Original article

Dental caries in peoples of Xingu Indigenous Park, Brazil, 2007 and 2013*

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Abstract

Objective: to describe the prevalence of dental caries and the supply of dental care in the population of Xingu Indigenous Park, Brazil, at 5, 12 and 15-19 years old, in 2007 and 2013. **Methods**: cross-sectional study panel, with secondary data provided by the Indigenous Special Sanitary District of Xingu and Project Xingu. **Results**: 368 indigenous people were examined in 2007 and 423 in 2013; there was no significant difference between the means of the number of decayed, missing and filled teeth at 5 years (6.43 [2007], 5.85 [2013]; p=0.29), and at 12 years (2.54 [2007], 2.78 [2013]; p=0.81); this difference was significant at 15-19 years (6.89 [2007], 4.65 [2013]; p<0.01); the dental care index decreased from 21.7 to 7.1%, 44.1 to 16.4%, and 63.1 to 41.1%, respectively at 5, 12, and 15-19 years. **Conclusion**: the prevalence of caries remained high in children, with a reduction in adolescents (15-19 years old); there was a decrease in the supply of dental care.

Keywords: Dental Caries; Oral Health; Indigenous Population; Epidemiology, Descriptive; Health of Indigenous Peoples.

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Introduction

The 2004 National Oral Health Policy gave new directions to oral health care through guidelines for the organization of programs and services, based on epidemiology and information on the health care territory, providing support for comprehensive care to the health needs of different population groups.[1] Health situation analysis is an important instrument for the management and evaluation of programs.[2]

In contrast to the decrease in dental caries indicators observed in national epidemiological analysis,[3,4] the studies on the oral health conditions of indigenous peoples in Brazil suggest an increasing trend in the prevalence of caries. This is attributed to the impact of changes in diet and sociocultural, economic and environmental factors, as well as a lack of preventive programs.[5,6] There is evidence of inequity in the supply of oral health care services and preventive methods between indigenous and non-indigenous people, which makes them more vulnerable to caries and its complications.[7-13] Socio-cultural diversity and the complexity of the different contexts of oral health care of indigenous peoples suggest the need to produce information about these different realities and their interpretation based on an appropriate theoretical framework.[14-16]

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One concept that may be useful in comparing different estimates of dental caries experience is the notion of prevalence channels.[17] According to this concept, the level of dental caries in a population of a given age can help predict the future level of caries in this group over the years, i.e., if this level is high in a group aged 12, by the end of six years without changing these conditions, it tends to be high in the 18-year-old population.

Similarly, if the level of dental caries in a 12-year-old group is low, under the same conditions, it tends to be low in the cohort of these individuals at 18 years of age, after six years. Studies that investigated whether the improvement in oral health among children and adolescents has been extended to the adult population over more than two decades have confirmed this observation.[18,19]

This study aimed to describe the prevalence of dental caries and the supply of dental care in the population of Xingu Indigenous Park, Brazil, at 5 and 12 years of age and in the 15-19 age group, in 2007 and 2013.

Methods

This is a panel of cross-sectional studies based on secondary data from two surveys conducted in two periods: January-May 2007 and January-May 2013. Data collection was performed by teams of the Indigenous Special Sanitary District (DSEI) and the Xingu Project.

The Xingu Indigenous Park (PIX), founded in 1961, was the first indigenous territory recognized in the country, and currently, it houses 16 ethnic groups. The park is located in the northeast region of Mato Grosso State, southern Amazon. The studied territory is located in the central region and to the north of the PIX, in the Low, Middle and East Xingu, and corresponds to the areas covered by the Pavuru, Diauarum and Wawi peoples. Altogether, there are 44 villages of the Kisêdje, Ikpeng, Kaiabi, Trumai, Kamayura, Yudjá, Waurá and Tapayuna ethnic groups, with a total of 2,957 people according to the 2013 Population Census of the Xingu DSEI.

