

Prevalence of dental caries and treatment needs among 12-year-old children in a small-sized municipality in the Amazon region

Prevalência e gravidade da carie dentária and necessidade de tratamento em children de 12 year-old de município de pequeno porte inserido no contexto amazônico

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Abstract

Scientific literature encloses little knowledge on the prevalence of dental caries in municipalities in the Amazon region. The present study aimed to investigate the prevalence and treatment needs in the population of 12-year-old children in the municipality of Rio Preto da Eva, Amazonas, in the year 2007, according to gender and type of locality (rural or urban). This was a cross-sectional study of descriptive and exploratory nature with collection of primary data on the disease. The design was based on the 2003SB-Brazil epidemiological survey. The sample comprised 344 children in homes and schools in the rural and urban zones of the municipality. The general DMF-T index found was 3.73 (\pm 0.17), with predominance of the decay component. The percentages of children free of caries in the urban and rural zones were 12.5 and 13.6, respectively. There were no statistically significant differences between genders or types of locality. In the rural zone there were around twice as many teeth needing treatment as in the urban zone. Restorative treatment was the major treatment needed in this population (86.2%). The prevalence of caries among the 12-year-old population in Rio Preto da Eva was moderate, and the mean DMF-T was above the target level established for the year 2000 by the FDI/WHO. The data show that there is a need to implement oral health care measures that are capable of intervening in relation to determinants of dental caries in the study population.

Keywords: Dental caries. Epidemiology. Oral health.

Resumo

O conhecimento da prevalência da carie dentária em municípios inseridos no contexto amazônico é pouco observado na literatura científica. O presente estudo visa investigar a prevalência e necessidade de tratamento da população de crianças de 12 year-old de Rio Preto da Eva, Amazonas no ano de 2007, segundo o sexo and o tipo de localidade (rural and urbana). O estudo transversal foi de natureza descritiva and exploratória com a coleta de dados primários da doença, cujo desenho teve como base o levantamento epidemiológico SB-Brasil 2003. A amostra foi constituída por 344 children nas residências and schools na zona rural and urbana do município. O índice CPO-D geral encontrado foi de 3,73 ($\pm 0,17$) com predomínio do componente cariado. O percentual de children livres de carie nas zonas urbana and rural foi de 12,5 and 13,6, respectivamente. Não houve diferença estatisticamente significativa entre os sexos and os tipos de localidade. Na zona rural existem cerca de duas vezes mais dentes com necessidade de tratamento do que na zona urbana. O tratamento restaurador representou a maior necessidade de tratamento desta população (86,2%). A prevalência de carie na população de 12 year-old de idade, em Rio Preto da Eva-AM, é moderada and o CPO-D médio encontrado está acima da meta estabelecida para o ano 2.000 pela FDI/OMS. Os dados evidenciam que há necessidade de implementação de medidas de atenção à health oral que sejam capazes de intervir nos determinantes da carie dentária na população estudada.

Palavras-chave: Cárie dentária. Epidemiologia. Saúde oral.

Introduction

There has been a decrease in the prevalence of caries in Brazil¹, although there are few studies on the subject for the cities of the Brazilian Amazon region.

The last national epidemiological survey on oral diseases was called SB- Brasil and was completed in 2003. It documented the decline in caries in the population of Brazilian children. The study showed that 70% of Brazilian 12 year-old children had at least one permanent tooth with caries². The country reached the target of the World Health Organization for the year 2000 (DMFT up to 3.0) with a four-year delay, presenting a DMFT index of 2.78 for the 12 year-old population. Data such as these are worrying, especially for the north region, that has unique characteristics.

In the north region of Brazil, that encompasses most of the Amazon, the few Brazilian studies developed have highlighted, with reservation, the profile of the disease. In 1986, the region had a caries index of 7.50 for the 12 year-old population, whose sample encompassed the capitals Manaus (DMFT = 6.8) and Belém (DMFT = 7.7)³. In 1993, another study promoted by the Social Service of the Industry (SESI)⁴, in partnership with the Ministry of Health, recorded the fall of the index to 5.48. In 1996, the results were disclosed per state and, thus the state of Amazonas had a DMFT index of 2.5. Still, the design of the study was greatly criticized, especially due to the exclusion of cities other than capital and to the fact that the sample was restricted to four schools. Currently, the north region has a DMFT index of 3.13 for 12 year-old children, in whom the caries component represented 60% of the index studied², which suggests the difficulty in access to oral health care services. In Manaus⁶, a study performed in 12 year-old schoolchildren, showed a DMFT of 3.31.

