Cogitare Enfermagem

ORIGINAL ARTICLE

LIVING CONDITIONS AND HEALTH OF KAINGANG INDIGENOUS PEOPLE WITH DIABETES*

HIGHLIGHTS

1. Non-indigenous people influenced Indigenous traditions and customs.
2. Indigenous women with diabetes have an altered waist circumference.
3. The importance of screening strategies for diabetes in indigenous people.

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ABSTRACT

Objective: To analyze the living conditions and health of Kaingang indigenous people with type 2 Diabetes *Mellitus*. **Method:** A cross-sectional study carried out through interviews and consultation of medical records with indigenous people of the Kaingang ethnic group living in an indigenous land in the northern region of Paraná-Brazil. Student's t-test and the chi-square test were used to analyze the data. **Results:** The average age of the 45 participants was 56.3 ± 12.4 years. Most women were overweight, and their waist circumference was higher than the risk indicator. The average glycated hemoglobin was 9.6 ± 2.7%, and venous glycemia was 189.1 ± 95.3 mg/dL. **Conclusion:** analyzing the living conditions and health of Kaingang indigenous people provides information for planning early screening, prevention, and monitoring of chronic conditions in the indigenous population.

KEYWORDS: Diabetes *Mellitus*; Indigenous Peoples; Anthropometry; Sedentary Behavior.

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INTRODUCTION

There are more than 305 indigenous peoples in Brazil, and according to the last census, around 896,000 people declared themselves to be indigenous in the country[1]. Of these, around 36.2% live in cities and 63.8% in rural areas, corresponding to approximately 0.47% of the country's total population[2].

Indigenous people are considered a vulnerable population in national society. The change in the lifestyle of indigenous people, resulting from increasingly frequent contact with the urban population, combined with low economic and educational levels and restricted access to health care, has contributed to an increase in the prevalence of chronic non-communicable diseases (CNCD) in this population[3].

Brazil is in sixth place with the highest number of people with diabetes *mellitus* (DM), and this is projected to increase over the coming decades. It has multifactorial causes such as low schooling, limited access to health goods and services and lifestyle habits[4]. In the indigenous population, DM is an emerging CNCD associated with traditional risk factors (smoking and alcoholism), changes in eating habits from subsistence to industrialized foods, and increasingly frequent contact with the non-indigenous population. It should be noted that low levels of schooling, communication difficulties, and the lack of professionals trained in health services to deal with the indigenous population can contribute both to underreporting and adequate treatment and follow-up[3].

One way of monitoring people with DM is to measure the anthropometric variables of body mass and height, as these help to assess the process of nutrition and health. In addition, they are used to fill the gaps in knowledge regarding the food and nutritional transition in indigenous populations, with body mass index (BMI) often used to assess nutritional status. Studies show an increase in the prevalence of overweight and obesity in indigenous populations[3,5-6].

It should be noted that obesity is associated with other cardiovascular risk factors besides DM, such as hypertension[7]. In addition, obesity and DM are complex diseases with an increasing prevalence worldwide, and the interaction between genetic and environmental factors6 determines both.

With the process of nutritional transition and urbanization in indigenous communities under sociodemographic, socioeconomic, and sociocultural influences, a health reality has emerged with the intense emergence of chronic non-communicable diseases (CNCD)[8]. A diet rich in carbohydrates and industrialized foods can contribute to an increase in obesity among indigenous people and, consequently, influence the glycemic profile. In addition, indigenous people in restricted areas have had their subsistence economy altered, leading to a sedentary lifestyle, which is one of the factors behind obesity in this population[3].

Given this context, studies that present the characteristics of the living conditions and health of the indigenous population are needed to direct care actions that meet their ethnic and cultural specificities.

This study aimed to analyze the living conditions and health of Kaingang indigenous people with Type 2 Diabetes *Mellitus*.

METHOD

This descriptive, analytical, cross-sectional, quantitative study is conducted through semi-structured interviews and consultation of the health unit's medical records.

The study included Kaingang indigenous people with DM living in an Indigenous Land (IL) with three villages (Apucaraninha, Água Branca, and Serrinha), located in the northern region of Paraná, of both sexes, aged over 20 and registered at the Family Health Unit (FHU) of the Apucaraninha IL. In turn, those who were absent from the community during the data collection period, bedridden, hospitalized, with sequelae that prevented them from communicating, and had difficulties traveling to the FHU for an oral health assessment were excluded.

According to the Indigenous health care information system in 2022, the IL under study has a population of 1,989 Indigenous people. The predominant ethnic group in the IL is the Kaingang (97.36%), and 100% of the indigenous people from this ethnic group have been diagnosed with DM. However, there are some Xokléng, Guaranis, other ethnic groups of Guaranis, and non-indigenous people living in the area. The Kaingang language belongs to the Jê linguistic group, which is part of the Macro-Jê linguistic trunk, and they are considered to be descendants of the ancient Guayaná[9]. At the start of the study, there were 48 indigenous people registered with type 2 diabetes *mellitus* (DM2) at the FHU in the main village.

