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## ORAL HEALTH CONDITION AMONG KAINGANG INDIGENOUS PEOPLE WITH DIABETES MELLITUS

*Condição de saúde bucal entre indígenas Kaingang com diabetes mellitus*

*Estado de salud bucal de los indígenas Kaingang con diabetes mellitus*

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### ABSTRACT

**Objective:** to analyze the oral health conditions of indigenous people with diabetes. **Method:** cross-sectional study, carried out in the Indigenous Land in the northern region of Paraná. Data were collected through interviews, intraoral examinations and consultation of medical records of indigenous people of the Kaingang ethnic group and subjected to descriptive and inferential analysis. **Results:** 45 indigenous people participated, with an average age of  $56.3 \pm 12.4$  years, 53.3% of whom were female. In relation to the risk in oral health, 31.1% presented a high risk, with 95.6% of them having a very high and high rate ( $\geq 5$ ) of decayed, lost and filled teeth, 42.2% reported xerostomia, 66.7% diagnosed with periodontal disease and 24.4% were completely edentulous. **Conclusion:** the oral health condition of indigenous people with diabetes reflects the need to prioritize preventive oral health education actions by family health teams.

**DESCRIPTORS:** Diabetes mellitus; Indigenous people; CPO Index; Oral health; Family health.

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## RESUMO

**Objetivo:** analisar as condições de saúde bucal de indígenas com diabetes. **Método:** estudo transversal, realizado na Terra Indígena na região norte do Paraná. Os dados foram coletados mediante entrevista, exame intraoral e consulta a prontuários de indígenas da etnia Kaingang e submetidos à análise descritiva e inferencial. **Resultados:** participaram 45 indígenas, com idade média de 56,3 ± 12,4 anos, sendo 53,3% do sexo feminino. Em relação ao risco em saúde bucal, 31,1% apresentaram alto risco sendo que 95,6% deles tinham índice muito alto e alto (≥ 5) de dentes cariados, perdidos e obturados, 42,2% referiram xerostomia, 66,7% diagnóstico de doença periodontal e 24,4% eram edêntulos totais. **Conclusão:** a condição de saúde bucal de indígenas com diabetes reflete a necessidade de priorizar ações de educação preventiva em saúde bucal pelas equipes de saúde da família.

**DESCRIPTORIOS:** Diabetes mellitus; Povos indígenas; Índice CPO; Saúde bucal; Saúde da família.

## RESUMEN

**Objetivo:** analizar las condiciones de salud bucal de indígenas con diabetes. **Método:** estudio transversal, realizado en Tierra Indígena de la región norte de Paraná. Los datos fueron recolectados a través de entrevistas, exámenes intraorales y consulta de historias clínicas de indígenas de la etnia Kaingang y sometidos a análisis descriptivo e inferencial. **Resultados:** Participaron 45 indígenas, con una edad promedio de 56,3 ± 12,4 años, de los cuales el 53,3% eran mujeres. En relación al riesgo en salud bucal, el 31.1% presentó riesgo alto, teniendo el 95.6% de ellos un índice muy alto y alto (≥ 5) de dientes cariados, perdidos y obturados, el 42.2% reportó xerostomía, el 66.7% diagnosticado con enfermedad periodontal. enfermedad y el 24,4% eran completamente edéntulos. **Conclusión:** la condición de salud bucal de los indígenas con diabetes refleja la necesidad de priorizar acciones de educación preventiva en salud bucal por parte de los equipos de salud de la familia.

**DESCRIPTORIOS:** Diabetes mellitus; Gente india; Índice CPO; Salud bucal; Salud familiar.

## INTRODUCTION

Native peoples, while constituting one of the most marginalized and socially and economically disadvantaged social groups in relation to national society, have been facing intense processes of socioeconomic and environmental transformations that reflect on their epidemiological profile. This is because their condition of vulnerability makes them more exposed to diseases related to changes in eating habits and a sedentary lifestyle.<sup>1</sup>

Diabetes Mellitus (DM), for example, has been recorded in increasing numbers among indigenous peoples and, when not properly managed, can present systemic and oral manifestations.<sup>2</sup>