It is worth pointing out that the data mentioned above refer to macro-regional contexts and capitals of the north region. Therefore, studies on small municipalities,

including the urban and rural areas, still require investigation, especially due to the fact that social inequalities may worsen the status of oral health^{7,8} especially in small cities of the Amazon region, with different characteristics from other regions of Brazil.

The present study's research field is the city of Rio Preto da Eva, Amazonas, given the lack of data that address the behavior of caries in distinct populations distant from the urban cluster of Manaus and within the Amazon biome. Therefore, the objective of the present study was to delineate the epidemiological profile of dental caries in the population of 12 year-old children, in the referred municipality, in the year 2007, to acknowledge prevalence, severity of the disease and treatment needs, according to the analysis of the gender and territorial zone variables.

Methods

Study Site

The municipality of Rio Preto da Eva, Amazonas, is along the AM-010 highway, 80 km away from the capital Manaus and has an area of 5,813 Km². According to the Brazilian Institute of Geography and Statistics⁹, small municipalities are characterized as those that regardless of their physical area, have low *per capita* income, low demographic density and severe socioeconomic problems. With an average *per capita* income of 107 reals and a Municipal Human Development Index¹⁰ of 0.677, this city was chosen because most oral health studies are limited to large capitals, especially in the north region. Moreover, it has a population of 24,858 inhabitants, most of which brown in color (70%) and with 60% concentrated in the rural area, with a demographic density near 4 inhab/Km², distributed in several communities located both at the margins of the road and of rivers of the region⁹.

We considered the rural and urban zones of Rio Preto da Eva, according to the political-administrative division in effect,

for carrying out the study. The urban zone is the space that houses the city administration, with the highest population and which exerts direct impact on the local economy⁹. The rural zone was considered as the territory characterized by the population clusters living in households alongside rivers and secondary roads distant from administrative centers with aspects of isolation and that survive and attain food from the forest. In this way, the population was distributed in four districts, according to the administrative division recommended by the local City Hall: a) the urban zone is comprised only by District I (city or main center of the city); b) rural zone is comprised of the communities of Divino Espírito Santo (district II), Miguel Romão (district III), and Manápolis (district IV).

The health system of the city is the following: a) 11 health facilities (including basic centers, bases and emergency services); b) a hospital with 30 beds to provide care to all inhabitants¹¹; c) and the Family Health Strategy covering 55% of the population, whereas the average domestic coverage for Brazilian cities of the same size is 61%¹¹. Regarding oral health services, there are three dental care units in the city¹² and other three offices in the rural zone not yet registered in the National Health Facility Registry (CNES), the former needing repairs for more complex procedures. Moreover, the city does not use fluoride in the water treatment system.

Data collection

This is a cross-sectional descriptive and exploratory study with primary disease data collection, approved by the Ethics Committee of the Federal University of Amazonas (process # 165/2006 – UFAM). In order to comply with the principle of benefit, all subjects who needed treatment were referred to the city health units. Toward that end, special referral forms issued by the Municipal Health Department were used, so as to guarantee treatment priority, without service routine.

There were 334 12 year-old children examined from a universe of 602 individuals in the year 2007. The sample was calculated in advance, based on a statistical formula utilized by SB-Brasil¹³, and on the estimates of average and standard deviation for the DMFT index for this age group in the north region ($\chi = 4.27$; $SD = 3.75$)²; design effect of the study = 2; non response rate = 20%; $\epsilon = 10\%$; level of significance = 95%) and adjustment for finite population^{2, 13}.

Intra-oral exams were performed at households randomly drawn from areas and respective sanitary districts, according to the administrative organization of the city. The study design was based on the SB-Brasil¹³ survey, taking into account some changes in the attainment of data both in the urban and rural zones.

In the urban area, three census sectors were drawn, according to the division of IBGE⁹. Of these, 07 blocks considered residential were drawn and, from these, 105 households were drawn, corresponding to 42% of the sample and obeying the distribution of the population of the city (60% living in the rural zone). All individuals present at the households drawn were examined. In case of absence, individuals were examined at school.