The Federal University of São Paulo (Unifesp) has developed health actions at PIX through a university extension program (Project Xingu) since 1965. Since the creation of the Xingu DSEI in 1999, the National Health Foundation (Funasa) manages local health services, in partnership with the Project Xingu. The oral health care activities were structured through partnerships (Huka Katu Project, from the College of Dentistry of Ribeirão Preto of the University of São Paulo [FORP/USP]; and Pro Natives Project).[20] Since 2007, a joint agreement between Funasa and FORP/USP was interrupted and the Pro Natives Project closed due to the end of financing of its supporting institution. Since 2010, the Special Secretariat for Indigenous Health (Sesai) of the Ministry of Health took responsibility for oral health care at PIX, as manager of the Indigenous Health Care Subsystem. [21]

The surveys included the entire population of Low, Middle, and East Xingu, at the ages of 5 and 12 and in the 15-19 age group.

The following variables were studied: sex (male and female); age (5, 12 and 15 to 19); and the condition of dental elements (decayed, missing and filled), from which the median decayed, missing and filled teeth (DMFT index) and median decayed, extracted and filled deciduous teeth (dmft index) were calculated. The DMFT index corresponds to the number of decayed, missing and filled teeth of an individual's permanent dentition. The dmft index corresponds to the number of decayed, extracted and filled teeth in an individual's deciduous dentition.

The dmft and DMFT indexes allow us to distinguish the history of past caries and the present situation, and make it possible to measure the magnitude of the occurrence of the disease in individuals and populations; they indicate past history (components M= missing or extracted due to caries, and component F= filled) and of current history (component D= decayed tooth at time of examination). In addition, the rate of caries-free individuals was assessed (dmft index=0 and DMFT index=0).

The percentage of individuals with dmft or DMFT index equal to or higher than 1 corresponds to the prevalence of caries in the respective group. Only in these groups was the dental care index proposed by Walsh[22] calculated – it allows evaluating the supply of dental services – as the ratio between restored or filled teeth (i.e., the F component of the DMFT index) and the total of decayed, missing and filled teeth (DMFT). The higher the index in a population, the greater the number of teeth restored and the lower the number of decayed and missing teeth, indicating greater dental services supply.

The indicators used in this study comply with the recommendations of the World Health Organization (WHO) registered in the 4th edition of the 'Manual of Instructions for Basic Epidemiological Survey on Oral Health'.[23]

The secondary data were gathered from the Local Health Information System (SLIS) of Xingu DSEI and from technical reports from Unifesp's Project Xingu. Both databases are under the care of the institutions that conducted the surveys and access can be requested for studies and research.

Prior to the surveys, the examiners were calibrated. This procedure was performed in accordance with the standards adopted in epidemiological surveys, basically consisting of the following steps: a) appropriation by the examiners of the theoretical foundations of the variables used; b) understanding of the criteria to be adopted in order to define each examination observation and its respective codes; c) application of the criteria in real situations, i.e., the calibration itself; and d) calculation of intra and inter-examiner errors, based on simple concordance analysis or using Kappa coefficient (k). The k values were 0.91 in 2007 and 0.92 in 2013. The examinations were performed under natural light and without drying of the field of observation, as recommended by WHO.[23] The data were recorded on paper forms, created specifically for this purpose, by people trained in this function; subsequently, these data were entered in the respective banks. The data were analyzed using tables generated with the purpose of identifying anomalous values, which were then deleted.

The data were processed using the Microsoft Excel software and analyzed with the Statistical Package for Social Sciences (SPSS) software, version 16.0. The absolute and relative frequencies distributions were obtained. For the analysis, the mean values and respective standard deviations were calculated for each age or age group and sex, in addition to the medians and quartiles, for the construction of box plots for each age or age group.

The (i) Mann-Whitney statistical test was used for the analysis of the means between the two periods studied, and the (ii) Pearson's chi-square was used for the comparison between the sexes. A 5% level of statistical significance was adopted.

The research project that originated this study was approved by the Ethics in Research Comittee of the School of Public Health of the University of São Paulo (COEP/FSP/USP) – Certificate of Presentation for Ethical Appreciation (CAAE) No. 40968815.0.0000.5421, on March 11th, 2015 – and by the National Commission for Ethics in Research (CONEP) – Report No. 1,004,479, on March 31th, 2015. The recommendations for research involving indigenous populations included in the Resolutions No. 196/96 and No. 466/12 of the National Health Council (CNS) were followed.

