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Self-perception of oral health by indigenous people: an analysis of latent classes

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Abstract *Given the limited comprehension of the indigenous oral health profile, this study proposed to understand the self-perception of oral health of this population group. This study aimed to verify the association of oral health's self-perceived impact on daily living with sociodemographic and oral health characteristics among indigenous people aged 10 to 14 years of the Xukuru do Ororubá ethnic group, in Pesqueira (PE), Brazil. This is a cross-sectional study conducted from January to March 2010, involving oral examinations and questionnaires applied to 233 indigenous belonging to the age group. Using the latent class analysis model, the variable "oral health impact" was created and applied to simple and multiple logistic regression models. The results pointed out that villages with the highest mean of households and indigenous people with caries experience evidenced worse self-perception, increasing the "oral health impact" 2.37 and 3.95 times, respectively. The Latent Class Analysis was an excellent strategy for understanding the self-perception of indigenous oral health and its relationship with associated factors.*

Key words *Indigenous people, South American, Indigenous people health, Oral health, Self-perception*

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Introduction

The understanding of the oral health profile of indigenous people is still limited. The few available studies reinforce that in different countries[1-3], this population group faces worse oral health conditions when compared to non-indigenous people.

Regarding self-perceived health, a subjective measure recommended by the World Health Organization (WHO) to verify the health of the population, while not replacing the clinical examination of the patient, allows a closer look at the real condition of the individual quickly, affordably and economically[4].

In oral health, self-perception is a vital measurement tool that can be used as an indicator of treatment needs or to estimate the effect of oral conditions in daily living, as well as to evaluate and monitor improvements in the oral health status of society[5,6].

The association of negative self-perception of oral health with oral clinical conditions (presence of oral disease, tissue damage, pain, functional and aesthetic impairment)[7], unfavorable demographic and behavioral psychosocial and socioeconomic factors[8] is well established in the literature, making subjective assessment a critical contribution in the identification of vulnerable groups of population that require sophisticated and often personalized interventions[9].

A study by Amarasena et al.[10] investigated oral health behaviors and perceptions of 181 Australian natives aged 22-74 years, comparing their data with the general Australian population. It was found that the indigenous population has less frequent dental visits. Their visits are motivated by oral problems, and among natives, it is more common to postpone dental treatment due to high costs. The perception of the need for treatment, pain, aesthetic discomfort and the report of food intake due to oral problems was also higher among natives.

Corroborating the complex nature inherent in oral health outcomes, Mejia et al.[11] found that the highest proportion of adults reporting poor oral health were identified as indigenous, older, non-Australian, with low educational and income level, unemployed, eligible for public dental care, smokers, reporting some food intake avoidance in the last 12 months, with aesthetic discomfort, pain or need for dental care.

Seeking to understand the self-evaluation of indigenous oral health, this study aimed to verify the association of the self-perceived impact of oral health on daily living, with sociodemographic and oral health characterization features among indigenous people aged 10 to 14 years of the Xukuru do Ororubá ethnic group, inhabitants of an indigenous land located in the municipality of Pesqueira (PE), Brazil.

Methods

A population-based survey was carried out in 27,550 hectares of indigenous land, divided into three socio-environmental regions (Serra, Ribeira and Agreste) and 25 villages, located in the municipality of Pesqueira (PE), in the northeastern region of Brazil, involving the indigenous population Xukuru do Ororubá village, from January to March 2010. The socio-environmental regions are spatial categories established by this ethnic group from the geoclimatic and socioeconomic characteristics[12].

Each socio-environmental region has its characteristics that define unequal patterns in the supply of natural resources among the Xukurus and also in the development of their economy. The Serra region harbors the primary sources of drinking water that supply the ethnic group, favoring initiatives of dairy farming production and organic agriculture. The Ribeira region includes the source of the Ipojuca River and the Pão-de-Açúcar dam, which allows irrigation and agricultural cultivation in the region. Agreste, however, has difficulty accessing water resources, further developing dairy farming. Besides the mentioned economic activities, the making of handicrafts is also part of the indigenous culture[12].