In the context of oral health, Brazil's indigenous peoples have historically been neglected, which is identified by the scarcity of studies that consider the epidemiological reality of these populations.<sup>3</sup> However, the few studies in this area have identified a high prevalence of caries and tooth loss, periodontal impairment and limited access to dental prevention and treatment services.<sup>4-6</sup>

Despite the influence of different factors on oral health conditions, socioeconomic and lifestyle factors are the most evident among indigenous peoples due to their precarious and unique living conditions.<sup>3</sup>

Concerned about this issue, in 2018 the Ministry of Health proposed a project called the National Survey of Oral Health of Indigenous Peoples, with the aim of understanding the oral health situation of this population. However, it was not implemented due to the high cost of funding this survey (US\$934,950.18).<sup>7</sup> Considering the need for these results for planning actions to assist the indigenous population, the un-

availability of resources to carry out surveys like this reflects the lack of investment in care actions and public policies aimed at indigenous peoples.

Considering that when both conditions are present, there is a bidirectional relationship between DM and periodontal disease, with an increase in the destruction of periodontal tissue and unfavorable glycemic control. Treating periodontitis in DM patients helps with glycemic control and also mitigates the damage caused by periodontal disease.<sup>8</sup>

Given what has been said so far and the scarcity of studies focusing on the oral health condition of indigenous people with DM, this study aims to contribute to identifying this profile, since the studies identified have prioritized surveying the oral health condition of indigenous people in general. It is believed that its results could support actions to promote oral health and prevent complications. The aim of the study was therefore to stratify and analyze the oral health conditions of indigenous people with diabetes.

## METHODOLOGY

### TYPE OF STUDY

A cross-sectional study was carried out from August to October 2022 with indigenous people with type 2 Diabetes Mellitus (DM2) in an Indigenous Territory (TI) in the northern region of Paraná with 1,927 indigenous people distributed in four villages, according to the indigenous health care information system (SIASI). The TI was chosen as the study site because it has the largest population and the largest indigenous territory in the northern region of Paraná.

The study included indigenous people of the Kaingang eth-

nic group, of both sexes and over 20 years of age. The predominant ethnic group is the Kaingang, who make up 97.36% of the TI. Only Kaingang indigenous people were selected for this study, since 100% of the indigenous people registered at the USF with DM belonged to this ethnic group.

Of the 48 indigenous people with DM who were eligible according to the inclusion criteria, two were absent from the Indigenous Territory (TI) during the data collection period and one refused to take part. The coverage of this study was 93.75%.

## DATA COLLECTION

Data was collected by interview, intraoral examination and consultation of medical records, following the WHO criteria for calibration.<sup>9</sup> To this end, we used an instrument made up of two parts: the first, containing variables for sociodemographic characterization; behavior (smoking, alcoholism and physical activity); clinical condition and a script to guide the assessment of oral condition (total edentulism and periodontal disease); and the second, made up of variables to guide data collection in medical records (DM and oral health risk stratifications). For these stratifications, we used the user risk stratification form and the oral health care network stratification form respectively.<sup>10-11</sup> In addition, we used validated questionnaires, the Brazil economic classification criteria (CCEB) for social class, the Alcohol Use Disorder Identification Test (AUDIT) for alcoholism and the International Physical Activity Questionnaire (IPAQ), short version for physical activity.

Initially, a pilot test was used to check the understanding of the data collection instruments by indigenous people not included in this study. It should be noted that no changes were made to the data collection instrument. At first, the indigenous people were invited to take part in the study when they went to the USF for their nursing appointment. The average interview took between 25 and 30 minutes and the intraoral examination between 20 and 25 minutes.