In the rural zone, the path to reach individuals was different. Considering that the City Hall and the regional IBGE-AM office did not have maps available with the respective census sectors and with blocks and households, the study in the rural zone covered all households within a radius of 500 meters from the most central point of a cluster of communities. Given the reality of the city with characteristics unique to the Amazon region, where the riverside population is spread alongside rivers and roads, the households of the rural districts of Rio Preto da Eva within a radius of 500 meters of the only *school* of each district were surveyed (Districts II, III and IV), unlike using the reference "*church*" adopted by SB-Brasil. In this way, households distributed in "*vilas*" in each district were mapped. Households were drawn using the draw

with replacement technique that guarantees equal chance of participation in the sample, using two stages: the first corresponding to the first digit and the second to the second digit in two-digit figures. It is worth pointing out that in case of repetition of a household already drawn, the procedure was repeated. In this fashion, the sample comprised 85 households, 25 of which in districts II and III and 35 in district IV, the latter with the highest rural population concentration.

In the event of absence or refusal of dwellers of a household elected for the study, the neighboring household at the right was visited, going in the clockwise direction until attaining the desired sample of individuals in the rural area.

Field activities began with a meeting with community leaders and introduction by the city Municipal Health Counsel surveyor to explain the aim of the study, technical procedures and public health benefits. Results of the study will be presented to the municipal and community leaders and is available to the Municipal Health Department, so as to contribute to the planning, execution and maintenance of the oral health policies of the city.

All 12 year-old children were examined at their homes or at the school where they studied, including everyone born in Rio Preto da Eva from November 01 1994 to October 31 1995.

In order to find the prevalence and severity of caries, and treatment needs, criteria and indexes recommended by WHO were used¹⁴. The exam was performed in natural light, drying teeth with gauze – without previous brushing or prophylaxis – the major aim of the exam being to attain information on the advanced stages of caries. Individuals were examined on school chairs or on tables.

In order to calculate the DMFT index, specific epidemiological forms that allowed tabulating data were used, based on the observation of the experience in caries of each survey subject. Forms were coded in letters and numbers corresponding to the history of disease in permanent teeth, according to SB-Brasil¹³.

There was only one examiner and one note keeper duly trained to execute this stage of the survey. The examiner was submitted to agreement tests – intra examiner Kappa Calculation – to adjust the subjective diagnosis criteria for caries before going to the field, and whose value was equal to 0.98, considering teeth as a set.

Statistical analysis

The database was set up in Microsoft Office 2003 Excel, and submitted to analysis in the Statistical Analysis Systems – SAS – program, version 6.12 for microcomputers. Descriptive statistical analysis was based on calculating central trend measures – such as mean and median and of variability – standard error and standard deviation for the variables prevalence and severity of dental caries in permanent teeth and need for treatment, according to gender and area (urban or rural). Shapiro-Wilks was used to assess the normal distribution of variables. If the normal distribution assumption was not accepted, non-parametric Mann-Whitney was used. The level of significance adopted for all tests was 5%.

Results

The DMFT found in the population studied was 3.73 and 13.2% did not have any caries. Caries in Rio Preto da Eva affects the population equally, regardless of gender, locality, without a significant statistical difference ($p = 0.54$ and 0.60 , respectively).

As to the composition of the DMFT index, decayed, missing and filled components had similar proportions in both genders (Table 01). The comparison of means did not show a statistically significant DMFT difference between genders according to stratification per territory zone, however there was a statistically significant difference ($p < 0.01$) in fillings (Table 02).

In the rural zone, there were more children observed with less teeth present and with more treatment needs (12.85%) in comparison to data of the urban zone (Ta-

ble 03). Moreover, boys needed more filling treatment (1 and 2 or more faces) and girls more channel and surgical treatment (7.20% and 7.61%, respectively).

Analyzing the number of children as an observation unit in relation to DMFT, the prevalence of caries is 86.8% in the 12 year-old children of Rio Preto da Eva, whereas 34.9% have a DMFT ≥ 6.0 .