Despite the knowledge of native words, the Xukurus use the Portuguese language in daily living. Their political representatives are the cacique, the shaman and village leaders, who act in the councils, associations and local assemblies. Their relationship with nature is represented in sacred rituals, which seek to transmit and strengthen their culture[13].

Their dwellings are mostly made up of brick walls and clay tiles. The water is mainly obtained from sources and receives as treatment the application of sodium hypochlorite. Most households do not have a bathroom, and garbage collection is not yet a reality for everyone. Garbage is burned in much of the territory. Almost the entire population has electricity and cooks using a combination of gas and charcoal or firewood[14].

Because of the small number of natives at the age of 12, an international standard age for mon-

itoring oral health status[15], we opted to expand the participating group to 10-14 years' age bracket. In 2010, the population of 7,225 indigenous people distributed in 1,896 households, consisted of 871 individuals aged 10-14 years. The sampling process was performed to represent this group, assuming the prevalence of SB Brasil 2003 (epidemiological survey on oral health periodically performed at the national level by the Ministry of Health)[16] of 20% for caries, 5% accuracy, confidence interval of 95%, besides an increase of 20% to cater for losses and refusals, requiring a sample of 231 individuals.

The individuals were systematically selected from the residents of households randomly and randomly drawn. All residents of households drawn from the 10-14 years' age group were invited to participate. The resident's absence after three visits of the field team, presence of impairing physical/mental condition to carry out the examination or its refusal, was computed as a loss. The final sample consisted of 173 households and 233 participants.

A calibration process was developed before the onset of data collection to standardize the field team in order to avoid diagnostic differences during oral examinations, which consisted of theoretical and practical training, experienced by all the team composed by 17 people, 8 examiners and 8 annotators (senior dental students), distributed in 8 working pairs and guided by a field coordinator. The examiner was responsible for conducting the oral clinical examination and the annotator completed the questionnaire.

The theoretical and practical phases of the training were based on SB Brasil 2010[17] manuals. The Kappa coefficient was calculated to verify the agreement of the results obtained by the oral exams. During the calibration training, the Kappa coefficient for the inter-examiner agreement reached an average of 0.83. All the examiners performed intra-examiner agreement throughout the data collection, reexamining 5% of their sample, reaching a Kappa coefficient average of 0.98.

In the fieldwork process, oral examinations were performed under natural light, with the examiner and the examined seated, using the flat mouth mirror nº5 with cable and a ball-point-type probe. Individual Protection Equipment (EPI) was also used and biosafety standards were observed[18]. The tests verified the prevalence of caries, the need for treatment and the number of teeth. The parameter used for its measurement was the DMFT[13] index.

After the examination, a questionnaire adapted from the SB Brasil 2010 National Survey was applied, aiming to characterize the study population regarding the oral health-disease process. Consisting of four blocks (socioeconomic evaluation, reported oral morbidity, use of dental services and oral health self-perception and impacts), the application of the questionnaire followed the guidelines of the Survey for 12-year-old participants, parents/guardians answered the block of socioeconomic evaluation, and other blocks were answered by the participants[19].

Data processing used EpiData 3.1® software, while descriptive and analytical statistics were performed using the statistical package SPSS 20.0®, with results shown in the tables.

The construction of the latent variable "oral health impact" was developed using the Growth Mixture Models (GMM) model in the Mplus software, in which models from 2 to 6 classes were created and tested. In the models, the individuals were classified into groups from the similarity profile in the answers, and the best latent class model was chosen.

From the creation of the latent variable, this same variable was inserted into the descriptive and analytical statistics as response variable (dependent), using Pearson's Chi-square test or Fisher's exact test, as needed, and analysis of the standardized residue to test its association with the independent variables. The level of significance for the association tests was 5% and, regarding the standardized residue analysis, the excess of standard deviations higher than 1.96 was considered significant.

The strength of association between the independent variables and the response variable was expressed by the Odds Ratio (OR) with a 95% confidence interval. Logistic regression was used with simple and multiple analyses[20]. In the simple analysis, the variables that obtained p-value < 0.25[21] were eligible for multiple analysis. Regarding multiple regression, the stepwise backward method was used and the other conclusions were taken at a significance level of 5%.

