

Epidemiological study on dental caries in schoolchildren: A cross-sectional study

Estudo epidemiológico sobre cárie dentária em escolares: Um estudo transversal

Estudio epidemiológico de la caries dental en escolares: Un estudio transversal

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Abstract

This paper aimed to describe the prevalence of dental caries in Quilombola schoolchildren aged 5 to 12 years using the DEF-T (decayed, extracted and filled teeth) and DMF-T (decayed, missing and filled teeth) indices. A cross-sectional study. The sample consisted of 47 schoolchildren, aged between 5 and 12 years old, of both sexes, in a municipal school located in a Quilombola community in the Tocantins state (Brazil). The participants underwent a clinical oral examination, performed by a dentist. Despite the relatively low rates (DEF-T at 5 years of 1.5 and DMF-T at 12 years of 1.24), the prevalence of caries was 78.72%, being higher in males than in females. In addition, only 5.4% of schoolchildren with some experience of caries received restorative treatment. In conclusion, the prevalence of caries in Quilombola schoolchildren aged 5 to 12 years was 78.72%, while the DEF-T/DMF-T index was 2.85 (\pm 2.84) for females, and 3.71 (\pm 3.52) for males.

Keywords: Epidemiology and biostatistics; Dental caries; Oral health; Public health; Vulnerable populations.

Resumo

Este trabalho teve como objetivo descrever a prevalência de cárie dentária em escolares Quilombolas de 5 a 12 anos por meio dos índices de dentes cariados, extraídos e obturados e dentes cariados, perdidos e obturados. Um estudo transversal. A amostra foi composta por 47 escolares, com idades entre 5 e 12 anos, de ambos os sexos, de uma escola municipal localizada em uma comunidade quilombola no estado do Tocantins (Brasil). Os participantes foram submetidos a um exame clínico bucal, realizado por um cirurgião-dentista. Apesar das taxas relativamente baixas (dentes cariados, extraídos e obturados aos 5 anos de 1,5 e dentes cariados, perdidos e obturados aos 12 anos de 1,24), a prevalência de cárie foi de 78,72%, sendo maior no sexo masculino do que no sexo feminino. Além disso, apenas 5,4% dos escolares com alguma experiência de cárie receberam tratamento restaurador. Em conclusão, a prevalência de cárie em escolares Quilombolas de 5 a 12 anos foi de 78,72%, enquanto o índice dentes cariados, extraídos e obturados/dentes cariados, perdidos e obturados foi de 2,85 (\pm 2,84) para o sexo feminino e 3,71 (\pm 3,52) para o sexo masculino.

Palavras-chave: Epidemiologia e bioestatística; Cáries dentárias; Saúde bucal; Saúde pública; Populações vulneráveis.

Resumen

Este estudio tuvo como objetivo describir la prevalencia de caries dental en estudiantes Quilombolas de 5 a 12 años utilizando los índices dientes cariados, extraídos y obturados y dientes cariados, perdidos y obturados. Un estudio transversal. La muestra estuvo compuesta por 47 escolares, con edades entre 5 y 12 años, de ambos sexos, de una escuela municipal ubicada en una comunidad Quilombola en el estado de Tocantins (Brasil). Los participantes se sometieron a un examen clínico oral, realizado por un cirujano dentista. A pesar de las tasas relativamente bajas (dientes cariados, extraídos y obturados a los 5 años de 1,5 y dientes cariados, perdidos y obturados a los 12 años de 1,24), la prevalencia de caries fue del 78,72%, siendo mayor en hombres que en mujeres. Además, solo el 5,4% de los estudiantes con alguna experiencia de caries recibió tratamiento restaurador. En conclusión, la prevalencia de caries en escolares Quilombolas de 5 a 12 años fue de 78,72%, mientras que el índice dientes cariados, extraídos y obturados/dientes cariados, perdidos y obturados fue de 2,85 (\pm 2,84) para el sexo femenino y de 3,71 (\pm 3,52) para el masculino.

Palabras clave: Epidemiología y bioestadística; Caries dental; Salud bucal; Salud pública; Poblaciones vulnerables.

1. Introduction

From 1980 to 2003, in Brazil, the prevalence of dental caries in the permanent dentition of 12-year-old children fell from 96.3% to 68.9%. This trend continued and, in 2010, in the last National Survey of Oral Health, we reached a prevalence of 56% in this age group (Gruter & Brand, 2020). It is believed that this reduction occurred due to the increase in access to water and fluoride toothpastes. Besides the change in the objectives of local oral health programs, which stopped prioritizing curatives and began to emphasize health promotion and specific preventive actions (Velasco et al., 2022).