Results

In the first survey, in 2007, we included data of 368 indigenous people: 100 individuals aged 5, 50

aged 12 and 218 in the 15-19 age group. The second survey, carried out in 2013, included data from 423 indigenous people: 86 individuals aged 5, 77 aged 12 and 260 in the 15-19 age group. In the distribution by sex, females were predominant in all categories: at the age of 5, they were 52% in 2007 and 61.6% in 2013; at the age of 12, 54.0% in 2007 and 51.9% in 2013; and in the 15-19 age group, 51.4% in 2007 and 57.3% in 2013.

Table 1 shows that 5-year-old children presented a mean dmft index of 6.43 in 2007 and 5.85 in 2013 (p=0.29). At the age of 12, the mean DMFT index was 2.54 in 2007 and 2.78 in 2013 (p=0.81). In the 15-19 age group, the mean DMFT index was 6.89 in 2007 and 4.65 teeth in 2013 (p <0.01).

There was no statistically significant difference between sexes in 2007 (5 years, p=0.95, 12 years, p=0.81 and 15 to 19 years, p=0.20) and in 2013 (5 years, p=0.25, 12 years, p=0.84, and 15 to 19 years, p=0.22). The distribution by sex is described in Table 1.

Figure 1 shows the characteristics of the distribution of dmft index values at the age of 5 and DMFT index at the age of 12 and in the 15-19 age group, in 2007 and 2013: at 5, median values were 6.0 in 2007 and 5.5 in 2013, and the interquartile ranges of 7.0 (2007) and 5.0 (2013); at 12, the medians were 2.0 in 2007 and 3.0 in 2013, and interquartile ranges of 3.0 (2007 and 2013); and in the 15-19 age group, the medians were 7.0 in 2007 and 4.0 in 2013, and interquartile ranges of 5.0 (2007 and 2013).

The percentage of caries-free individuals aged 5 was of 6.0% in 2007 and 10.5% in 2013 – a significant difference (p=0.027). Caries-free individuals aged 12, (DMFT index=0) in 2007 and in 2013 corresponded to 24.0% and 22.1%, respectively, which is not a significant difference (p=0.80). In the 15-19 age group, the percentage of caries-free individuals (DMFT index = 0) was of 4.1% in 2007 and 7.7% in 2013, and no statistically significant difference was observed (p=0.10).

With regard to the percentage of the components of the dmft index and DMFT index (Figure 2), there was a reduction in the percentage of filled teeth and an increase in the decayed component, at all ages. The component caries at the age of 5 represented 70.5% of the index in 2007 and 87.5% in 2013. There was also an increment from 43.3 to 73.8% at the age 12 of and from 20.7 to 43.3% for the 15 to 19 age group.

Regarding the missing or extracted component, Figure 2 illustrates the differences between the years 2007 and 2013. At the age of 5, the values dropped from 7.9 to 5.4%; at 12, from 12.6 to 9.8%; and in the 15-19 age group, from 16.2 to 15.6%.

Dental care rates decreased at all ages, from 2007 to 2013. At 5, it decreased from 21.7 to 7.1%; at 12, from 44.1 to 16.4%; and in the 15-19 age group, from 63.1 to 41.1% (Figure 2).

Table 1 – Distribution of dental caries median indexes by age or age group and sex in the Low, Middle and East Xingu, Mato Grosso, 2007 and 2013

Age (in years)	Sex	dmft index [a] and DMFT index [b]					
		2007			2013		
		N	Median	Standard-deviation	N	Median	Standard-deviation
5	Male	48	6.40	3.79	33	5.06	3.03
	Female	52	6.46	3.73	53	6.34	4.48
	Total	100	6.43	3.74	86	5.85	4.01
12	Male	23	2.35	1.75	37	2.97	3.03
	Female	27	2.70	2.48	40	2.60	2.15
	Total	50	2.54	2.16	77	2.78	2.60
15-19	Male	106	6.49	3.91	111	4.83	2.91
	Female	112	7.28	4.37	149	4.51	3.22
	Total	218	6.89	4.16	260	4.65	3.09

a) dmft index: sum of decayed, extracted due to caries and restored deciduous teeth in an individual.
b) DMFT INDEX: sum of decayed, missing due to caries and filled permanent teeth in an individual.

