

Oral health disparities among Brazilian self-identified indigenous individuals

Disparidades em saúde bucal entre Brasileiros autodeclarados indígenas

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SUMMARY: This article aimed to use epidemiological constructs to describe and analyze the oral health burdens among self-identified indigenous individuals in Brazil and to compare the findings with the oral health status within the non-indigenous population. The study utilized secondary data from the Oral health Brazil database (SB Brasil 2003) to address the null hypothesis that there were no oral health differences between self-identified indigenous and non-indigenous individuals in Brazil. Indigenous individuals had 3.17 (95% C.I.:2.44--4.13) greater odds of never having visited a dentist's office than non-indigenous individuals. Indigenous persons had 1.55 (95% C.I.:1.20--2.00) greater odds of having periodontal problems than non-indigenous persons. Indigenous children had 1.71 (95% C.I.:1.37--2.14) higher odds of having a decayed, missing, and filled teeth score different from zero than non-indigenous children. Finally, indigenous persons were found to have 1.24 (95% C.I.:1.07--1.45) greater odds of not being a caries free individual than a non-indigenous person. The results lend credence to the suspicions that in Brazil there are unequal and unfair differences in oral health status and access to dental care between self-identified indigenous individuals and their respective national counterpart.

Key words: oral health; disparities; indigenous peoples; Brazil

RESUMO: Este artigo teve como objetivo utilizar os constructos epidemiológicos para descrever e analisar as cargas de saúde bucal entre Brasileiros autodeclarados indígenas e comparar os achados com o perfil de saúde bucal da população não-indígena. O estudo utilizou dados secundários da base de dados Saúde Bucal Brasil (SB Brasil 2003) visando abordar a hipótese nula de que não existem diferenças em saúde bucal entre indivíduos autodeclarados indígenas e não indígenas no Brasil. Indivíduos indígenas tiveram uma razão de chances 3.17 (95%C.I.: 2.14--4.13) maior de nunca terem visitado um consultório odontológico do que indivíduos não indígenas. Indígenas possuem 1.55 (95%C.I.: 1.20--2.00) mais chances de terem problemas periodontais do que pessoas autodeclaradas não-indígenas. Crianças indígenas tiveram 1.71 (95%C.I.: 1.37--2.14) mais chances de possuir uma pontuação de dentes cariados, perdidos e obturados diferente de zero do que crianças

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não-indígenas. Os resultados nos levam às suspeitas de que no Brasil existem diferenças desiguais e injustas no perfil de saúde bucal e no acesso ao atendimento odontológico entre indivíduos autodeclarados indígenas e sua respectiva contraparte nacional.

Palavras-chave: saúde bucal; disparidades; povos indígenas; Brasil

INTRODUCTION

Five hundred years ago, in the area today known as Brazil, lived almost 5,000,000 native individuals^{1,2}. Today, these first inhabitants are called the indigenous peoples in Brazil and different sources estimate them to be in a range that varies from 350,000 to more than 900,000 persons. However, they represent no more than 0.5% of the overall Brazilian population³⁻⁵.

Besides this demographic divergence between sources, a common point of agreement is that the interethnic contact has had an impact on the reduction of the proportion of people in the Brazilian indigenous population after five centuries. Indeed, several authors affirmed that the trajectory of contact of this population with non-indigenous subjects led to disastrous consequences (e.g. wars and epidemics) that are often cited as the main causes of this indigenous depopulation^{6,7}.

The medical anthropology literature encompasses a theoretical framework which states that the interethnic contact with industrialized societies causes a disturbance in political, demographic, socio-cultural and environmental systems of traditional societies such as indigenous populations⁸⁻¹⁰. Therefore, the disruption of previously established states of equilibrium (homeostasis) can facilitate the introduction of new diseases, increase sedentary lifestyles, alter birth and mortality rates, and change diet patterns^{11,12}.

The consequences on oral health caused by this interethnic contact are still under-explored. As a matter of fact, the scientific literature that describes the oral health profile of the indigenous peoples in Brazil is scarce and primarily focused on the prevalence of dental caries among restricted ages from a few specific ethnic groups¹³⁻¹⁵.