For the economic characterization of the participants, the Brazilian Association of Research Companies instrument was used, which estimates people's purchasing power and establishes eight social classes: A1, A2, B1, B2, C1, C2, D and E. These classes are divided into: AB, high purchasing power; C, medium purchasing power; and DE, low purchasing power.<sup>12</sup> For this indigenous population, after data collection, the categorized classes were: C1, C2 and DE. Classes AB were not included among the participants in this study, which is why they were not categorized. For the physical assessment, a short version of the International Physical Activity Questionnaire (IPAQ) was used, considering the last seven days prior to data collection.<sup>13</sup> Regarding polypharmacy, the concomitant use of five or more medications was defined.<sup>14</sup>

The decayed tooth lost and filled (DMFT) is a general indicator of oral health status, often used for epidemiological purposes, and was used in this study. It is also estimated as the average of the total number of decayed (C), missing (P) and filled (O) teeth in a given group of individuals.<sup>9</sup>

Oral health risk stratification was also used, based on biological, dental and self-care criteria. In this stratification, participants were considered to be at low, medium and high risk, based on pre-defined criteria, using scores whose sum will define the patient's individual risk.<sup>10</sup>

The primary and secondary data were recorded in a Microsoft Excel spreadsheet and submitted to statistical analysis using the Statistical Package for Social Science (SPSS) version 25.0.

This study was approved by the Research Ethics Committee (CEP) of the Federal University of Mato Grosso do Sul (UFMS) and by the National Research Ethics Commission (CONEP), according to CAAE no. 50086221.3.0000.0021 and opinion no. 5.176.634.

## RESULTS

The study included 45 indigenous people with DM2, more than half of whom were women, 24 (53.3%) with an average age of  $56.3 \pm 12.4$  years. The majority were not bilingual, 29 (64.4%).

In terms of oral health, the average number of times the participants brushed their teeth was  $1.6 \pm 1.3$  times a day (median of twice a day, minimum of none and maximum of five times a day) and 13 (28.9%) used dental floss. The average DMFT was  $21.7 \pm 9.6$  (median 22.0, minimum 2 and maximum 32), with an average of 13.8 in the 35-44 age group and 22.6 in the 65-74 age group.

With regard to SB risk, 14 (31.1%) were at high risk, 19 (42.2%) reported xerostomia and 30 (66.7%) were diagnosed with PD, 11 (24.5%) with gingivitis and 19 (42.2%) with periodontitis. In addition, 11 (24.4%) were totally edentulous, 14 (31.1%) used dentures and 33 (73.3%) needed them. In addition, 18 (56.3%) needed extraction and seven (21.9%) needed endodontics.

Table 1 shows the characterization of the oral health conditions of the Kaingang indigenous people in the northern region of Paraná.

**Table 1** - Characterization of the oral health conditions of Kaingang indigenous people, Indigenous Land, Northern Region of Paraná, Brazil, 2022

VARIÁVEIS	n (%)
<b>Brushing (number of times per day)</b>	
0 (No brushing/toothless)	15 (33,3)
1	3 (6,7)
2	16 (35,6)
3	10 (22,2)
≥ 4	1 (2,2)
<b>Use of dental floss</b>	
No	32 (71,1)

	13 (28,9)
<b>Missing and filled decayed teeth (DMFT)</b>	
Very low, low and moderate ( $\leq 4$ )	2 (4,4)
Very high and high ( $\geq 5$ )	43 (95,6)
<b>Oral health risk</b>	
Medium risk	31 (68,9)
High risk	14 (31,1)
<b>Xerostomia</b>	
No	26 (57,8)
Yes	19 (42,2)
<b>Periodontal disease</b>	
Healthy	2 (4,4)
Gingivitis	11 (24,5)
Periodontitis	19 (42,2)
Edentulous	13 (28,9)
<b>Total edentulism</b>	
No	34 (75,6)
Yes	11 (24,4)
<b>Use of dental prosthesis</b>	
No	31 (68,9)
Yes	14 (31,1)
<b>Need for dentures</b>	
No	12 (26,7)
Yes	33 (73,3)
<b>Need for extraction†</b>	
No	14 (43,8)
Yes	18 (56,3)
<b>Need for endodontics†</b>	
No	25 (78,1)
Yes	7 (21,9)

† Indigenous people without teeth were not included in the calculation.

Table 2 shows the adjusted analysis and stratification of oral health risk and the association with the number of decayed and missing teeth among Kaingang indigenous people in the northern region of Paraná.

