

Body mass index and dental caries in native Peruvian communities

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Oral disorders and eating disorders affect everyone, however, these will be more frequent in vulnerable populations such as native communities. **Aim:** Determining the body mass index and the prevalence of dental caries and its clinical consequences in native Peruvian communities. **Methods:** Observational, correlational, cross-sectional study. The sample consisted of 169 adults from the native communities selected for convenience, meeting inclusion and exclusion criteria. Nutritional status was evaluated through the body mass index, to quantify the experience of dental caries, the DMTF index was used, the severity was quantified by the significance index of dental caries, and its clinical consequences when not being treated by the PUFA index. The evaluation was carried out in natural light by calibrated observers. The data were analyzed in the STATA v 14 program using frequency distribution tables and figures, to determine the association, the Pearson's correlation coefficient was used. **Results:** The majority of residents had an adequate weight for their height 71 (41.01%), followed by low weight 64 (37.87%), overweight 29 (17.16%) and obesity 5 (2.96%). The prevalence of dental caries was 100% (DMTF = 13.23; SIC = 19.01), of which 68.04% had clinical consequences, no association was found between: BMI and DMTF ($p = 0.557$) BMI and PUFA-index (0.485). **Conclusions:** No association was found between the body mass index and dental caries and its clinical consequences.

Keywords: Nutritional status. Oral health. Population groups. Epidemiology. Dental caries. Peru.



Introduction

Indigenous communities are culturally different societies and communities, presenting diverse religions, traditions, languages and histories, being a vulnerable population, in addition, it represents around 5% of the world population, of which 15% live in poverty^{1,2}; in addition to having the worst health indicators compared to urban populations³. These inequalities and inequities may stem from globalization, poverty and marginalization, as well as barriers to accessing medical care⁴.

The diverse native communities constitute a high percentage of the population with food insecurity. Malnutrition, overweight or obesity has increased in this type of population, which can be related to the high consumption of carbohydrates, especially those in the form of sugars, increasing the risk of developing dental caries, this is caused by limited access to quality food, or due to the unavailability of rural stores where healthy products are sold^{5,6}. In Peru, the fight against malnutrition, anemia and obesity has improved, but there is still a large gap⁷.

Decades ago it was recognized worldwide that oral diseases are a public health problem, the most frequent being dental caries. Peru is no stranger to this reality, according to the Peruvian Ministry of Health (MINSA) 90.4% of Peruvians have dental caries and 85% suffer from periodontal diseases^{8,9}, being this reality more frequent and acute in vulnerable populations such as indigenous communities¹⁰.

The present study was carried out in the Ashanincas indigenous communities of Potsoteni, Union Puerto Ashaninka and Boca Sanibeni, located in the Ene River basin, belonging to the Mazamari district, Satipo province; Junin department, Peru, its economy is based on agriculture, hunting and fishing. Its main access routes are river and road transport¹¹.

The objective of the present study was to determine the body mass index and dental caries in Peruvian indigenous communities.

Materials and methods

Observational, correlational, cross-sectional study. The sample was made up of 169 residents of both sexes, selected for convenience, who attended the dental care module installed in each community during the days of intervention (04/08/2018 to 08/11/2020), in the XII Camp Multidisciplinary University of Research and Service (CUMIS) of the Peruvian Student Medical Scientific Society (SOCIMEP), organized by the Scientific Society of Medical Students of the Center (SOCIEMC), belonging to the indigenous communities of Potsoteni, Boca Sanibeni and Union Puerto Ashaninka of Mazamari district, Satipo province, Junin department, Peru, the inclusion criteria were: belonging to the selected indigenous communities, over 18 years of age, signing the informed consent, the exclusion criteria were: presence of any impairment (physical, psychological or social).

For the evaluation of nutritional status, the body mass index was used using the formula $BMI = \text{Weight (kg)} / \text{Height}^2 (\text{m}^2)$. Adults were evaluated barefoot and with a minimum of clothing, a calibrated SECA brand scale was used. The weight was recorded in

kilograms (kg). To measure height, the adult stood up straight, barefoot on the height meter. Height was recorded in centimeters (cm), down to the nearest 0.5. Once the measurements were obtained, they were extrapolated to the anthropometric calculator, provided by the WHO Anthro Plus 1.0.4 software. BMI was classified as low weight (BMI <18.5), normal (BMI 18.5 - 24.9), overweight (BMI 25-30), and obese (BMI > 30)¹².

The experience of dental caries was evaluated using the DMFT index (permanent decayed, lost and filled teeth)¹³, for the diagnosis of dental caries, explorers, oral mirrors, with natural light were used, fulfilling the biosecurity criteria. He inspected the occlusal, vestibular, palatal, lingual, mesial, and distal faces of all permanent teeth present except for the third molars. The presence of caries was diagnosed if there was a visible loss of continuity of the dental surface, without the characteristics of a developmental defect and in pits and fissures when the end of the explorer "hooked" under light pressure¹⁴, to the degree of severity the dental caries significance index (SIC) was used¹⁵. To determine the clinical consequences of untreated dental caries, the PUFA index was used, which quantifies the number of teeth with presence of pulp exposure (P / p), ulceration of the oral mucosa due to root fragments (U / u), fistula (F / f) and abscess (A / a)¹⁶.

