

Dental Caries in Preschoolers and Parental Level of Oral Health Literacy in Tocantins

Marlon Brendo da Silva Benigno¹, Juliana Bastoni da Silva¹, Marla Andréia Garcia de Avila²,
Hélio Rubens de Carvalho Nunes², Fábio Luiz Mialhe³

¹Postgraduate Program in Health Sciences, Federal University of Tocantins, Palmas, TO, Brazil.

²Department of Nursing, Botucatu Medical School, São Paulo State University, Botucatu, SP, Brazil.

³Piracicaba Dental School, University of Campinas, Piracicaba, SP, Brazil.

Corresponding author: Fábio Luiz Mialhe

E-mail: mialhe@unicamp.br

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ABSTRACT

Objective: To investigate the association between dental caries in preschoolers and parental oral health literacy (OHL) levels. **Material and Methods:** A cross-sectional study was conducted with 448 dyads of five-year-old preschoolers in all public preschools in the urban area of Porto Nacional city (Tocantins, Brazil) and their respective primary caregivers. Caries experience with deciduous teeth was measured through the decayed, missing, and filled teeth (dmft) index. OHL level was calculated using the Brazilian Portuguese version of the Health Literacy in Dentistry (HeLD-14) instrument and categorized into tertiles. Sociodemographic data were collected. Associations between variables were evaluated by Poisson's regression in bi and multivariate models. **Results:** A total of 190 (42.41%) children had dental caries in at least one tooth, and 243 (54.2%) of the primary caregivers showed an OHL level below the sample median (49 points). Analyses revealed that an OHL level at the upper tertile was considered a protective factor for caries in the evaluated preschoolers (RP=0.660; 95% CI = 0.480–0.910). **Conclusion:** Parental oral health literacy level was significantly associated with early childhood caries. Promoting oral health literacy among parents can be important in preventing tooth decay in preschoolers.

Keywords: Oral Health; Health Literacy; Dental Caries; Child; Caregivers.

■ Introduction

Early childhood caries (ECC) is a dental condition characterized by one or more decayed, missing, or filled tooth surfaces in any primary tooth in children under six [1,2]. The presence of caries lesions at this age significantly impacts the child's oral health, overall health, and well-being. This has implications for treatment costs, school absenteeism, loss of learning ability, and diminished oral health-related quality of life [2].

Studies have shown that ECC remains prevalent in most countries worldwide, with a wide range of variation between them [3,4]. Children's oral health status is influenced by their health practices and their caregivers' knowledge, attitudes, and behaviors regarding oral health [5]. Recently, interest has been growing in oral health literacy (OHL), which the American Dental Association considers "the degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services needed to make appropriate health decisions and act on them," including that of caregivers, and its implications for children's oral health [5-7].

Such a topic is critical for evidence-based health practices but requires further investigation in diverse local and global contexts. For example, Dieng et al. found that high maternal OHL levels in Senegal were a protective factor against caries disease, including greater frequency of tooth brushing with fluoridated toothpaste [8]. In India, Sowmya et al. [9] showed that maternal behavior and oral health literacy influenced caries presence in children. A Brazilian study found that parental OHL influences preschoolers' use of dental services and better-quantified fluoride toothpaste [10,11]. Thus, OHL is essential for caregivers to make better oral health decisions for themselves and their children because caregivers are critical as primary examples and decision-makers for children's oral hygiene practices, dietary choices, and healthcare access [6]. A high level of OHL empowers caregivers to supervise proper brushing techniques, prioritize fluoride-based toothpaste, and seek timely dental care, all of which serve as protective measures against conditions such as Early Childhood Caries (ECC). Moreover, caregivers with higher OHL are better equipped to understand the benefits of preventive measures, including regular dental checkups, and are more likely to follow professional guidance. This reduces the prevalence of untreated caries and its associated complications, ultimately improving children's overall oral health and quality of life [6,8,9].