Health disparities are an expression of inequalities and inequities that demand “an ethical judgment of which conditions are considered unacceptable”¹⁶. Furthermore, health disparities reflect the disproportionate burden of diseases “among segments of the population, including differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation”¹⁷.

Indigenous peoples are the most marginalized groups in the world when compared with their respective national counterparts^{18,19}. Indeed, in Latin America, scientific evidence points out that indigenous peoples have worse indicators, ranging from unequal education status to an unacceptable lack of access to basic health services²⁰⁻²².

Oral health disparities can be viewed as unequal and unfair differences in oral health status and access to dental care. These differences can be better understood as i) poor oral health outcomes, ii) untreated dental caries, iii) destructive periodontal diseases, iv) severe pain and infections, v) additional missed days from work and school, vi) increased speech and eating disorders, vii) increased risks to general health, viii) lower survival rates for oral cancer, and ix) higher edentulism rates^{23,24}.

Understanding that there is a significant void in the literature addressing oral health disparities among the Brazilian indigenous population, this study aims to use epidemiological constructs to describe and analyze the oral health burdens among self-identified indigenous individuals and to compare the findings with the oral health status within the non-indigenous population. In addition, this study analyzes the perceptions of native Brazilians about their oral health status and access to dental care.

METHODS

The investigation followed a cross-sectional study design in which a descriptive analysis was performed through the quantitative data of the Oral Health Brazil database (SB Brasil 2003) focusing on how the burden of oral health diseases was distributed among the Brazilian indigenous population. Therefore, aggregated data analyses according to macro areas, gender and age-groups were performed as a description of the percentiles, mean, standard deviation (S.D.), and median values. In addition, an exploratory investigation was performed through the qualitative data that focused on self-perceptions of the indigenous population about their oral health status and access to dental care.

Hypotheses addressing potential oral health differences between indigenous and non-indigenous populations in Brazil were also tested. The investigation utilized multivariable logistic regression analysis when the outcome of interest was dichotomous and multiple linear regressions when the dependent variable was continuous and demanded a multivariate technique.

All data utilized was gathered without any intervention or interaction with the Brazilian population. In fact, the SB Brasil 2003 information was obtained from a public data source hosted by the Brazilian Ministry of Health where the access was available without need for a password or previous agreement²⁵. The SB Brasil database does not contain identifiers that could be used to directly recognize individuals, and the research in question did not use manipulation of human subjects or collection of new data. Thus, this investigation met the criteria to qualify as an exempt study (exemption certification protocol: 08-0692-X6B). A confidence interval of 95% was applied to statistic and hypothesis tests, and all data analyses were carried out using the Statistical Analysis System Package (SAS 9.2 for Windows, SAS Institute Inc., Cary, NC, USA).

RESULTS

The SB Brasil survey collected oral health data from 108,921 individuals. Women were 55% of the sample, twelve years was the mode for age, and the majority of respondents (67.4%) had not completed elementary education. Additional demographic information is presented in Table 1. Five categories based upon self-identified race were utilized to classify ethnic groups: yellow,² brown (pardo),³ black, indigenous, and white.

A. Percentage of caries free individuals

Among the 1,084 persons self-identified as indigenous, nearly 25% (n=268) were caries free. No statistical significance was found when analyzing caries free individuals by gender ($\chi^2=0.946$, $df=1$, $p=0.3307$). However, the likelihood of being a caries free individual was not the same for all the five Brazilian macro areas ($\chi^2=47.452$, $df=4$, $p<0.0001$) and age groups ($\chi^2=126.454$, $df=5$, $p<0.0001$). Thus, the north region and twelve-year-olds presented the best percentages of caries free individuals, respectively, 28% and 38%.

When non-indigenous persons of all age groups were compared with indigenous individuals from the SB Brasil database, the percentage of caries free individuals found among the former group was 28.6% (n=30,626) while among the latter the percentage was 25% (n=268). This difference increased when only five-year-olds were analyzed. In fact, non-indigenous children presented a 40% (n=10,469) caries free rate while 32.6% (n=84) were observed among five-year-olds from the indigenous sample.