The study was approved by the Research Ethics Committee (CEP) of the Aggeu Magalhães Institute (IAM) and the National Research Ethics Commission (CONEP) due to research involving indigenous people. Also, it obtained consent from the National Health Foundation (FUNASA) and the Xukuru do Ororubá ethnic group and did not report any conflicts of interest.

Results

From a total of 233 natives between 10 and 14 years of age, 228 answered the questionnaire and performed an oral examination (missing = 5). From the descriptive analysis shown in Table 1, it can be seen that the vast majority of the group is characterized by being 11 years of age, male, knows how to read and write, visited the dentist less than a year earlier in a public institution due to dental extraction and with an experience of caries.

Concerning the presentation of the latent classes, the best analysis model was verified from seven criteria: AIC (Akaike Information Criterion), BIC (Bayesian Information Criterion), and adjusted BIC test must show the lowest possible values, denoting a good model fit; at the same time, entropy must have a value closest to 1, characterizing a model with a more adequate number of classes; finally, to evaluate the statistical significance, in the three likelihood ratio tests (VLMR-LRT - Vuong, Lo, Mendell, Rubin likelihood ratio test, LMR-LRT - Likelihood ratio test and BLRT - Bootstrap likelihood ratio test), the significant values indicate that the number of classes in the model need not be reduced to one less class, that is, it is adequate[22,23].

From these criteria, it can be observed in Table 2 that the models with 2 and 4 classes were statistically significant. Analyzing these two models, the one with 2 classes could fill a higher number of criteria, with BIC test with the lowest value, better entropy and LRT tests with statistical significance. To better understand the similarity pattern between the two classes generated, Table 3 shows the probability of positive response to the classes for each of the variables investigated.

The results of the simple and multiple logistic regression are shown in Table 4. Variables "average number of households per village", "household floor material", "gender", "reason for dental visit" and "DMFT index" were included in the simple regression because they showed a p-value < 0.25 in Table 1. In the development of the multiple analysis, the variables "higher average population per village" and "caries experience measured by the DMFT Index" remained statistically significant when associated with the dependent variable "oral health impact", increasing the likelihood of oral health impact 2.37 and 3.95 times, respectively.

Discussion

Understanding the self-perceived oral health impact poses a challenge. Its measurement is complex and must be inferred from different explanatory variables. Commonly, the impact assessment is observed by a single variable that questions users about their satisfaction with teeth/mouth. While attractive for its simple application, this type of approach does not account for the perception of health built through signs and symptoms presented in daily living. Responses to oral health issues are products of varied experiences, requiring broad and multidimensional approach strategies.

This study's methodological option was to understand the oral health impact through the application of Latent Class Analysis (LCA) to one of the blocks of the questionnaire consisting of nine questions. The LCA is a statistical method that identifies distinct groups (latent classes) based on the patterns of responses observed in categorical variables. It is based on a probabilistic model to identify characteristics that indicate the groups well, to estimate the prevalence of each group and to classify each within the groups[24].

The traditional method of analyzing questionnaire data with multiple categorical questions, which seek to measure a particular phenomenon, usually dichotomize their findings in individuals who answered positively to at least one question, and others who responded negatively to all. This way of analysis overestimates the oral health impact, classifies as similar different individuals and assigns the same weight to the different issues of the instrument. This is because individuals who answered that only one of the nine questions affects them in daily life would be classified in the same group as those who responded positively to the nine questions. Thus, we advocate the use of the Latent Class Analysis model to obtain reliable results in the measurement of oral health categorical outcomes.

One of the main findings of the study is the fact that the group investigated with experience of clinically verified caries was associated with the results of self-assessment with the impact of oral health in daily living. In the multiple analysis, this group was 3.95 more likely to have an oral health impact. This means that the illness status verified by the DMFT Index corroborates the findings of self-perception. The literature

Table 1. Descriptive analysis and association of independent variables by dependent variable, using Chi-Square test. Pesqueira, 2010.