Discussion

Data on dental status in the north region, within the legal Amazon region, are little explored in the literature. The findings on caries in Rio Preto da Eva are different from other studies in Brazilian cities. Using 12 year-olds as a reference, the prevalence of caries (86.8%) in Rio Preto da Eva-AM was high. The value of the DMFT index was 3.73 teeth, considered a moderate value in the scale recommended by WHO¹⁵. However, even with the availability of epidemiological information on the prevalence of caries in the city studied, the findings of the present study seem to suggest that the picture is not so critical when compared to the results of the national survey carried out by the Ministry of Health in 1986³. After 11 years, a 49.3% reduction was observed in the index of the north region (DMFT=7.5). Considering that the city does not have fluoridated water, the fact could be attributed to the availability of fluoride toothpastes in Brazil, as of 1989. However, it is worth pointing out that one should be cautious when comparing estimates obtained by other studies, given the lack of standardization and calculation of variables. Therefore, the attainment of unrepresentative samples can compromise the analysis¹, in addition to the fact that epidemiological surveys were not carried out in the city of the present study. Moreover, the fact that present study worked with a population-based sample makes it different from most of the studies and from national surveys, carried out in schoolchildren.

The mean DMFT in our study, both in the urban (3.9) and rural zones (3.6) is higher than those found in Brazil (3.38), north re-

Table 1 – Decayed, missing, and filled components, mean DMFT index, number of present teeth and caries-free teeth in 12-year-old children (n=344). Rio Preto da Eva, Amazonas, 2007.

Variables	Gender		Zone		Total N = 334
	Women N = 160	Men N = 174	Rural N = 198	Urban N = 136	
Decayed					
Average (SE)	3.03 (0.22) ^a	2.0 (0.19) ^a	3.00 (0.18) ^a	2.77 (0.17) ^a	2.91(0.14)
CI	(2.67 ; 3.39)	(2.49 ; 3.11)	(2.70 ; 3.29)	(2.49 ; 3.05)	(2.68 ; 3.14)
%	78.7	77.4	83.1	71.0	77.9
Minimum	0	0	0	0	0
Median	3	2	2.5	2	2
Maximum	22	10	12	22	22
Missing					
Average (SE)	0.31 (0.05) ^a	0.29 (0.05) ^a	0.25 (0.04) ^a	0.38 (0.07) ^a	0.30(0.04)
CI	(0.23 ; 0.39)	(0.21 ; 0.37)	(0.18 ; 0.31)	(0.26 ; 0.49)	(0.23 ; 0.36)
%	8.1	8.0	6.9	9.7	8.1
Minimum	0	0	0	0	0
Median	0	0	0	0	0
Maximum	4	3	3	4	4
Filled					
Average (SE)	0.51 (0.08) ^a	0.53 (0.10) ^a	0.36 (0.07) ^a	0.75 (0.12) ^b	0.52(0.06)
CI	(0.38 ; 0.64)	(0.37 ; 0.69)	(0.24 ; 0.47)	(0.55 ; 0.95)	(0.42 ; 0.62)
%	13.3	14.6	10.0	19.2	14.0
Minimum	0	0	0	0	0
Median	0	0	0	0	0
Maximum	7	8	8	7	8
CPOD					
Average (SE)	3.85 (0.25) ^a	3.62 (0.22) ^a	3.61 (0.20) ^a	3.90 (0.29) ^a	3.73 (0.17)
CI	(3.44 ; 4.26)	(3.23 ; 3.98)	(3.28 ; 3.94)	(3.42 ; 4.37)	(3.45 ; 4.01)
%	100	100	100	100	100
Minimum	0	0	0	0	0
Median	4	3	3	4	3
Maximum	23	14	14	23	23
Teeth Present					
Average (SE)	24.57 (0.31)	23.04 (0.36)	23.60 (0.32)	24.03 (0.37)	23.97 (0.24)
CI	(24.06 ; 25.08)	(22.45 ; 23.63)	(23.07 ; 24.12)	(23.42 ; 24.64)	(23.38 ; 24.16)
Minimum	12	9	9	9	9
Median	26	24	25	26	25
Maximum	28	28	28	28	28
Caries-Free					
%	11.3	14.9	13.6	12.5	13.2
CI	(6.39; 16.21)	(9.61;20.19)	(8.83; 18.37)	(6.94; 18.06)	(9.57; 16.83)

*Averages followed by distinct letters differ between themselves at the 5% level of significance. EP = standard error. Mann-WhitneyTest.