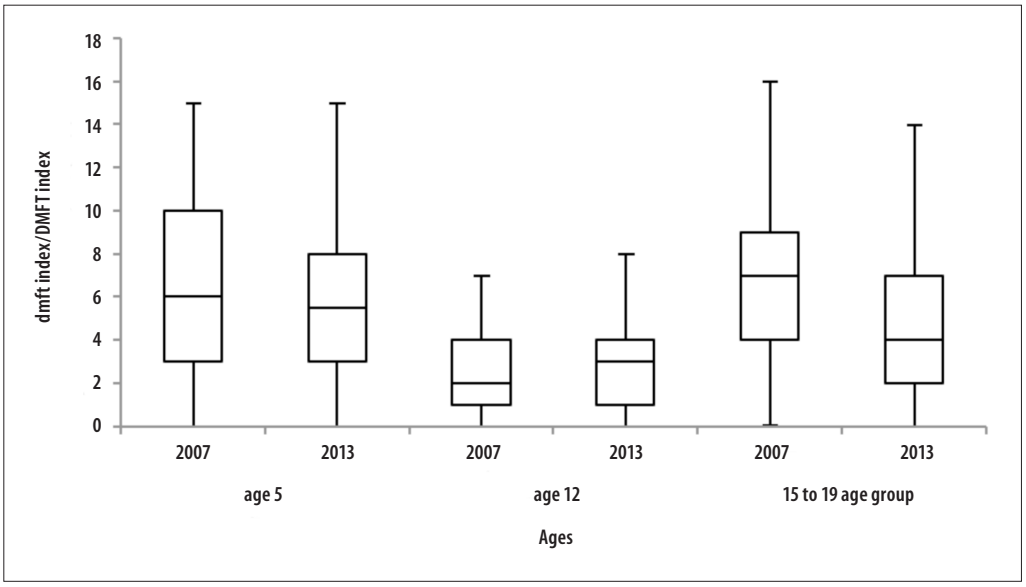


Figure 1 – Distribution of the number of decayed, extracted due to caries or restored deciduous teeth (dmft index), at the age of 5 and number of decayed, missing due to caries or filled permanent teeth (DMFT index), at the age of 12 and in the 15-19 age group in the Low, Middle and East Xingu, Mato Grosso, 2007 and 2013

Discussion

From 2007 to 2013, there was no significant difference in the experience of dental caries at 5 and 12 years old in the population of the Xingu Indigenous Park. Only in the 15-19 age group did the DMFT index decrease. In all age groups, there was a decrease in the supply of dental care, with no statistical differences between the sexes.

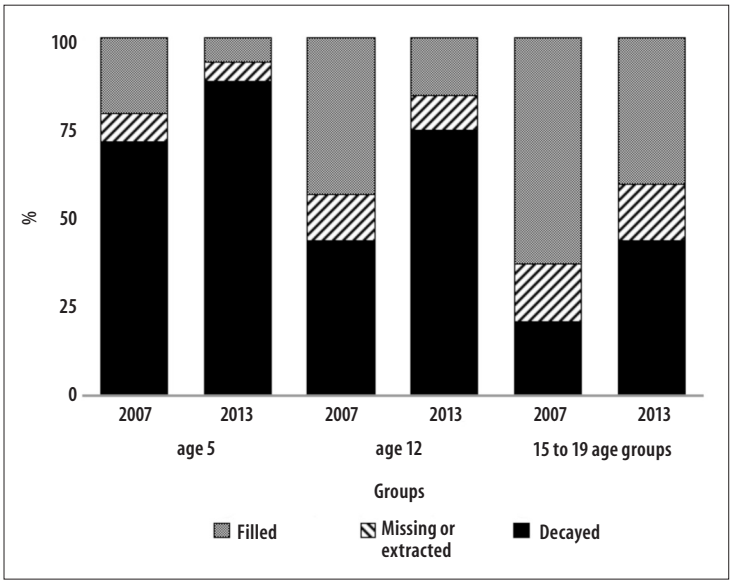
The use of secondary data brought important limitations, such as the impossibility of presenting results by ethnic groups and, therefore, of analyzing similarities and differences among the peoples of the Xingu region. In addition, the variables were restricted to those available in the databases used. Nevertheless, it was possible to understand the occurrence of caries in that territory, and produce useful knowledge for health services and other interested in indigenous oral health.