Although some studies have assessed parental OHL and the presence of ECC [9-11], most investigations were conducted in urban or socioeconomically developed regions, ignoring the particularities of geographically isolated areas with fewer resources. Research focusing on Northern Brazil is scarce, but based on other locations, we hypothesize that a high parental OHL level is a protective factor against tooth decay in preschoolers in the municipality subjected to the evaluation [9-11]. Understanding the reality of this population is essential for developing more effective oral health policies adapted to local needs, which can reduce inequalities and improve oral health outcomes among young children.

Thus, this research evaluated the association between caregivers' OHL level and tooth decay in five-year-old preschoolers enrolled in the municipal urban education network of Porto Nacional, Tocantins, Brazil.

■ Material and Methods

Ethical Aspects

This study was approved by the Human Research Ethics Committee of the Federal University of Tocantins (Opinion Number 5.925.214). The caregivers responsible for the preschool children consented to their participation and that of the preschoolers by signing an informed consent form. The preschoolers agreed to participate through an informed assent form designed for five-year-olds.

Study Design

This cross-sectional observational study was conducted with caregivers and their 5-year-old children enrolled in public schools in Porto Nacional, Tocantins, Brazil.

Setting

With an estimated population of 64,000, the municipality had 19 educational centers with preschools for children aged five or older during the study period. Of these, seven were located in urban areas and twelve in rural areas. Educational centers located in metropolitan areas had the highest proportion of five-year-old children (73.5%) and were selected for the present study's sample.

The city has 21 basic health units (UBS) with oral health teams regarding the public health structure. At the secondary care level, the municipality was served by a dental specialty center (CEO). Children were assisted by the School Health Program (PSE), a public policy designed to integrate health and education to promote overall health among schoolchildren. Data collection took place from March to June 2023

Participants

Preschoolers and their caregivers participated in the study. Age selection was based on the World Health Organization (WHO) recommendations for epidemiological surveys that investigate dental caries, as at the age of 5, we can analyze caries levels in primary dentition since during this period, modifications occur in a short space of time compared with permanent dentition [12].

Sample calculation considered a target population of 763 five-year-old preschoolers enrolled in the municipality's public network in 2022, with a hypothetical 53.4% frequency of dental caries in this population based on previous data from a national epidemiological survey [13] and a 99.9% confidence interval. Thus, the OpenEpi online sampling program indicated a minimum sample of 448 dyads. Preschoolers with trismus or fixed dental appliances that hindered complete dental crown evaluation and illiterate caregivers who lacked external support for reading and filling out the provided questionnaires were excluded.

Initially, the leader researcher visited all seven public preschools to talk to the directors and plan the research activity. After adjustments, the researcher returned to schools with the consent forms and self-administered questionnaires to be delivered to the caregivers by the school team. All five-year-old children enrolled in the schools visited were given the instruments. Still, only the dyad (primary caregiver and child) whose legal guardian had completed all self-administered questionnaires were included in the research sample. On the structured questionnaire, caregivers indicated the sex of the preschool child under their legal guardianship (male or female) and their skin color/ethnicity.

Variables

The outcome variable was caries experience in deciduous teeth, defined according to the dmft index as recommended by WHO [12]. Then, children were classified as having or not having tooth decay (outcome variable). All preschoolers were examined for tooth decay after initially undergoing supervised tooth brushing with fluoridated toothpaste to remove biofilm. Clinical evaluation was performed by a single expert-calibrated examiner who received training and calibration through Brazil's National Oral Health Policy and actively participated in the data collection process during its 2020 application. Clinical data were collected using a dental mirror and CPI probe (WHO) under natural light. Caries experience in deciduous teeth was defined according

to the dmft index as recommended by WHO [12]. Then, children were classified as having or not having tooth decay (outcome variable).