The clinical examination procedure was standardized, the research team was divided into three pairs: the first consisting of an examiner and an annotator, the second focused on the evaluation of weight and height, and a third focused on the collection of demographic data of the natives. The evaluators were subjected to calibration and concordance tests, the results were subjected to the Cohen's Kappa index to establish the agreement between the observers, obtaining the value 0.87 ($p < 0.005$). The evaluations were made in the local school, under natural light, adapting the resources according to ergonomics and biosafety. To avoid fatigue bias, breaks were taken every ten evaluations per pair.

In order to collect the information, we had the support of bilingual translators from the community, who knew the research and the meaning of the questions to adapt the terms at the time of translation. After the inspection, each participant was given a hygiene kit consisting of a face soap, brush and toothpaste.

This study complies with the ethical principles of the Declaration of Helsinki, has the approval of the research ethics committee of the National Child Teaching Hospital San Bartolome, and the patients were previously consulted about their willingness to participate in the research by signing informed consent, explained what it consisted of and the possible benefit it would bring them. The project had the approval of the chiefs and residents of the selected native communities.

The data was analyzed in the Microsoft Excel 2016 program and subsequently statistical quantification was performed using the STATA v.14.0 statistical package, for descriptive analysis, percentages and frequency measurements, mean scores and standard deviations of the variables were obtained. The Pearson's correlation coefficient was used to determine the association.

Results

The sample was made up of 169 adults, the mean age was 29.13 ± 11.05 years, it was grouped by age group according to MINSA: young adult (18-29 years), adult

(30-59 years) and adult older (60 years and older). The distribution of the selected sample was 99 women (58.57%) and 70 men (41.43%). (Table 1)

Table 1. Sample characteristics, by community, age group and sex.

Age group	Indigenous communities			Sex				Total	
	Potsoteni	Boca Sanibeni	Unión Puerto Ashaninka	Male		Female			
	n (%)	n (%)	n (%)	n	%	n	%	n	%
Young adult	31(18.34%)	30(17.75%)	43(25.44%)	36	21.30%	68	40.24%	104	61.54%
Adult	24(14.20%)	20(11.85%)	19(11.24%)	33	19.53%	30	17.75%	63	37.27%
Elderly	0	1(0.59%)	1(0.59%)	1	0.61%	1	0.61%	2	1.19%
Total	55(32.54%)	51(30.19%)	63(37.27%)	70	41.44%	99	58.6%	169	100%

Regarding the nutritional status of the native population, it was found that the majority presented an adequate weight for their height 71 (41.01%), low weight 64 (37.87%), overweight 29 (17.16%) and obesity 5 (2.96%). It should be noted that the female sex presented more cases of overweight and obesity. (Table 2)

Table 2. Body mass index of the inhabitants of native communities, according to sex.

BMI	Sex				Total	
	Male		Female			
	n	%	n	%	n	%
Underweight	27	15.98	37	21.89	64	37.87
Normal weight	34	20.12	37	21.89	71	42.01
Overweight	9	5.33	20	11.83	29	17.16
Obese	0	0	5	2.96	5	2.96

Regarding the prevalence of dental caries, this was 100%, a population DMFT of 13.23 (4.91) was found, being slightly higher in the female sex, and with a severity of dental caries of 19.01, according to the group age. (Table 3)

Table 3. Prevalence, experience and significance of dental caries of the inhabitants of native communities, according to age group.

	Prevalence	C \bar{x} (SD)	P \bar{x} (SD)	O \bar{x} (SD)	CPOD \bar{x} (SD)	SIC
Age group						
Young adult	104 (100)	10.47 (2.83)	1.10 (1.46)	0 (0)	11.56 (2.63)	14.02
Adult	63 (100)	13.87 (5.06)	2.05 (2.49)	0 (0)	15.34 (4.69)	16.66

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Continuation

	Prevalence	C \bar{x} (SD)	P \bar{x} (SD)	O \bar{x} (SD)	CPOD \bar{x} (SD)	SIC
Elderly	2 (100)	15 (1.41)	0 (0)	0 (0)	15 (1.15)	0 (0)
Total	169 (100)	11.79 (4.15)	1.44 (1.96)	0 (0)	13.23 (4.91)	15.34
Sexo						
Male	70 (100)	11.21 (3.96)	1.14 (1.58)	0 (0)	12.36 (4.49)	15.65
Female	99 (100)	12.20 (4.25)	1.65 (2.17)	0 (0)	13.85 (5.13)	16.81
Total	169 (100)	3.77 (4.56)	0.99 (1.32)	0 (0)	13.23 (4.91)	16.23

In relation to the prevalence of the clinical consequences of untreated dental caries, 115 (68.04%) were residents, with the P component (pulp involvement) being the most frequent 112 (66.27%). (Table 4)

Table 4. Frequency of components of the PUFA index of the inhabitants of native communities, according to age group and sex.