In 2010, a cross-sectional epidemiological survey on oral health, of national range, conducted by the Ministry of Health, identified that in the Midwest region of the country, the median value of the dmft index for non-indigenous children was of 3.00, whilst in Brazil, this value was of 2.43,[24] lower than the result found in this study. The same unfavorable condition was observed in relation to the percentage of caries-free individuals. The condition found in the deciduous dentition is an indicative of greater vulnerability of the indigenous peoples from PIX, compared to the non-indigenous population of the Midwest region.

At the index-age 12, the number observed in 2013 for dental caries in Xingu was higher than in the Midwest region (2.63) and Brazil (2.07), in 2010. According to WHO,[23] the prevalence of caries is considered low when the DMFT index values are between 1.2 and 2.6; and "moderate" when the values are between 2.7 and 4.4. In this age-index, the percentage of caries-free individuals for the PIX indigenous population was much lower than in the Brazilian population in 2010 (43.5%).

On the other hand, the 15-19 age group showed a significant decrease in the caries experience from 2007 to 2013. The number found in 2013 was closer to that observed for Brazil (4.25) than for that found in the Midwest (5.94) in 2010.[24] The percentage of caries-free individuals in the non-indigenous population of the Midwest was slightly higher.

Some indigenous populations experienced an increment in the prevalence of caries in the second half of the 20th century.[6,12-14] However, two cross-sectional epidemiological studies, conducted in Xingu in 2006 and in the Xavante indigenous land of Pimentel Barbosa in 2004, showed that in the age group 15-



a) dmft index: sum of decayed, extracted due to caries and restored deciduous teeth in an individual.
b) DMFT INDEX: sum of decayed, missing due to caries and filled permanent teeth in an individual.

Figure 2 – Percentage composition of dmft index[a] and DMFT index[b] according to components, in the age groups 5, 12 and 15-19, in the Low, Middle and East Xingu, Mato Grosso, 2007 and 2013

19, some ethnic groups, like the Trumai, Kamaiura and Xavante,[6] have shown patterns compatible with the non-indigenous population of the region. In this present study, the results found for the permanent dentition among adolescents and youngsters of Kisêdje, Ikpeng, Kaiabi, Trumai, Kamayura, Yudjá, Waurá and Tapayuna ethnic groups express this trend, probably related to the access to fluoride in the form of toothpaste, either through programs maintained by the Indigenous Health Care Subsystem, through partnerships with universities and private institutions or through increased family income through social programs and a greater number of formal labor contracts.[25,26] A study conducted with an indigenous Brazilian population showed that household income may be a protective factor against dental caries at the age of 12.[27] The levels observed in the population addressed by this study may lead to a prevalence distinct from the previous level, extending to the cohort in adulthood.[17]

The increase in the percentage of the component D (decayed or untreated caries) and the decrease of the component F (filled) in all groups in the investigated period indicate a worsening of dental care supply, since, proportionally, a smaller number of patients' teeth have been restored. This may be related to the discontinuity of the dental care program and its partnerships, as well as to the period of change in the management of the Indigenous Health Care Subsystem, which, with all its structural problems, brought losses to the oral health of this population. When comparing the dental care indexes of the Xingu with the data from Brazil for 2010, at ages 5, 12 and 15 to 19, we found the percentages of 13.6%, 35.3% and 50.8%, respectively, indicating higher numbers in relation to the indigenous groups investigated in this study.

Finally, the prevalence of untreated decay remained high in children and adolescents of the Xingu Indigenous Park between 2007 and 2013. Populations not affected by caries at all ages are small. Although the mean values of the DMFT index indicate a decrease in the magnitude of caries experience in the permanent dentition, the values of the dmft index show that this magnitude is stationary in the deciduous dentition. The provision of dental care worsened from 2007 to 2013, declining in the three age groups evaluated. Such conditions indicate the need for oral health care programs that promote timely dental care to indigenous communities, overcoming under-dimensioning of resources and discontinuation of actions, emphasizing the dimension of prevention in the care strategy and

investing in researches that allow the generation of knowledge capable of contributing to the improvement of the current situation.

Authors' contributions

Lemos PN and Narvai PC idealized and participated in all stages of the study. Rodrigues DA and Frazão P contributed to the final revision of the text. Coelho CC and Campos JNS contributed to the transcription, reliability and analysis of data. All authors contributed to planning the study, reviewing and approving the final version of the manuscript and declared to be responsible for all aspects of the study, ensuring its accuracy and integrity.

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