**Table 2** - Adjusted analyses and oral health risk stratification and association with number of decayed and missing teeth in indigenous people (n=45) Indigenous Land, Northern Paraná Region, Brazil, 2022

	n	With cavities†		p	Lost		p
		coef( $\beta$ )	IC95%		coef	IC95%	
<b>RISK ORAL HEALTH</b>							
Medium	31		Ref			Ref	
High	14	3.1	(0.12; 6.02)	0.04	0.90	(-3.96; 5.75)	0.71
<b>SOCIODE-MOGRAPHC</b>							
<b>SCHOOLING</b>							
0	17		Ref			Ref	
1 to 4	20	-1,7	(-5.83; 2.34)	0.39	1.17	(-3.61; 5.96)	0.62
above 4	8	0.05	(-4.10; 4.08)	0.98	-1,43	(-7.68; 4.81)	0.64
<b>SOCIAL CLASS</b>							
C1 or C2	13		Ref			Ref	
D or E	32	1.85	(-2.18; 5.88)	0.35	-4,15	(-8.68; 0.38)	0.07
<b>GENDER</b>							
Male	21		Ref			Ref	
Female	24	-2,87	(-6.08; 0.34)	0.07	5.88	(1.68; 10.07)	0.001
<b>BEHAVIOR</b>							
<b>SMOKING</b>							
No	36		Ref			Ref	
Yes	9	3.7	(0.28; 7.36)	0.04	0.92	(-4.51; 5.68)	0.81
<b>DRINKING</b>							
No	40		Ref			Ref	
Yes	5	0.27	(-4.84; 5.38)	0.91	-9,58	(-15.83; -3.62)	0.003
<b>BRUSHING</b>							
No	16		Ref			Ref	
One	3	0.25	(-6.64; 7.15)	0.94	-8,8	(-18.2; 0.64)	0.06
Two or more	26	1.28	(-3.6; 6.26)	0.60	-12,6	(-18.94; -6.30)	1
<b>FLOSSING</b>							
No	32		Ref			Ref	
Yes	13	-1,13	(-4.58; 2.32)	0.50	-5,53	(-10.6; -0.49)	0.01
<b>AGE</b>							
		-0,94	(-0.27; 0.08)	0.27	0.33	(0.11; 0.56)	0.001

## DISCUSSION

In addition to being vulnerable and sometimes economically disadvantaged, indigenous peoples have become more exposed to diseases related to the epidemiological transition and rapid urbanization, especially due to the consequent change in eating habits and sedentary lifestyles. This is especially true of ethnic groups that are in closer contact with the non-indigenous population.<sup>2</sup>

Evidence of the vulnerabilities of indigenous peoples was identified through the first National Survey of Health and Nutrition of Indigenous Peoples, carried out between 2008 and 2009, characterized by low socioeconomic and educational le-

vels, dependence on government benefits, lack of resources and poorer health.<sup>15</sup>

The participants in this study lived in an indigenous land, located in a rural area. 71.1% belonged to socioeconomic class D or E, 80% received social benefits and 82.2% had a low level of education (up to four years of study). These results corroborate a study which pointed out that individuals who live in rural areas live with greater poverty, no or little schooling, precarious housing conditions and difficulties in accessing health services, and as a result become more vulnerable.<sup>2</sup>

The fact that more than half of the study participants were female may be related to the fact that Kaingang indigenous women seek out the services of the Basic Health Unit (UBS) more often. This result in turn corroborates the findings of studies carried out with Xavante (51.0%) and Mura (57.8%) indigenous people.<sup>16-17</sup>

Sometimes in economically disadvantaged populations, the only alternative to stop momentary dental pain is low-cost, non-conservative dental treatment, characterized by tooth extraction. However, factors such as smoking, systemic diseases, low level of education, monthly income, age group, gender and marital status can also have an influence.<sup>6</sup>

In this sense, it is essential for health professionals to recognize aspects relating to the culture, social organization and dietary pattern of the indigenous population in order to identify early on the factors that can favor cariogenic activity, especially in people with DM, with a view to preventing unindicated tooth extraction.