Despite these improvements, dental caries, like most health conditions, is unevenly distributed in all countries and for all groups within the same country, which has perpetuated the picture of social inequalities in health (Gaengler et al., 1988). Namely, most people affected by dental caries live in areas with high rates of poverty, poor socioeconomic indicators and consumption of non-fluoridated water (Vinereanu et al., 2022). Many of these areas are located in the Brazilian Amazon region, a vast territory in northern Brazil, where health surveys are rare (Eduardo et al., 2022).

Among the protected areas of the Legal Amazon, currently comprising the states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, Tocantins, and part of the Maranhão, there is an important portion of the land reserved for the Quilombola populations that, like indigenous people, rubber tappers and artisanal fishermen, they are considered traditional peoples (Silva, 2019).

Until the decree n.º 138/2019 there were 3,386 Brazilian Quilombola communities registered by the Palmares Cultural Foundation. At the time, the state of Maranhão had 816 of them, occupying the 1st position among the Brazilian states, Tocantins, in turn, with 45 communities, occupied the 13th position in this ranking. However, it is believed that these data are underestimated, making it even more difficult to fight for the effective execution of public and social policies specific to this group (Castrillón et al., 2022). The existing inequities in oral health, characterized by a higher prevalence of caries in poorer population groups, are persistent and reflect the marked social inequalities in Brazil and their implications for the health of the population (Paiva et al., 2022).

Thus, carrying out epidemiological surveys on the oral health of vulnerable populations, such as the traditional communities of the Legal Amazon, becomes essentially important for the assessment of the oral health conditions of these populations, and for the elaboration of health policies that are capable of to reduce health inequalities (Vieira et al., 2022). Thus, this article aimed to describe the prevalence of dental caries in Quilombola schoolchildren aged 5 to 12 years using the DEF-T and DMF-T indices, in order to answer the following research question: What is the prevalence of dental caries in Quilombola schoolchildren?

2. Methodology

Study design

A cross-sectional study (Malta et al., 2010). The exposure variables were socioeconomic and demographic characteristics and the outcome variable, caries index in Quilombola children and adolescents (Castrillón et al., 2020). Data collection was performed by a dentist, previously trained and calibrated to apply the DEF-T and DMF-T indices, according to the diagnostic criteria defined by the WHO (Xie & Shang, 2022).

Participants

The target population of the present study consisted of schoolchildren aged between 5 and 12 years old and of both sexes, residents in the Quilombola Barra do Aroeira Community. There was no sample selection, since the intention was to evaluate the universe of children and adolescents in this age group throughout the community. The invitation to participate in the research was made to all children from preschool to 6th grade of elementary school at Escola Municipal Horácio José Rodrigues, totaling 91 children.

Among the pre-established inclusion criteria were: being between 5 and 12 years old at the time of the initial assessment; to be a resident and descendant of the respective community; responsible to sign the free and informed consent term and the child or adolescent agrees with the free and informed consent term. The sample loss was characterized by those who refused to participate in the research, those who missed class on the day of the clinical examination, and/or those whose guardians were not located in the community after three attempts by the interviewer.

Variables

The prevalence of caries was the main outcome studied, and it is usually evaluated in epidemiological studies using two indices recommended by the WHO: DEF-T at 5 years of age and DMF-T at 12 years of age. The DMF-T (decayed, missing and filled teeth) index is composed of the sum of permanent teeth affected by caries, whether they are still untreated (decayed) or treated using a conservative approach (filled) or mutilating (extracted/lost). The acronym DEF-T refers to decayed, extracted and filled teeth (Xie & Shang, 2022). In addition, socioeconomic and demographic characteristics were analyzed as variables that could influence the outcome. These variables were: sex, age, social class and access to fluoridated public water supply.

Measurement

The survey in question was conducted following the criteria proposed by the WHO, through clinical-epidemiological examinations carried out under natural light by a previously trained and calibrated dentist. The results were recorded according to a form based on the model recommended by the WHO (Xie & Shang, 2022).

DEF-T and/or DMF-T indices were calculated for each participating schoolchild, as recommended by the World Health Organization and, based on them, the prevalence of dental caries was estimated, measured by the DEF-T/DMF-T index > 0 , and its severity (also called tooth decay experience or attack), as measured by the average number of decayed “D”, missing “M” and filled “F” teeth (Xie & Shang, 2022).

As there is a mathematical relationship between caries experience measured by the DMF-T index and caries prevalence measured by the percentage of individuals with DMF > 0 , DMF-T values greater than 4.4 are indicative of a high level of caries or high prevalence; values between 2.7 and 4.4 are indicative of moderate prevalence; values between 1.2 and 2.6 reflect low prevalence; and values below 1.2 reflect a very low prevalence (Xie & Shang, 2022).