Independent variables		Dependent variables			
		No oral health impact N (%)	With oral health impact N (%)	Total	P-value
Average number of households per village*	≤ 92	95(82.60%)	20(17.40%)	115(100.00%)	0.01
	> 92	75(66.40%)	38(33.60%)	113(100.00%)	
Household floor material	Pottery	15(78.90%)	4(21.10%)	19(100.00%)	0.15
	Cement	146(76.00%)	46(24.00%)	192(100.00%)	
	Soil	6(50.00%)	6(50.00%)	12(100.00%)	
Average population per village*	≤ 310	95(82.60%)	20(17.40%)	115(100.00%)	0.01
	> 310	75(66.40%)	38(33.60%)	113(100.00%)	
Median per capita income	≤ R$80.13	84(73.00%)	31(27.00%)	115(100.00%)	0.51
	> R$80.13	83(76.90%)	25(23.10%)	108(100.00%)	
Age	10	36(75.00%)	12(25.00%)	48(100.00%)	0.80
	11	41(80.40%)	10(19.60%)	51(100.00%)	
	12	32(72.70%)	12(27.30%)	44(100.00%)	
	13	32(74.40%)	11(25.60%)	43(100.00%)	
	14	29(69.00%)	13(31.00%)	42(100.00%)	
Gender	Male	84(70.60%)	35(29.40%)	119(100.00%)	0.15
	Female	86(78.90%)	23(21.10%)	109(100.00%)	
	Normal weight	46(73.00%)	17(27.00%)	63(100.00%)	
	Overweight	7(63.60%)	4(36.40%)	11(100.00%)	
Reads and writes	Yes	144(75.00%)	48(25.00%)	192(100.00%)	0.61
	No	19(70.40%)	8(29.60%)	27(100.00%)	
Have you seen a dentist?	Yes	123(71.50%)	49(28.50%)	172(100.00%)	0.06
	No	47(83.90%)	9(16.10%)	56(100.00%)	
When was the last visit?	Never went to the dentist	47(83.90%)	9(16.10%)	56(100.00%)	0.26
	Less than one year	67(72.80%)	25(27.20%)	92(100.00%)	
	1-2 years	38(69.10%)	17(30.90%)	55(100.00%)	
	Three years and over	15(68.20%)	7(31.80%)	22(100.00%)	
Where was the last visit?	Never went to the dentist	47(83.90%)	9(16.10%)	56(100.00%)	0.17
	Public office	113(72.40%)	43(27.60%)	156(100.00%)	
	Private office	7(63.60%)	4(36.40%)	11(100.00%)	
	Other	3(60.00%)	2(40.00%)	5(100.00%)	
What was the reason for the last visit?	Never went to the dentist	47(83.90%)	9(16.10%)	56(100.00%)	0.08
	Revision/prevention	6(75.00%)	2(25.00%)	8(100.00%)	
	Pain	6(46.20%)	7(53.80%)	13(100.00%)	
	Extraction	67(72.00%)	26(28.00%)	93(100.00%)	
	Treatment	44(75.90%)	14(24.10%)	58(100.00%)	
DMFT Index*	No caries experience	54(90.00%)	6(10.00%)	60(100.00%)	<0.01
	With caries experience	116(69.00%)	52(31.00%)	168(100.00%)	

Source: Own elaboration.
* Statistically significant variables with Chi-square test: p-value < 0.05 and residual > 1.96.

confirms that self-assessment of oral health is a reasonable measure of clinically determined oral health status[25,26].

It should be noted that 74.56% of the investigated population was grouped in the category "without oral health impact". This surprising

Table 2. Adequacy and adjustment in latent class model criteria. Pesqueira, 2010.

Criteria	Number of classes				
	2	3	4	5	6
AIC – Akaike Information Criterion	1,688.91	1,676.83	1,662.57	1,667.17	1,672.79
BIC – Bayesian Information Criterion	1,754.06	1,776.28	1,796.31	1,835.21	1,875.12
BIC – Adjusted	1,693.85	1,684.37	1,672.71	1,679.91	1,688.13
Entropy	0.87	0.88	0.82	0.87	0.83
LRT Vuong-Lo-Mendell-Rubin (p-value)	<0.01	0.69	0.05	0.76	0.11
LRT Lo-Mendell-Rubin (p-value)	<0.01	0.69	0.05	0.77	0.12
LRT Parametric bootstrap (p-value)	<0.01	<0.01	<0.01	0.50	1.00

Source: Own elaboration.
AIC- Akaike Information Criterion. BIC- Bayesian Information Criterion. LRT- Likelihood ratio test.