When the prevalence of being a caries free individual was analyzed as a dichotomous dependent variable through a logistic regression equation, the null hypothesis which stated that there was no difference between indigenous and non-indigenous individuals was rejected ($\chi^2= 7.9382$, $df=1$, $p=0.0048$) at the significance level $\alpha=0.05$. Moreover, indigenous individuals were found to have 1.24 (95% C.I.: 1.07-1.45) increased odds of not being a caries free individual than non-indigenous persons, after controlling for age, gender, area (rural or urban), and city's water fluoridation system.

Table 1 - Characteristics of the study population, SB Brasil 2003

Variables	Frequency	Percentage
All Subjects	108,921	100.0%
Gender		
Female	59,872	55.0%
Male	49,049	45.0%
Ethnic Groups		
Indigenous	1,084	1.0%

2 Yellow meaning Eastern Asian phenotypes.

3 Pardo is a term that covers the Brazilian mixed-race heritage of mulattos, caboclos, and indigenous ancestry.

Yellow	3,294	3.0%
Black	9,969	9.2%
Pardo	45,426	41.7%
White	48,495	44.5%
Missing information	653	0.6%
Age Groups		
18 to 36 months	12,117	11.1%
5 years	26,641	24.5%
12 years	34,550	31.7%
15 to 19 years	16,833	15.5%
35 to 44 years	13,431	12.3%
65 to 74 years	5,349	4.9%
Years of education		
0 to 3 years	7,991	7.3%
4 to 7 years	11,154	10.2%
8 to 11 years	13,285	12.2%
12 to 16 years	2,527	2.3%
Missing information	73,964	67.9%
Household		
1 to 4 persons	18,906	17.3%
5 to 9 persons	15,208	14.0%
10 to 14 persons	1,084	1.0%
15 to 20 persons	71	0.1%
Missing information	73,652	67.6%
Household income per month (R\$)†		
R\$ 0 to 999	29,737	27.3%
R\$ 1,000 to 2,999	4,615	4.2%
R\$ 3,000 to 9,999	683	0.6%
R\$ 10,000 to 35,000	91	0.1%
Missing information	73,795	67.8%

† Values in Reais. In July of 2003, \$1 American dollar was R\$2.84 Reais (Brasil, 2009)

When only five-year-olds were analyzed, indigenous children showed a 1.42 (95% C.I.: 1.09--1.85) greater odds of not being free of tooth decay than non-indigenous children at the same age, after controlling for gender, area, and water fluoridation.

B. Prevalence of edentulism

Thirty four percent (n=123) of native Brazilians older than 15 years of age were in need of upper dental prosthesis while 51% (n=184) were in need of lower prosthodontics rehabilitation. Nearly 10% (n=35) of the native Brazilians older than 15 years of age were totally edentulous. Of those 35 persons who lost all their teeth, 62.9% (n=22) were females and 54.3% (n=19) were dwelling from the north region of Brazil. When stratified by education, the prevalence of edentulism among

indigenous persons older than 15 years of age decreased with the increase in years of education (Figure 1).

When indigenous people older than 15 years of age were compared with non-indigenous, the prevalence of edentulism did not differ very much. For instance, the percentage of edentulous people found among the indigenous sample was 10% while among non-indigenous the percentage was 11.5%.

In 1981, the World Health Organization (WHO) proposed a global goal regarding edentulousness, which stated that 85% of 18-year-olds should retain all their teeth by the year 2000 ²⁶. However, this investigation found that among 18-year-olds from the SB Brasil 2003 survey who identified themselves as indigenous, only 45% had all their 32 teeth. Among the non-indigenous persons, the prevalence was 55.2%.

When the presence of all teeth among 18-year-olds was analyzed as a dichotomous outcome through a logistic regression model, the null hypothesis which stated that there was no difference between indigenous and non-indigenous persons was not rejected ($\chi^2=0.7826$, $df=1$, $p=0.3763$) at the significance level $\alpha=0.05$. In fact, there was no statistically significance difference between indigenous and non-indigenous individuals (OR: 0.67, 95% C.I.: 0.27--1.62), after controlling for gender and area (urban or rural).