Socioeconomic conditions were assessed using the economic classification criteria questionnaire proposed by the *Associação Brasileira de Empresas de Pesquisa* (ABEP). This criterion considers household comfort goods, education of the head of the family and the characteristics of the household, and categorizes the economic class of families into eight strata: A1, A2, B1, B2, C1, C2, D, and E (ABEP, 2016) (through this same questionnaire, it was possible to identify whether the child had access to fluoridated public water supply) (Paiva et al., 2022). The questionnaires were delivered to the participants upon signature of the free and informed consent form and were completed by them, without the help of the researchers, in a self-reported manner (Sukumaran et al., 2020).

Bias

Data may present biases common to convenience sampling, in which it is not possible for all individuals to have the same chance of participating in the study. To reduce this bias, all schoolchildren aged between 5 and 12 years were invited to participate in the research and their guardians were contacted. In addition, to reduce the bias of disagreement between examiners, it was decided to carry out the clinical examinations by a single previously trained and calibrated researcher.

Study size and Ethical aspects

Rural Quilombola communities are, for the most part, lacking in dental care. This fact, together with the unfavorable socioeconomic condition, are the main causes of poor oral health in this population. According to *Política Nacional de Saúde bucal*, the appropriation of individual and collective knowledge tends to contribute to the achievement of autonomy and self-care. In this way, health education acts as a protective factor against oral diseases and, consequently, tends to reduce the prevalence of caries (Paiva et al., 2022). Participation was voluntary after obtaining informed consent from parents and students. This study was approved by community leaders and the Ethics Committee for Research with Human Beings (report number 3358190).

Statistical analysis

Information from the forms and questionnaires were initially entered into tables in the Microsoft Excel Program and then statistically treated using the Stata® 14.2 software. The data collected were related to: Number of decayed, missing or filled teeth; socioeconomic criteria; sex, and age. Individual DEF-T and/or DMF-T indices, used to estimate the prevalence of caries, are the result of the sum of their components: “d” (number of decayed deciduous teeth), “e” (number of deciduous teeth extracted due to caries), “P” (number of deciduous teeth restored), “D” (number of decayed permanent teeth), “M” (number of permanent teeth lost), and “F” (number of permanent teeth restored).

Socioeconomic criteria, in turn, followed the ABEP recommendation, according to which each criterion has a specific weight, resulting in a final score that allows the definition of the economic class to which each individual belongs. Through a univariate analysis, absolute frequencies and percentages were calculated for the qualitative variables: sex and economic class. For the quantitative variables, age and prevalence of caries, dispersion measurements were performed (mean and standard deviation or median and interquartile range, depending on the data distribution, observed using the Shapiro Wilk test).

3. Results

Fifty-nine schoolchildren were recruited for the research, there was a sample loss for the following reasons: Schoolchildren who refused to participate in the research (1), who missed class on the day the oral clinical examination was performed (3) and when those responsible were not located in the community after three attempts by the researcher (8). Thus, the final sample consisted of 47 participants (26 female, 21 male).

Prevalence of caries in the total sample was 78.72% (n=37). According to sex, this indicator was higher in males (80.95%); in females, it remained around 76.92% (Table 1). The results obtained regarding the general DEF-T/DMF-T index by sex were 2.85 (\pm 2.84) for females, and 3.71 (\pm 3.52) for males. The DEF-T at 5 years was 1.5 (\pm 0.7) and the DMF-T at 12 years was 1.25 (\pm 1.04) (Table 2). We observed the exclusivity of the “d” component in the primary dentition and the dominance of the “D” component in the permanent dentition. It was also noted that the “F” component for permanent dentition was observed only in females (Table 3).

Table 1 - Prevalence of caries, by sex, in schoolchildren from the Quilombola community Barra do Aroeira (2018).

Variables	No caries		Caries		Total	
	n	%	n	%	n	%
Sex						
Female	6	23.08	20	76.92	26	100
Male	4	19.05	17	80.95	21	100
Both sexes	10	21.28	37	78.72	47	100

Source: Authors.

Table 2 - Mean DEF-T/DMF-T, by sex and age, in students from the Quilombola community Barra do Aroeira (2018).

Variables	Mean DEF-T/DMF-T	Standard-deviation
Sex		
Female	2.85	\pm 2.84
Male	3.71	\pm 3.52
Age		
5	1.50	\pm 0.70
6	2.43	\pm 2.50
7	7.17	\pm 2.32
8	2.00	\pm 2.45
9	4.00	\pm 4.30
10	4.33	\pm 2.94
11	1.80	\pm 1.79
12	1.25	\pm 1.04

Source: Authors.

Table 3 - DEF-T and DMF-T indices, by sex and age, of students from the Quilombola community Barra do Aroeira (2018).