The predictor variables included parental OHL levels and family sociodemographic profiles. Parental OHL level was measured using the Health Literacy in Dentistry (HeLD-14) index [14], adapted to the Brazilian population by Mialhe et al. [15], which presents 14 questions with five answer options that evaluate seven OHL domains. Among the various aspects addressed is the ability to find, understand, process, and apply oral health-related information, allowing caregivers to express their level of agreement with the statements provided. Response options range from 'completely disagree' to 'completely agree,' the total score is calculated by summing the values assigned to each response, reflecting the overall literacy level. Total scores vary from 0 to 56 points, with higher scores representing higher OHL levels [14]. HeLD-14 index results were interpreted using tertile cut-off points determined based on population distribution. Caregivers were categorized into three groups according to their OHL levels: lower tertile (lowest OHL), middle tertile, and upper tertile (highest OHL).

The family socioeconomic profile was assessed using six closed and structured questions that classify the household into one of five pre-established strata (i.e., lower, lower middle, middle, upper middle, and upper class) [16]. These questions were based on five key factors: assessment of family income, identification of economic living conditions, scoring of parental schooling level, identification of home ownership status, and integration of the family into a broader social, cultural, and economic context [16]. Additional data were collected on the school location (center, south, or north) and the preschoolers' skin color/ethnicity and sex, as reported by their caregivers.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences, version 29.0 (SPSS, IBM Corp., Armonk, NY, USA). Associations were estimated by Poisson's regression with a robust variance model between preschoolers with and without dental caries and the variables of sex, skin color/ethnicity, school location (north, center, and south), parental oral health literacy level, and family socioeconomic stratum. A statistical structure was applied to allow variables with $p < 0.20$ in bivariate analyses to enter the multivariable model. Correlations with $p < 0.05$ were considered statistically significant.

Results

The sample was composed of 448 dyads of five-year-old preschoolers in seven public preschools in the urban area of Porto Nacional and their respective primary caregivers. Table 1 describes the sample demographic profile, in which we note a higher prevalence of Mixed-race women. Most children's families were classified socioeconomically as low and lower middle class.

Table 1. Demographic characteristics of the preschool sample.

Variables	N	%
Sex		
Male	217	48.4
Female	231	51.6
Skin-Color/Ethnicity		
White	68	15.2
Black	74	16.5
Asian	5	1.1
Mixed-race	301	67.2
School Region		

Center	165	36.83
South	109	24.33
North	174	38.84
Family Socioeconomic Classification		
Lower lower class	16	3.6
Lower class	171	38.2
Lower middle class	212	47.3
Middle class	42	9.4
Upper middle class	6	1.3
Upper class	1	0.2

Regarding caries experience, children had a mean dmft of approximately 1.77 (± 2.75). We observed 565 decayed teeth in 190 preschool children (42.41%), and 258 (57.59%) were caries-free. OHL levels measured by the HeLD-14 index were divided into tertiles: the first tertile ranged from 13 to 39 points, the second from 40 to 43 points, and the third (upper tertile) from 44 to 56 points. Table 2 presents Poisson's regression model for the study variables. We found a statistically significant association between the highest parental OHL level and the presence of decayed teeth in preschoolers (RP=0.700; 95% CI = 0.630–0.790).

Table 2. Regression analysis between the presence of caries and independent variables.

Variables	Unadjusted Analysis			Adjusted Analysis		
	PR	95% CI	p-value	PR	95% CI	p-value
Sex						
Male	1.05	0.950–1.150	0.321			
Female	1	-	-			
Skin-color/Ethnicity						
White or Asian	1.220	1.080–1.370	0.002	1.170	1.050–1.310	0.005
Black or Mixed-race	1	-	-	1	-	-
School Region						
Center	1.120	1.010–1.240	0.033			
South	1.100	0.970–1.230	0.130			
North	1	-	-			
Parental OHL Level						
High	0.650	0.580–0.720	<0.001	0.700	0.630–0.790	<0.001
Medium	0.780	0.710–0.870	<0.001	0.800	0.630–0.790	<0.001
Low	1	-	-	1	-	-
Family Socioeconomic Classification						
Upper or upper middle class	0.550	0.390–0.790	<0.001	1.020	0.990–1.050	0.117
Middle class	0.750	0.690–0.820	<0.001	0.970	0.940–1.000	0.033
Lower or lower lower class	1	-	-	1	-	-