C. Decayed, Missing, Filled Teeth (DMFT/dmft) index

On average, an indigenous child younger than three years of age has already two compromised teeth. The burden of damage reaches almost a twofold increase (four teeth) when only five-year-olds are analyzed (Table 2). Moreover, decayed teeth accounted for around 88% of the overall dmft score when indigenous children from 18 to 36 months of age and five-year-olds were investigated.

When non-indigenous children younger than three years of age were compared with indigenous kids in the same age group, the mean dmft score found among the former group was 1.06 ± 2.39 , while among the latter was 2.32 ± 2.96 . In addition, indigenous children aged five years had an overall dfmt of 3.82 ± 4.08 , while non-indigenous individuals in the same age-bracket presented a mean dmft score of 2.78 ± 3.48 .

There were no practical differences in the mean dmft score between boys and girls from the indigenous sample (**boys:** 3.16 ± 3.60 , **girls:** 3.49 ± 4.07), nor among the non-indigenous sample (**boys:** 2.35 ± 3.38 , **girls:** 2.13 ± 3.17). When only the indigenous sample was analyzed according to the macro areas, all of the five regions showed low resolution regarding dental treatment. In fact, less than seven percent of the overall dmft index was related to filled teeth.

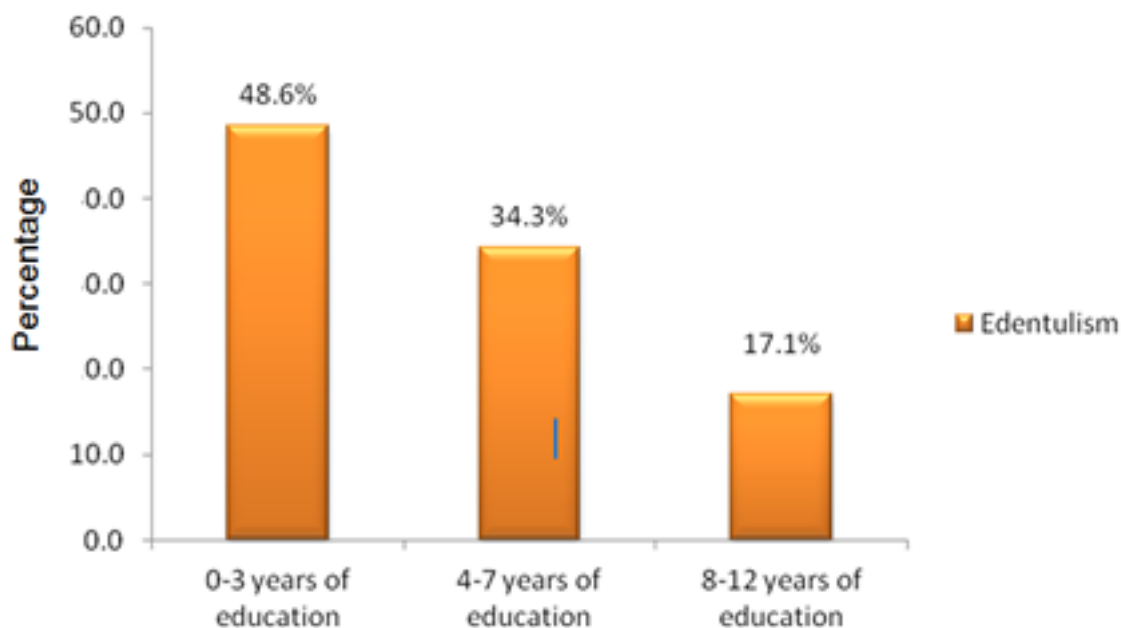


Figure 1- Prevalence of edentulism among indigenous persons older than 15 years of age according to years of education, SB Brasil 2003

When the dmft index was analyzed as a dichotomous dependent variable in a logistic regression equation, the null hypothesis was rejected ($\chi^2=22.5212$, $df=1$; $p<0.0001$) at the significance level $\alpha=0.05$. Furthermore, the logistic regression revealed that indigenous children had 1.71 (95% C.I.: 1.37--2.14) greater odds of having a dmft score different from zero than non-indigenous children (Table 3).