Variables	d	e	f	DEF-T	D	M	F	DMF-T
Sex								
F	2.66	0.33	0.00	3.00	0.73	0.04	0.14	0.91
M	3.06	0.60	0.00	3.66	1.18	0.18	0.00	1.36
Age								
5	1.50	0.00	0.00	1.50	-	-	-	-
6	2.43	0.00	0.00	2.43	0.00	0.00	0.00	0.00
7	6.17	0.66	0.00	6.83	0.33	0.00	0.00	0.33
8	1.50	0.25	0.00	1.75	0.25	0.00	0.00	0.25
9	2.44	0.66	0.00	3.10	0.67	0.00	0.22	0.89
10	1.75	0.75	0.00	2.50	2.33	0.33	0.00	2.66
11	2.00	1.00	0.00	3.00	1.00	0.20	0.00	1.20
12	-	-	-	-	1.00	0.12	0.12	1.24

d: number of decayed deciduous teeth; e: number of deciduous teeth extracted due to caries; f: number of deciduous teeth restored; DEF-T: Decayed, Extracted and Filled Teeth; D: number of decayed permanent teeth; M: number of permanent teeth lost; F: number of permanent teeth restored; DMF-T: Decayed, Missing and Filled Teeth. Source: Authors.

4. Discussion

High prevalence of dental caries (78.72%) can be explained, mainly, by the fact that rural Quilombola communities are, most of the time, lacking preventive, educational and restorative dental care. The DEF-T at 5 years was 1.5, with a predominance of the “d” component (deciduous caries) and the DMF-T at 12 years was 1.25, with a predominance of the “D” component (permanent caries) (Queiroz et al., 2022). Despite this relatively low rate, if we consider that the target proposed by the WHO for the year 2010 was a DMF-T lower than 1.0, it is possible to perceive that we are at an important distance from the situation considered ideal.

Furthermore, what stands out is the exclusivity of the carious component in the primary dentition and the predominance of this same condition in the permanent dentition. Of the 37 schoolchildren who had a history of caries, only 2 (5.4%) had access to restorative dental services. This higher percentage of decayed or missing teeth, according to Chisini et al. (2022) suggests that this population is underserved by the benefits arising from dental care, through actions to promote, prevent and restore oral health, and the public supply of fluoridated water (Vollú et al., 2019).

Socioeconomic levels are low – all children and adolescents belong to classes C2, D or E, and most are beneficiaries of the *Programa Bolsa Família*. Unfavorable socioeconomic indicators are constantly associated with a higher prevalence of caries (Paiva et al., 2022). As for access to fluoridated public water supply, coverage of only 35.1% of this benefit was obtained, so that most families make use of water from wells or springs (Khemiss et al., 2022). Limited fluoridated public water supply is another determining factor for poor oral health (Ferreira et al., 2022). Thus, in order to reduce this public health problem, it is essential to adopt preventive measures that result in the control of all these factors: access to dental care and fluoridated public water supply, socioeconomic status and individual habits (Goes et al., 2022).

Difficulties in accessing dental consultations can be explained, in part, by the precarious infrastructure of the *Unidade Básica de Saúde* (UBS) located in rural Quilombola communities, making dental consultation impossible and summarizing oral health care to occasional educational activities (Schmoeckel et al., 2021). Added to this, the low socioeconomic levels of most Quilombola populations, often reaching below the poverty line, end up eliminating the chances of accessing a dental service capable of restoring oral health (Frusca do Monte et al., 2022).

Preventive potency of water fluoridation can still be proven (Chisini et al., 2022; Ferreira et al., 2022; Paiva et al., 2022). Thus, the deficiency in the public supply of fluoridated water, in most of the rural area, tends to potentiate the phenomenon of polarization of dental caries (Melgar et al., 2016). Given this scenario, the implementation of existing public health policies is essential for promoting the oral health of vulnerable populations, in addition to preventing diseases and restoring the oral health of those who have already been affected by them (Egić, 2022).

This study has limitations that must be addressed, especially in relation to the number and selection of samples. As it evaluated an intentional sample of only one community, the data from this study cannot be generalized to other locations. Thus, it is suggested to carry out future studies that seek to assess oral health conditions in larger samples and in different locations.

Although numerous studies have evaluated the prevalence of caries in specific groups, there are still few studies that seek to assess the association between these variables in vulnerable communities (this limited the discussion and comparison of these results); Finally, we also emphasize the limitations arising from the type of study (observational), namely, the cross-sectional design prevents the researcher from establishing cause and effect relationships, which makes associations difficult.

5. Conclusion

Prevalence of caries in Quilombola schoolchildren aged 5 to 12 years was 78.72%, while the DEF-T/DMF-T index was 2.85 (\pm 2.84) for females, and 3.71 (\pm 3.52) for males.

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