = 0, and the average dmft index was 2.1 (SD = 3.1), in addition, the severity of caries lesions increased with age. In the study by Silva²⁴, in a 5-year-old population, it was found that 54.8% of the evaluated children were free of caries; in the study by Fernandez et al.²², approximately 57.0% of the evaluated children aged between 2 and 5 years were also free of caries, results similar to those obtained in this study.

It appears, therefore, that caries disease considerably affects the deciduous dentition of Brazilian children, which demonstrates the importance of developing preventive and educational strategies in oral health care for this age group and those responsible for them²⁵.

The analysis of socioeconomic conditions allows taking into account the etiological factors of social inequalities such as income, educational level and housing conditions^{26, 27}. Brazil, a country with a large territorial extension, presents inequalities both between different regions and between different cities and even between neighborhoods of a single municipality^{28, 29}.

It can be seen that of the families evaluated in this study, 39.1% are in the upper class (classes A, B1 and B2 of ABEP – Associação Brasileira de Empresas de Pesquisa - 2010³⁰) and 59.5% belong to the lower class (ABEP classes C1, C2, D and E), with 1.5% of the participants' parents or guardians not responding to the socioeconomic survey. According to Scarpelli et al.¹⁴, 85.7% of the individuals participating in their study belong to economic classes D and C (monthly family income ≤ 517 US dollars, equivalent to approximately 1028 reais, when compared to the national, and using a quotation value of 1.9887), being considered of lower income. Thus, the most of the participants in this research have low income, with a variation in the results found in the research by Scarpelli et al.¹⁴, with a relationship with the socioeconomic level and the populations of different regions evaluated and used in both studies.

However, previous studies address data related to mothers' education, and children whose mothers had completed only the first 8 years of education had a higher percentage of caries lesions²². Knowledge of these data makes it possible to understand the reorientation of public expenses as to the regions with the greatest need for educational, preventive and assistance activities for better equal access to available health resources³¹.

To compare and evaluate the relationship between oral health and socioeconomic conditions, it has been observed that worse socioeconomic conditions are related to a higher prevalence of dental

caries^{22, 31}. However, in the present study, there was no significant difference in the dmft index in relation to sex, ethnicity and social class, similar results to the study by Pereira et al.³². The relationship between the socioeconomic factor and dental caries is of fundamental importance, as the socioeconomic factor exerts an important influence on the dietary pattern, access to knowledge and health care, quality and location of housing, and important factors related to factors of risk, exposure or protectors for the disease installation process to take place.

For quantitative measures of oral problems that interfere with the daily life and well-being of the population, instruments were developed to measure the impact of oral health on people's lives. The existing instruments to assess the quality of life are, for the most part, developed for adults or the elderly, thus there is a lack of instruments aimed at children, especially at preschool age.

The *Early Children Oral Health Impact Scale* (ECOHIS) questionnaire was developed for application in epidemiological research with the aim of assessing the negative impact on quality of life due to the presence of oral problems in preschool children³¹. It considers the experience of diseases lifetime oral hygiene and dental treatment with the responses provided by parents^{28, 31, 32}.

The Brazilian version (B-ECOHIS), applied in this study, reported a negative impact of the child's oral condition on their well-being and on the daily life of family members, coincident with previous studies^{9-11, 33}, being greater in students from low income (49.3%), compared to those of highest income (28.2%). The impact of quality of life that there is a relationship between the influence of oral health on the quality of life of preschoolers, also affecting the daily lives of their families and socioeconomic conditions^{10, 22, 32}.

On the other hand, studies show the positive impact and improvement in OHRQoL after performing treatment on children's decayed teeth^{32, 34}, such as the improvement in the attitude of parents regarding guilt, which dropped from 56.3% to 39.1%³². Instruments for assessing the influence of oral health on the quality of life of preschoolers are essential to demonstrate parents' perception of their children's oral health and guide oral health care for this population group²⁸.

To prevent harm to their quality of life and their physical, psychological and social development is necessary to encourage once again the organization of more comprehensive care programs aimed at this vulnerable population, ranging from encouraging the adoption of healthy habits early on to raising awareness of the importance of adopting these habits in their lives through their guardians²⁵.

The results of this research compared with those of the study carried out by Silva et al.¹⁷ show that, over 10 years, there was a reduction in the percentage of children with caries. It should be noted that the disease is preventable and controllable and can negatively interfere with the physical and emotional development of affected preschoolers, as well as having an impact on their families.

As limitations, it is important to mention that the results of this study cannot be extrapolated to all children in this same age group, since only children from the public sector participated in the research. Additionally, the cross-sectional nature of the study makes it impossible to establish a causal relationship between the studied variables. Despite the limitations, the importance of the need for educational, preventive and assistance programs is reinforced, in view of the objective of minimizing inequalities and increasing the level of oral health of the preschool population.

CONCLUSION

It was concluded that the prevalence of caries and cavitated lesions in the primary dentition was high. Children with an impact on the OHRQoL were those who had caries experience, were from a lower social class or had a history of dental treatment.

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