From a total of 718 self-identified indigenous individuals older than twelve years of age, less than 20% presented a DMFT score of zero. On average, an indigenous person older than twelve years already has eight compromised teeth, and decayed teeth are responsible for around 40% of this overall score. A fifteen-year-old male from the southeast region of Brazil was the only individual who had all 32 sound teeth among the entire indigenous sample. Moreover, tooth decay was observed in all ages and the DMFT index increased with aging (Table 4).

Table 2 - Mean values of the dmft index, dmft components, and sound teeth from indigenous children, by age group and macro area- SB Brasil 2003

<u>Age group</u>	<u>Macro area</u>	<u>N</u>	<u>Sound teeth</u>	<u>decayed teeth</u>	<u>missing teeth</u>	<u>filled teeth</u>	<u>dmft index</u>
18 to 36 months	North	55	15.85	3.33	0.02	0.04	3.39
	Northeast	10	18.90	1.00	0.00	0.00	1.00
	Southeast	9	18.56	1.00	0.00	0.00	1.00
	South	29	16.41	1.31	0.03	0.00	1.34
	Midwest	5	16.00	1.20	0.00	0.00	1.20
	Sub-total	108	16.52	2.28	0.02	0.02	2.32
5 years	North	100	13.81	5.28	0.49	0.06	5.83
	Northeast	26	17.62	2.08	0.00	0.00	2.08
	Southeast	49	16.02	2.51	0.10	0.67	3.28
	South	45	15.64	2.11	0.09	0.29	2.49
	Midwest	38	17.16	1.42	0.16	0.42	2.00
	Sub-total	258	15.43	3.31	0.25	0.26	3.82
Total	366	15.75	3.01	0.18	0.19	3.38	

When the mean DMFT index according to age group and macro area was analyzed, the lowest value recorded was among indigenous aged twelve years from the south region of Brazil (1.47 ± 1.88), while the highest score observed was among the oldest age-group (65-74 years) from the north region (31.18 ± 1.94).

At the age of twelve years, the mean DMFT score observed among indigenous individuals was 2.75 ± 3.08 . The percentage distribution of the DMFT components showed that native individuals younger than 20 years of age had more decayed teeth (range: 30% to 83%), while indigenous persons older than 20 years had more missing teeth (range: 53% to 95%). Among twelve-year-olds, 70% of the overall DMFT index was of decayed teeth.

Table 3 - Odds ratio estimates and 95% confidence intervals of the dmftⁿ score, SB Brasil 2003

Variable	Point Estimate	95% Confidence Intervals
Age	1.346	1.333 – 1.359
Race*	1.715	1.374 – 2.146
Gender**	1.096	1.050 – 1.144
Area†	1.486	1.374 – 1.608
Fluoridation††	1.636	1.567 – 1.709

ⁿ dmft= 0 was the reference group

* Non-indigenous children were the reference group

** Women were the reference group

† Urban areas were the reference group

†† Cities with water fluoridation system were the reference group

When the DMFT components were analyzed among self-identified indigenous individuals older than twelve years of age, the filled component often presented the lowest value, with an exception among the youngest age-bracket. Decayed teeth accounted for almost 40% of the overall DMFT score. However, missing teeth were responsible for the largest ‘piece’ of the final DMFT value. Moreover, all five macro areas showed low resolution regarding dental treatment. In fact, less than 15% of the overall DMFT index was related to filled teeth.

First molars were the group of teeth most compromised by caries in the upper jaw region (maxilla). Concerning the lower jaw (mandible), first molars were also the most compromised group of teeth, but now instead of the decayed component the missing component was the most prevalent. Canines and incisors were, respectively, the groups of teeth with more sound elements in the upper and lower arcades.