Discussion

This study investigated the association between tooth decay in five-year-old preschoolers (outcome) and parental OHL level. Our findings indicate that higher parental OHL levels serve as a protective factor against early childhood caries, corroborating other studies and expanding the findings to a reality applicable to Brazil's inland territory [17–19]. Studies about OHL in Brazil with this population were generally conducted in larger urban centers and Brazil's south and southeast regions [17,18]. Thus, our findings provide innovative information about the importance of the caregiver's OHL in other areas of the country.

Higher OHL levels, particularly in mothers, are a protective factor associated with preventive oral health behaviors in children, such as daily tooth brushing with fluoridated toothpaste and regular dental visits for preventive measures, reducing the risk of dental caries [8,20].

Such a topic is essential because the dental caries process begins with demineralization, clinically characterized as a white spot that noninvasive procedures can treat, like daily cleaning with fluoride toothpaste and professional fluoride application. When this initial condition goes untreated, it evolves into a cavitated lesion that presents symptoms such as pain and even systemic signs [21].

The preschool participants had an average dmft of approximately 1.77, a better index compared with the national average values found in the national survey from 2010 (2.5) [13] and preliminary results of the national study found for the same population in 2020 (2.4) [22]. Additionally, the municipality achieved the *Fédération Dentaire Internationale* (FDI) targets for 2000, establishing that 50% of children between five and six should be free from cavities [23]. This can be attributed to the municipality's good public dentistry structure and intersectoral actions implemented by the school health program, which improve access to prevention and oral health promotion actions aimed at children.

Our study sample was comprehensive and representative, encompassing children and caregivers from all Porto Nacional regions and different social strata. Moreover, this is one of the first epidemiological surveys on oral health among 5-year-old children in the municipality, and it provides essential information for public health planning.

The study's limitations included the cross-sectional design, which limits the potential for associating causes and effects between variables. Other restrictions stem from the self-administered instruments used, which may generate some measurement bias. Not all participants provided feedback on the questionnaires answered. Thus, we cannot exclude the possibility that parents with low literacy levels did not participate in the study.

Considering that oral health inequalities can be reduced by actions aimed at improving individual OHL levels [24,25], we reiterate the need for interventions based on the continuous dissemination of health information using simple language following the principles of health literacy to strengthen the bond between the community and health professionals.

■ Conclusion

Parental oral health literacy was associated with the experience of tooth decay in five-year-old preschoolers in the municipal urban education network of Porto Nacional City. Oral health literacy levels above the median are a protective factor against caries development. These findings can guide local policymakers and academics in implementing initiatives to enhance caregivers' oral health literacy level, ultimately improving children's oral health outcomes.

■ Authors' Contributions

MBSB	 https://orcid.org/0000-0003-3990-0607	Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review and Editing and Project Administration.
JBS	 https://orcid.org/0000-0002-6642-8910	Conceptualization, Methodology, Formal Analysis, Data Curation, Writing - Original Draft, Writing - Review and Editing and Supervision.
MAGA	 https://orcid.org/0000-0002-6652-4427	Conceptualization, Methodology, Writing - Original Draft and Writing - Review and Editing.
HRCN	 https://orcid.org/0000-0002-7806-1386	Conceptualization, Formal Analysis, Writing - Original Draft, and Writing - Review and Editing.
FLM	 https://orcid.org/0000-0001-6465-0959	Methodology, Writing - Original Draft and Writing - Review and Editing.
All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.		

■ Financial Support

None.

■ Conflict of Interest

The authors declare no conflicts of interest.

■ Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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