	Index of clinical consequences of untreated tooth decay								Prevalence	
	P		U		F		A		n	%
	n	%	n	%	n	%	n	%		
Age group										
Young adult	59	56.70	5	4.80	0	0	9	8.70	62	59.62
Adul	51	81.10	16	25.4	3	4.80	9	14.3	51	80.95
Elderly	2	100.0	0	0	1	50.0	1	50.0	2	100.0
Total	112	66.27	21	12.43	4	2.36	19	11.24	115	68.04
Sexo										
Male	45	64.30	8	11.40	0	0	5	7.10	47	67.14
Female	67	67.70	13	13.10	4	4.40	14	14.10	68	68.68
Total	112	66.27	21	12.43	4	2.36	19	11.24	115	68.04

Regarding the Pearson’s correlation analysis between the BMI and the experience of dental caries and its clinical consequences, a very low correlation was found. Furthermore, there was no statistically significant association ($p > 0.05$) between the variables studied. (Table 5)

Table 5. Correlation between BMI and caries experience and its clinical consequences when not treated.

BMI	DMTF		PUFA index	
	<i>rho</i>	<i>p</i>	<i>rho</i>	<i>p</i>
	0.039	0.616	0.069	0.370

Pearson Correlation (significance $p < 0.05$)

Discussion

Nutritional disorders such as low weight, overweight and obesity are of growing concern not only in developed countries, but also in low-income countries such as Peru¹⁷. Our study found that most of the inhabitants had an adequate body mass index, in agreement with what was reported by De Souza-Filho et al.¹⁸ [BMI (mean = 26.65)] in Mura indigenous people of the Amazon region of Brazil, Romero et al.¹⁹ [BMI (mean = 24.20)] in residents of five native Ashaninka Peruvian communities and with Davison et al.²⁰ [BMI (mean = 21.70)] in young indigenous adults from the north from Australia²¹. However, our study evidenced that a large number of underweight and overweight residents coexist, known as the “double burden of malnutrition”, this is particularly noticeable in low-income countries such as Peru, this can manifest itself within a community, in the home or even in the same individual. According to the Food and Agriculture Organization of the United Nations (FAO), indigenous communities are at greater risk of food insecurity and malnutrition than other population groups²².

Another aspect to consider is that the majority of overweight and obese indigenous residents were female, in agreement with what was reported by Romero and others¹⁹, Boaretto and others²³, this may be because women have a higher percentage of body fat, serotonin regulation, leptin levels, in addition to the progressive weight gain in pregnancy and menopause²⁴.

Dental caries affects without distinction of social class, however, it affects more low-income people, our study showed a prevalence of 100%, being higher than that reported by Soares and others (91.6%)²⁵ and Aamodt and others (99%)²⁶, in adult indigenous residents of Kaingang-Brazil and Chiapas-Mexico; respectively. In relation to the dental caries experience, our study found average scores lower than those reported in adult Guaraní indigenous settlers (DMTF = 13.9)²⁷, Xavantes-Brasil (DMTF = 14.25)²⁸ and from the Park. National Xingu-Brazil (DMTF = 20.2)²⁹ and higher than that reported by Jayashantah and Johnson (DMTF = 0.98) in indigenous people of Sri Lanka³⁰. In relation to the age group, older adults presented a higher average number of carious lesions compared to the rest, this could be explained by the fact that the enamel of the older adult undergoes natural wear³¹, in addition to the fact that many of them continue to accept that oral deterioration is normal and inevitable in old age.

Regarding the clinical consequences of untreated dental caries, the majority presented teeth with the presence of pulp exposure, the prevalence of PUFA was 68.04%, being more frequent in the female sex, however, this is relatively high compared to infants³²⁻³⁴. Something important to mention is that no inhabitant had any dental restoration (amalgam and / or resin), this can be explained by the fact that the indigenous communities studied have a minor oral health service quality (limited to the topical application of fluoride), in addition, it is a challenge to have dental personnel who speak their indigenous language, which also compromises the quality of the service provided, this added to the distance from health institutions that have dental equipment³⁵.

Our study found a very low correlation, and there was no statistically significant association between BMI and dental caries and its clinical consequences when not treated,

being similar to what was reported by Adriano et al.³⁶, in Mexican adults and contrary to what reported by Shetha and others in Nepalese teachers³⁷, these discrepancies in the literature may be due to the multifactorial etiology of dental caries.

The change in the prevalence, experience of dental caries and its clinical consequences of not being treated and nutritional disorders in indigenous communities have increased mainly due to changes in diet, with the progressive inclusion of industrialized and sugar-rich products in their diet. In food, this can be explained by sociocultural, economic and environmental changes, as a result of their interaction with society^{38,39}.

Limitations:

1. Variability that exists in the different ethnic groups existing in Peru, will not allow these results to be extrapolated to other countries in the region.
2. The cross-sectional design does not allow evaluating the causality of dental caries, and other variables such as food diet were not considered.
3. The sample size was not significant and the fact of evaluating the BMI values and not having considered other indicators to evaluate the nutritional status.

Our results show the need for the implementation of policies in oral health and food safety with an intercultural approach, both in prevention, as well as in the treatment of pathologies and their rehabilitation, guaranteeing accessible, quality care appropriate to the culture of these populations.

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