Table 4 - Mean values of the DMFT index, DMFT components, sound teeth, and standard deviation (S.D.) from indigenous persons, by age group and macro area- SB Brasil 2003

Age-groups	Macro areas	N	Sound teeth	Decayed teeth	Missing teeth	Filled teeth	Mean DMFT	S.D.
12 years	North	138	22.10	2.75	0.49	0.74	3.98	3.51
	Northeast	38	22.50	2.58	0.18	0.34	3.10	3.20
	Southeast	80	23.53	0.96	0.01	0.63	1.60	2.36
	South	34	24.65	0.94	0.06	0.47	1.47	1.88
	Midwest	70	22.84	1.30	0.11	0.67	2.08	2.37
	total	360	22.84	1.88	0.24	0.63	2.75	3.08
15-19 years	North	82	19.52	7.00	1.52	0.52	9.04	5.92
	Northeast	29	22.55	3.34	1.24	1.69	6.27	4.03
	Southeast	22	24.95	1.05	0.36	2.00	3.41	3.22
	South	22	23.18	3.00	0.91	1.27	5.18	5.45
	Midwest	14	21.36	2.36	2.29	2.07	6.72	5.36
	total	169	21.38	4.69	1.31	1.14	7.14	5.57
35-44 years	North	62	11.50	5.42	13.19	1.44	20.05	7.44
	Northeast	26	15.08	4.08	8.38	3.27	15.73	6.62
	Southeast	16	13.63	4.19	9.50	2.56	16.25	9.52
	South	13	12.15	8.54	9.31	1.69	19.54	7.32
	Midwest	31	11.13	2.90	12.48	3.81	19.19	8.40
	total	148	12.34	4.80	11.46	2.40	18.66	7.84
65-74 years	North	11	0.82	2.82	28.36	0.00	31.18	1.94
	Northeast	12	11.42	1.67	16.83	1.08	19.58	8.55
	Southeast	7	2.14	0.29	28.57	1.00	29.86	3.76
	South	3	4.00	5.00	23.00	0.00	28.00	6.92
	Midwest	8	3.00	4.75	20.13	0.00	24.88	11.49
	total	41	4.80	2.59	23.02	0.49	26.10	8.46
All groups	Total	718	19.30	3.18	4.10	1.11	8.39	9.20

Concerning gender, indigenous women older than twelve years of age often presented higher DMFT scores than men in all regions of Brazil, with the exception of the north region where

the mean DMFT value among men was 10.74 ± 9.51 and 9.12 ± 8.76 among women. The largest practical difference in the mean DMFT score concerning gender was observed in the Midwest region where native women (10.14 ± 11.10) had almost three more compromised teeth than men (6.60 ± 8.62). However, when all age-groups and regions were analyzed together, there was not a statistically significant difference between the mean DMFT value of men and women (males: 7.99 ± 9.02 ; females: 8.72 ± 9.34 ; $p=0.7669$).

The overall DMFT score of 8.39 found in the SB Brasil 2003 data set for self-identified indigenous individuals can be considered high *per se*, but this burden of damage can reveal a more ‘destructive face’ when DMFT values are broken down by age-groups.

When the DMFT index was analyzed as a dichotomous dependent variable in a logistic regression equation, the null hypothesis was not rejected ($\chi^2=0.9846$, $df=1$, $p=0.3211$) at the significance level $\alpha=0.05$. Indeed, there was no statistically significant difference between indigenous and non-indigenous individuals (OR: 1.10, 95% C.I.: 0.90--1.34), after controlling for age, gender, area, and water fluoridation. The odds ratio estimates and their respective 95% confidence intervals regarding the DMFT score from individuals surveyed during the SB Brasil 2003 investigation are presented in Table 5. Furthermore, when the DMFT was analyzed as a continuous outcome in a multiple linear regression, it was also not possible to reject the null hypothesis for the partial slope coefficient regarding race at the significance level $\alpha=0.05$ ($t=-0.31$, $df=1$, $p=0.7530$).

D. Community Periodontal Index (CPI)

The percentage distribution of the highest CPI score recorded from self-identified indigenous individuals is presented in Table 6. Overall, the percentage of indigenous individuals without any periodontal problems was 24.3%. However, when age groups were analyzed separately, the healthy periodontal status decreased with aging. Although the prevalence of periodontal problems was frequent (64%) among the indigenous sample, periodontal pockets were not a common outcome. In fact, the most common periodontal alterations were calculus (43.9%) and gingival bleeding (14.5%).