Table 2 – DMFT means and its components per gender, according to territorial zone. Rio Preto da Eva, Amazonas, 2007.

Variables	Men		Women	
	Rural n = 108	Urban n = 66	Rural n = 90	Urban n = 70
Decayed				
mean (SE)	2.86 (0.24) ^a	2.69 (0.32) ^a	3.16 (0.26) ^c	2.84 (0.37) ^c
CI	(2.47 ; 3.25)	(2.16 ; 3.21)	(2.73 ; 3.59)	(2.23 ; 3.45)
Missing				
mean (SE)	0.24 (0.06) ^a	0.38 (0.09) ^a	0.26 (0.06) ^c	0.38 (0.10) ^c
CI	(0.14 ; 0.34)	(0.28 ; 0.53)	(0.16 ; 0.36)	(0.22 ; 0.54)
Filled				
mean (SE)	0.38 (0.11) ^a	0.77 (0.18) ^b	0.32 (0.08) ^c	0.72 (0.16) ^d
CI	(0.20 ; 0.58)	(0.47 ; 1.06)	(0.19 ; 0.45)	(0.46 ; 0.98)
CPOD				
mean (SE)	3.49 (0.27) ^a	3.87 (0.39) ^a	3.74 (0.30) ^c	4.00 (0.45) ^c
CI	(3.05 ; 3.93)	(3.23 ; 4.51)	(3.25 ; 4.23)	(3.26 ; 4.74)

*Averages followed by distinct letters differ between themselves at the 5% level of significance. Mann-WhitneyTest.

gion (3.15), when we consider areas without fluoridated water². The mean DMFT found in our study was higher than indexes found in schoolchildren of the same age in other cities of the southeast and south regions of Brazil such as: Piracicaba¹⁶, Araraquara¹⁷, Sorocaba¹⁸, Itapetininga⁸ in São Paulo; Itaúna⁷ in Minas Gerais; Blumenau¹⁹, São João do Sul and Treviso²⁰ in Santa Catarina; and Manaus, capital of the state of Amazonas⁶. On the other hand, cities such as: Perdeneiras²¹ in São Paulo; and also nine cities of inner state of Goiás²² and Abaetetuba in Pará²³, and findings in some Indian ethnicities such as Baniwa²⁴ in Amazonas, and those in the Xingu region²⁵ in Pará have caries indexes higher than those in the study. The differences may be associated to socio-economic factors that were not addressed by the present study.

As to composition of the DMFT index, decayed, missing and filled components presented similar proportions both for males and females (table 1), while the variation range was different only for fillings. A study in Itapetininga⁸ observed that decayed components contributed most in the rural

zone while filled components contributed most in the urban zone. This is in agreement with the findings of the present study, in which components with caries, representing 83.10% of the index found prevailed in the rural zone, highlighting the severity of the disease. These results are also in agreement with the studies of Freire²², Cangussu²⁶ and with the results of SB-Brasil², but, are different from those found in Treviso²⁰ and Itapetininga⁸, where filled components prevailed. Moreover, missing and filled components in the urban zone were more represented, if compared to the rural zone (9.74% and 19.23%, respectively).

Decayed components prevailed in the DMFT composition in both genders and locations (table 01). The results differ somewhat from the profile of the condition in 12 year-old Brazilian children, in which afro-descendent girls from rural zones and public school students are more affected by permanent untreated teeth with caries²⁷.

Regarding the treatment needs verified in the present study, filling prevailed (85.22%) over the others. Of the 980 (12.2%) teeth needing treatment, roughly 60% were

Table 3 – Permanent teeth of 12-year-old children, according to treatment needs per gender and territorial zone. Rio Preto da Eva, Amazonas, 2007.