Due to the lack of comprehensive research into the oral health of indigenous peoples, it is not possible to say whether specific cultural habits influence cariogenic activity and, consequently, the development of dental caries. However, an oral health survey of Kaingang adults aged between 35 and 44 in the southern region of Brazil showed a high frequency of untreated caries and missing teeth, a result of gaps in the care provided. In addition, 34.58% had the need for tooth extraction, which was associated with the location of the village, time since the last dental appointment and a higher number of decayed teeth.<sup>5</sup>

In the same vein, a cross-sectional study carried out with an adult indigenous population from the Kiriri ethnic group in the north-east of Brazil found a prevalence of 33% of individuals with one or more teeth requiring extraction. High age was one of the most relevant associated factors in cases where extractions were indicated, as well as being related to the evolution of periodontal disease, resulting in higher levels of bone loss.<sup>6</sup>

It should be emphasized that the difficulties of understanding, due to low schooling and economic income, are of great relevance to understanding the health-disease process of indigenous peoples. It has been observed that social inequalities generally modify differences in disease patterns and the use of services.<sup>18</sup> In another study, lower levels of schooling usually identified limited oral health education. This can lead to restrictions in the knowledge of methods to prevent oral diseases, especially those related to hygiene, as well as late seeking of

dental treatment.<sup>6</sup>

Access to accurate information and an understanding of oral health prevention measures are essential for self-care and maintaining good oral health.<sup>19</sup> However, a lack of specific knowledge in this area can lead indigenous people to worsen pre-existing oral problems, make it more difficult to manage clinical conditions and, consequently, increase the demand for health services. For this reason, health professionals must be aware of their role in promoting health, in order to guarantee correct and accurate information for indigenous users. Since access to information is a key aspect in promoting health equity among indigenous people.

The rate of edentulism found in this study, although worrying, is lower than that found in elderly people in the general population assessed by Saúde Bucal - SB Brasil 2010, which is one of the highest in the world.<sup>20</sup> The study by Barbato et al. found that the highest rates of edentulism were observed in women with self-reported white, brown, black, yellow and indigenous skin color.<sup>21</sup> An explanatory hypothesis again reinforces that women use dental services more, which could result in overtreatment and tooth loss. Also in this study, 37.8% of the Kaingang ethnic group reported being illiterate. Of these individuals with no schooling, 100% had a high and very high DMFT score of  $\geq 5$ . In addition, the average and high oral health risk was 70.6% and 29.4% respectively.

The proportion of caries severity expressed by the DMFT index in this study (13.8%) was higher than that found among the Guarani indigenous peoples (11.5), but lower than among the Kaingang of the Guarita Indigenous Land (14.4) and the rest of the population in SB-2010 (16.7) in the 35-44 age group.<sup>3,5,22</sup> For the 65-74 age group, it was 18.6 among the indigenous Guarani<sup>3</sup>, lower than in the present study, which was 22.6, and the SB-2010 for the Brazilian population, which recorded <sup>27,5,22</sup>

On the other hand, when evaluating the DMFT index separately, the lost component (P) in Kaingang indigenous people was 65% in adults (35-44 years), lower than the index found in Guarani indigenous people (88.7%) among the elderly (65-74 years) and 69.3% in adults (35-44 years).<sup>3,5</sup> This P component of the index may indicate that these indigenous people had access to dental services, but predominantly for tooth extraction. In addition, some studies have shown a low percentage of restored teeth among indigenous adults. Therefore, these specific populations are considered to be more socially vulnerable, characterized by low socio-economic conditions, low resolution of dental caries and lack of incorporation of less invasive restorative treatments.<sup>3,5,22</sup>

In this context, it should be noted that the determinants of the health-disease process are diverse and complex for each indigenous people, when contact with the non-indigenous population becomes frequent.<sup>1</sup>

It was found that indigenous people with less schooling had greater need for dental treatment, i.e. a higher DMFT index and greater oral health risk. This indicates the existence of inequalities linked to the social determinants of health (SDH) among

indigenous people that need to be considered when planning measures to prevent, monitor and treat oral health problems.<sup>18</sup> However, this low level of schooling was lower when compared to indigenous people from the Jaguapiru village in the municipality of Dourados in Mato Grosso do Sul, where 72.7% were illiterate.<sup>23</sup>

The poor periodontal conditions identified in this study (66.7% with periodontal disease and 28.9% with total edentulism) corroborates what has been identified in other studies with indigenous people and is even more striking when compared with the SB-2010 data.<sup>20</sup>