Table 5 - Odds ratio estimates and 95% confidence intervals of the DMFT ⁿ score, SB Brasil 2003

Variable	Point Estimate	95% Confidence Intervals
Age	1.208	1.198 – 1.217
Race*	1.105	0.907 – 1.347
Gender**	1.165	1.118 – 1.215
Area†	1.578	1.455 – 1.708
Fluoridation††	1.814	1.739 – 1.892

ⁿ DMFT= 0 was the reference group

* Indigenous persons were the reference group

** Men were the reference group

† Urban areas were the reference group

†† Cities with water fluoridation system were the reference group

When the maximum CPI score recorded among individuals older than fifteen years of age was analyzed as a dichotomous outcome through a logistic regression, the null hypothesis was rejected ($\chi^2=11.6676$, $df=1$, $p=0.0006$) at the significance level $\alpha=0.05$. Moreover, indigenous individuals had 1.55 (95% C.I.:1.20--2.00) greater odds of having periodontal problems than non-indigenous persons, after controlling for age, gender, and area (rural or urban).

Although non-indigenous persons presented healthier periodontal tissues than the indigenous sample, similar distributions regarding the highest CPI score were observed between both groups (Table 7).

Table 6 - Percentage* distribution of the highest CPI score recorded from self-identified indigenous individuals, SB Brasil 2003

Age groups	Healthy	Bleeding	Calculus	Pocket 4-5 mm	Pocket ≥ 6 mm	Not recorded	Excluded
15-19 years	35.0%	19.5%	40.2%	4.1%	0.0%	0.6%	0.6%
35-44 years	18.3%	12.2%	50.0%	5.4%	2.0%	4.7%	7.4%
65-74 years	2.4%	2.4%	36.6%	2.4%	2.4%	17.2%	36.6%
Total	24.3%	14.5%	43.9%	4.5%	1.1%	4.2%	7.5%

Table 7 - Frequency and percentage distributions of the highest CPI score recorded among indigenous and non-indigenous individuals, SB Brasil 2003

Maximum CPI	Indigenous	Non-Indigenous
Healthy	87 (24.3%)	11,025 (31.3%)
Gingival bleeding	52 (14.5%)	4,615 (13.1%)
Calculus	157 (43.9%)	12,874 (36.6%)
Pocket 4-5 mm	16 (4.50%)	1,474 (4.20%)
Pocket ≥ 6	4 (1.10%)	406 (1.20%)
No information	15 (4.20%)	1,142 (3.30%)
Sextant excluded	27 (7.50%)	3,632 (10.3%)
Total	358 (100%)	35,168 (100%)

E. Self-perception: access to dental care & oral health status

The existence of free dental services in a universal health system such as in Brazil does not guarantee *per se* access of users to the health system. For instance, 21.2% of the indigenous sample from the SB Brasil 2003 database responded that they never had been in a dentist's office. This rate of response increases to 33% when only adolescents were investigated. Furthermore, teenagers dwelling in the north region of Brazil answered that around 50% of them never stepped foot into a dentist's office. The main 'gateway' to the Brazilian health system among self-identified indigenous people seems to be the public sector since 67% of respondents said that they are patients of some public dental service.

Among the indigenous persons who have already been in a dentist's office, the main motivation for the appointment were to solve some pain-related problem (48%), followed by routine visits (28%) and treatment of decayed teeth (15%). According to self-identified indigenous patients, the quality of the dental treatment received by them was rated as good (67%). From the universe of 358 indigenous individuals who said they have already visited a dentist's office, around 79% believed that they are still in need of some dental treatment, while 21% stated that they do not require further dental care.

When individuals were asked about how they would rate their oral health, 40.2% (n=144) of self-identified indigenous persons rated as good or excellent, 36.9% (n=132) as satisfactory, 17.6% (n=63) as bad or terrible, and 5.3% (n=19) of the sample said 'I do not know' or preferred not to answer.