Need and type	Gender		Zone	
	Women	Men	Rural	Urban
No Need				
n = 7,027	3,483 (87.8%)	3,544 (87.8%)	4,090 (87.2%)	2,937 (88.6%)
CI	(87.3; 88.57)	(87.3; 88.57)	(86.42; 87.98)	(88.17; 89.63)
With Need				
n = 980	486 (12.2%)	494 (12.2%)	603 (12.9%)	377 (11.4%)
CI	(10.15; 14.25)	(10.15; 14.25)	(10.80; 15.00)	(9.41; 13.39)
Restoration 1 face				
n = 708	355 (73.1%)	353 (71.5%)	435 (72.1%)	273 (72.4%)
CI	(69.83; 76.37)	(68.17; 74.83)	(68.80; 75.40)	(69.11; 75.69)
Restoration of 2 or more faces				
n = 137	57 (11.7%)	80 (16.2%)	94 (15.6%)	43 (11.4%)
CI	(6.32; 17.08)	(10.03; 22.37)	(9.52; 21.68)	(6.08; 16.72)
Crown				
n = 02	0.00 (0.0%)	02 (0.4%)	0.00 (0.0%)	02 (0.5%)
CI	-	(0.00; 9.15)	-	(0.00; 10.28)
Face				
n = 04	02 (0.4%)	02 (0.4%)	04 (0.7%)	0.00 (0.0%)
CI	(0.00; 6.59)	(0.00; 6.59)	(0.00; 8.87)	-
Restoration and channel				
n = 56	35 (7.2%)	21 (4.3%)	27 (4.5%)	29 (7.7%)
CI	(0.43; 13.97)	(0.00; 9.61)	(0.00; 9.93)	(0.72; 14.68)
Exodontia				
n = 73	37 (7.6%)	36 (7.3%)	43 (7.1%)	30 (8.0%)
CI	(1.52; 13.68)	(1.33; 13.27)	(1.21; 12.99)	(1.78; 14.22)

in the rural zone. Of these, roughly 7.13% and 4.48% of total teeth needed surgical and endodontic treatment, respectively. In the urban zone, the ratio for the same types of treatment were 7.69% and 7.96% (table 03). In the north region of Brazil, 9.7% of the population studied had some kind of treatment need, the higher percentage being for filling of 1 and 2 surfaces (81.2%).

Observing the variables number of teeth needing treatment and DMFT components, it may be suggested that individuals from the rural zone have more difficult access to dental care, if compared to the urban zone of Rio Preto da Eva.

It is worth pointing out that the rural zones of small cities of the Amazon region have different features from those of other Brazilian regions. According to Sawyer²⁸, areas considered urban based on size criteria in specific regions, with great distances, as is the case of the Amazon region, may exclude small population clusters that may play an important economic role at the local level. On the other hand, rural areas may have difficult access to urban centers and, therefore to consumer goods and industrialized foods. Given these individuals would only have access through rivers or secondary roads, which in many cases means many

traveling hours, this represents a barrier to access to dental care.

In Rio Preto da Eva, 34.9% of individuals have a DMFT higher than 6, representing a small part of the population that concentrate the disease and a greater need for treatment, characterizing the phenomenon of polarization. This may reflect measures to prevent and control the disease, based on population strategy¹, orienting, in this fashion, information that guides measures to promote oral health and access of the population to dental care.

In the context of the disease in Brazil¹, the percentage of schoolchildren with DMFT equal to zero grew from 3.7% in 1986 to 31.1% in 2003. In the north region, the rate is 24.15% and in Rio Preto da Eva the percentage is only 13.2%. The scenario of this city may be similar to other cities of inner state Amazonas, given there is no fluoridated water supply and that there are characteristic regional specificities that contribute to increasing the number of

caries. Although fluoridated water is a highly efficient action with a low relative cost and great social benefit²⁹, the measure is not feasible currently, for the city studied, given the water comes from the underground directly to reservoirs, without a treatment station³⁰. In this sense, new studies are suggested to investigate the access to industrialized and cariogenic products, and to fluoridated products, specifically in the Amazon Region which would justify scientifically the prevalence of caries found.

The mean DMFT index at 12 years of age in our study area, both in the urban (3.9 \pm 0.29), and rural zone (3.61 \pm 0.20) did not reach the target proposed by the WHO for the year 2000 (DMF below or equal to 3)³¹. It is recommended that the health oral policy of the city include monitoring future trends of dental caries and the implementation of oral health care measures, respecting the characteristics of this population in the scenario of the Amazon region.

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Recebido em: 14/03/08
 Versão final reapresentada em: 03/09/08
 Aprovado em: 17/10/08