In general, the lack of knowledge about oral hygiene is reflected in oral problems, especially edentulism and gingival and periodontal problems. A review study on the knowledge, attitude and oral health practices of patients with diabetes found that those who lacked knowledge had poor oral health habits and consequently increased edentulism.<sup>24</sup> In turn, a study on factors associated with the indication for tooth extraction in the Kiriri indigenous population found that socioeconomic inequality associated with social and cultural factors influences oral health conditions, even leading to tooth loss.<sup>6</sup>

Socioeconomic influence has also been identified in the non-indigenous population. A study of elderly people in Minas Gerais found a high prevalence of edentulism associated with socioeconomic factors, demonstrating inequality in oral health and the need for state intervention and protection. Total edentulism, for example, was more prevalent in women with lower income and schooling who had not sought a dental service in the last six months.<sup>25</sup>

Tooth loss is replaced by making dental prostheses, which improve quality of life from both an aesthetic and functional point of view. In this study, it was found that 31.1% used prostheses and 73.3% needed them, which is responsible for the large number of edentulous individuals and, consequently, the significant demand for specialized dental services, requiring more pragmatic actions to offer oral rehabilitation, as well as preventive and curative services.

In some specific areas, there is weakness in the process of coordination between the Special Health Districts for Indigenous Health (DSEI) and the municipalities in the area covered by indigenous lands to establish flows of specialized dental services, which is a constitutional right. Relationships in this field are built according to the sensitivity of the municipal and/or state manager to the indigenous cause, and based on partnership relationships between indigenous health professionals and municipal or state health professionals. The difficulties detected in the relationship between managers may be due to a lack of clarity about the roles to be played by the different federal entities in indigenous health.

In terms of public health, smoking and alcoholism are among the five main risk behaviors for the development of CNCDs.<sup>26</sup> A study has shown that the frequency of both alcoholism and smoking has increased among indigenous peoples, even though little is known about national epidemiolo-

gical data to quantify this trend.<sup>17</sup> It should be noted that there is a greater risk of developing DM among people who consume a high volume of alcoholic beverages. Although smoking among indigenous peoples is strongly influenced by historical and cultural manifestations, the high prevalence of this habit is a risk behavior that favors the development of chronic diseases as well.<sup>2,17</sup>

However, it is worth noting that studies carried out with indigenous populations have revealed the positive aspects of pipes and snuff.<sup>27-28</sup> Among Fulni-ô indigenous people, for example, a study showed that the use of xanduca, a traditional pipe for smoking natural herbs, had a religious character associated with disease prevention.<sup>27</sup>

With regard to alcoholism, it is necessary to understand the cultural and historical specificity of each indigenous group. In addition, we need to understand that the use of low-alcohol drinks is used in traditional rituals and is not characterized as a disease. On the other hand, abusive consumption is not linked to cultural customs and can lead to irreversible damage and social and psychological problems.

A possible limitation of this study is the failure to include other spaces for recruiting indigenous people from the region studied, such as the Indigenous Health Houses (CASAI) and the Base Poles in the state of Paraná. However, there is the possibility that the results found could lead to actions to track the living conditions and health of indigenous people who frequent these other places.

In view of the results found, it was possible to establish partnerships with universities in the neighboring municipality as a complementary strategy to expand the possibilities of access to health care for indigenous people, in addition to assistance from the single health system, to fill the gap in dental specialties.

## CONCLUSION

High oral health risk was found in 31.1% of the indigenous people, with 95.6% having a very high and high index ( $\geq 5$ ) of decayed, missing and filled teeth, 42.2% reported xerostomia, 66.7% were diagnosed with periodontal disease and 24.4% were totally edentulous.

The oral health condition of the Kaingang indigenous people who took part in this study reflects the need to prioritize the preventive and educational dimension by the Family Health teams in the Indigenous Territory, as well as the expansion of more complex dental services offering periodontics, prostheses and major surgery.

It is essential that epidemiological studies be carried out on the indigenous population in order to understand how the processes of cultural change and lifestyle habits can influence, positively or negatively, the oral health-disease process in individuals with DM. In addition, the problems identified demonstrate the need to implement secondary prosthetic, endodontic and periodontic care services on indigenous lands.

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