When people were asked about 'how they would classify the appearance of their teeth and gums', 42.7% (n=153) of self-identified indigenous persons classified as good or excellent, 32.1% (n=115) rated as satisfactory, 19.8% (n=71) as bad or terrible, and 5.3% (n=19) of the respondents said 'I do not know' or preferred not to answer.

When persons were asked about 'how much tooth and gum pain they had in the last six months', indigenous respondents said 'no pain at all' (64.8%), 'a little pain' (18.7%), 'a lot of pain' (9.8%), and 'just average pain' (6.7%). Moreover, non-indigenous individuals practically answered in the same way, 'no pain at all' (66.2%), 'a little pain' (17.3%), 'a lot of pain' (8.6%), 'just average pain' (7.2%), and 0.7% did not respond.

After a logistic regression was performed with the answers originated from the following question 'Have you ever been in a dentist's office?', the null hypothesis was rejected ($\chi^2=74.5449$, $df=1$, $p<0.0001$). In fact, indigenous individuals had 3.17 (95% C.I.:2.44--4.13) greater odds of never having been in a dentist's office than non-indigenous persons, after controlling for age, gender, and area (rural or urban).

No matter the ethnic group, all individuals who said they have already been in a dentist's

office also said that the main ‘gateway’ to the health system was the public sector. However, non-indigenous persons seemed to utilize more private dental practices than self-identified indigenous individuals, respectively, 32% and 24%. When persons were asked “How does your oral health affect relationship with others?”, non-indigenous individuals answered ‘it does not affect’ (66.2%), ‘affects a little’ (11.5%), ‘more or less’ (6.4%), and ‘affects a lot’ (5.3%). Moreover, 10.6% said ‘I do not know’ or preferred not to answer. On the other hand, self-identified indigenous respondents said ‘it does not affect’ (43.9%), ‘affects a little’ (16.2%), ‘more or less’ (19.5%), ‘affects a lot’ (4.2%), and 16.2% did not know.

CONCLUSION

At the individual level, oral health problems are often considered as the first indication that the overall health status of a person is not in a homeostatic condition. At the community level, oral health disparities are a reflection of unequal access to dental care and prevention services as well as disproportionate allocation of public assets that can lead to a better health status, such as education, sanitation and water fluoridation.

The evidence presented in this study revealed that self-identified indigenous individuals surveyed during the SB Brasil 2003 had not only elevated rates of oral health problems but also statistically significant differences in oral health status and access to dental care when compared with their respective national counterpart. Therefore, the null hypothesis of the investigation which stated that there were no oral health differences between self-identified indigenous and non-indigenous individuals in Brazil was often rejected. In fact, the results lend credence to the suspicions that in Brazil there are unequal and unfair differences in oral health status and access to dental care between self-identified indigenous individuals and their respective national counterpart.

At this point, it is very important that we acknowledge some limitations of this investigation. For instance, an extrapolation of the findings to all indigenous peoples in Brazil cannot be made since the SB Brasil 2003 survey produced biased oral health estimates as a result of a deficient sampling strategy. In addition, the SB Brasil survey utilized a self-assessment query regarding ‘ethnic groups’ that may jeopardize the degree of inferences and generalizations of the variable ‘indigenous’. In other words, instead of capturing the socio-cultural myriad of information about the indigenous peoples in Brazil, the SB Brasil database takes into consideration only the dichotomous (yes/no) self-identification information regarding the variable ‘indigenous’. Moreover, the inferences about indigenous individuals were based upon statistics collected among self-identified indigenous persons living at urban areas of Brazil. As a matter of fact, 91.97% of self-identified indigenous individuals in the SB Brasil 2003 survey were from urban areas, inadequately representing the Brazilian indigenous population and undermining the ability of the results to be generalized to the rest of the indigenous population who are, in general, dwellers of rural areas.

Brazilian public health authorities should utilize epidemiological constructs to better understand

how the burden of disease is distributed among the Brazilian society and its segments, the information brought to light by this investigation can be viewed as a 'starting point' to further rigorous-scientific-investigations which addresses the issue of potential oral health disparities between the indigenous and non-indigenous populations in Brazil.

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