Table 3. Probability of positive response between the two latent classes generated. Pesqueira, 2010.

Latent classes	No oral health impact N = 170 (74.56%)	With oral health impact n = 58 (25.44%)
Did you have difficulty eating because of your teeth, or did you feel pain in your teeth when drinking cold or hot liquids?	0.30	0.62
Do your teeth bother you when you brush?	0.10	0.35
Did your teeth make you nervous or angry?	0.07	0.64
Did you stop going out, having fun, going to parties, or going for a ride because of your teeth?	0.00	0.56
Did you stop playing sports because of your teeth?	0.01	0.48
Did you have trouble speaking because of your teeth?	0.02	0.39
Did your teeth make you feel ashamed to smile or talk?	0.12	0.52
Did your teeth get in the way of studying/working or doing homework?	0.01	0.40
Did you stop sleeping or slept badly because of your teeth?	0.12	0.74

Source: Own elaboration.

Table 4. Simple and multiple logistic regression analysis. Pesqueira, 2010.

Independent variables		Simple			Multiple		
		OR	95% CI	P-value	OR	95% CI	P-value
Average number of households per village	≤92	1.00			1.00		
	>92	2.35	1.21-4.56	0.01	2.37	1.25-4.49	0.01
Household floor material	Pottery	1.00					
	Cement	1.10	0.33-3.72	0.88			
	Soil	3.54	0.64-19.61	0.15			
Gender	Male	1.50	0.75-2.97	0.25			
	Female	1.00					
What was the reason for the last visit?	Never went to the dentist	1.00					
	Revision/prevention	2.30	0.36-14.59	0.38			
	Pain	7.35	1.54-35.16	0.01			
	Extraction	2.03	0.83-5.00	0.12			
	Treatment	1.89	0.69-5.16	0.21			
DMFT Index	No caries experience	1.00			1.00		
	With caries experience	3.49	1.36-8.98	0.01	3.95	1.58-9.89	< 0.01

Source: Own elaboration.
OR: Odds Ratio. 95%CI: 95% Confidence Interval.

result raises a reflection about the indigenous people's perception of their oral health. It is likely that their expectations for a good oral health condition will be minimized when compared to the expectations of the non-indigenous people.

The result pointed out can portray a cultural perception of the natives that the good oral health condition is not linked to aesthetic factors or adoption of preventive practices, but rather to the absence of experience of pain and suffering, and search for the dental service is not necessary when these characteristics are lacking. This type of profile needs to be closely monitored by the Multidisciplinary Indigenous Health Teams (EMSI) because it leads indigenous people to seek late dental care, thereby reducing their opportunities for early detection and treatment.

Based on the work of Sisson[27], Sanders and Spencer[28], it is possible to admit that this self-assessment can be influenced by three factors: compromised access to oral health services and actions, differentiated exposure to oral health risk factors and behaviors, and formative sociocultural aspects of oral health conceptualization.

Aday and Forthofer[29] found that the search for health services among different social groups has different motives: while ethnic-racial minorities and population groups with lower levels of schooling visit the dentist for self-perceived oral health problems, white individuals with higher levels of schooling do so for preventive or follow-up visits.

The set of data shown strengthens the relevance of specific approaches to indigenous oral health care, so that the interventions consider the different needs and conceptions of oral health, dialoguing with the intercultural contexts.

It should be noted that a limitation of this study was the fact that the final sample was not restricted to the age index of 12 years, compromising the comparability of its results. The cross-sectional design of the study also is a limitation for the establishment of time-related relationships.

The verification of the association of the self-perceived oral health impact on daily living with sociodemographic and oral health characterization aspects among indigenous people aged 10 to 14 years of the Xukuru do Ororubá ethnic group confirms that the adoption of subjective assessments allows health services to provide the population with what is, in fact, pointed out as a necessity, and not only meet the demands established in service protocols.

The adoption of the Latent Class Analysis applied to oral health outcomes was an innovative strategy that measured the self-perceived impact of oral health in daily living.

Collaborations

HA Mauricio performed data collection and processing and drafted the text. RS Moreira conceived the paper, analyzed data and critically reviewed the text.

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