The data was collected between August and October 2022, and the interviews were carried out by the main researcher and an oral health assistant, both duly trained in the care of the indigenous population.

For sociodemographic characterization, the following variables were considered: age group (categorized as adult and elderly), gender, village (1, 2, and 3), marital status (with or without a partner), schooling (none, 1 - 4 years, 5 - 9 years and >10 years) and social class (C, D or E) according to the Brazilian Economic Classification Criterion (CCEB), bilingual (no or yes), religion (no, Catholic or Evangelical), social benefit (no or yes).

The variables relating to health behaviors were smoking (no or yes); alcoholism (no or yes) according to the validated instrument *Alcohol Use Disorder Identification Test* (AUDIT); and physical activity (sedentary, irregularly active, or active/very active), verified using the International Physical Activity Questionnaire (IPAQ) short version.

The variables for characterizing health conditions collected in the interview were polypharmacy (no or yes), which was defined as the use of five or more drugs concomitantly[10], time since diagnosis (< 5 years, ≥ 5 years or unknown), amputation due to DM (no or yes), retinopathy (no or yes), insulin use (no or yes) and hypertension (no or yes). The health condition variables, with emphasis on the data collected in the medical records, were total cholesterol (normal or altered), triglycerides (normal or altered), urea (normal or altered), and creatinine (normal or altered).

Anthropometric characterization included body mass index [eutrophy (< 24.9 kg/m^2), overweight (25 to 29.9 kg/m^2) and obesity (≥ 30kg/m2)]11; waist circumference [below the cut-off point or equal to/greater than the cut-off point of 102 cm for men and 88 cm for women]11; conicity index [below the cut-off point or equal to/surpassing the cut-off point of ≥ 1.25 and ≥ 1.18 for men and women respectively]12; and waist-to-height ratio [below the cut-off point or equal to/surpassing the cut-off point of ≥ 0.50][11]. The information in the medical records was used to determine the risk stratum of the person with DM (low, medium, and high risk).

For metabolic analysis, glycated hemoglobin (HbA1c) was categorized as normal (<5.7%) and altered (≥5.7%), and fasting venous glucose was considered normal (70 to 99 mg/dL) and altered (≥ 100 mg/dL)[4].

The data was entered into Microsoft Office Excel spreadsheets and transferred to the Statistical Package for Social Sciences (SPSS)® version 25.0 for analysis. *Student's t-test* and Pearson's *chi-squared* test were used for statistical analysis. It was also associated with anthropometric measurements with a 95% CI according to gender and about the Brazilian population. The same association was made with gender and age group. Finally, the distribution of risk for DM2 complications was based on sociodemographic and behavioral characteristics. Quantitative variables were expressed as means, and categorical variables as frequencies and percentages.

This study was approved by the Research Ethics Committee (CEP) of the Universidade Federal do Mato Grosso do Sul (UFMS) and by the Comissão Nacional de Ética em Pesquisa (CONEP), according to opinion no. 5.176.634.

RESULTS

Of the 48 eligible indigenous people, two were excluded for not coming to the FHU twice in a row for data collection and one for not presenting the results of follow-up laboratory tests (in the last six months) and refusing to collect them. A total of 45 Kaingang indigenous people took part, with an average age of 56.3 ± 12.4 years, ranging from 32 to 88 years.

Table 1 shows the distribution of risk frequencies for DM complications according to the sociodemographic and behavioral characterization of the Kaingang indigenous people participating in the study. This stratification shows different degrees of risk that corroborate the development of DM complications in this population.

Table 1 - Distribution of risk frequencies for diabetes mellitus complications according to Kaingang indigenous people's sociodemographic and behavioral characteristics. Campo Grande, MS, Brazil, 2023.

VARIABLE	RISK OF DIABETES *MELLITUS* COMPLICATIONS		
	Bass n (%)	Moderate n (%)	High n (%)
Sociodemographic characteristics			
Age group			
Adults	3 (8,8)	3 (8,8)	28 (82,4)
Elderly	2 (18,2)	1 (9,1)	8 (72,7)
Sex			
Female	2 (8,3)	4 (16,7)	18 (75,0)
Male	3 (14,3)	0 (0,0)	18 (85,7)
Village			
Apucaraninha	3 (8,6)	3 (8,6)	29 (82,9)
Água Branca	1 (11,1)	1 (11,1)	7 (77,8)
Barreiro	1 (100,0)	0 (0,0)	0 (0,0)

Marital status			
Without a partner	0 (0,0)	0 (0,0)	4 (100,0)
With a partner	5 (12,5)	4 (9,8)	32 (78,0)
Schooling (years)			
None	0 (0,0)	1 (5,9)	16 (94,1)
1-4	4 (20,0)	3 (15,0)	13 (65,0)
5-9	0 (0,0)	0 (0,0)	4 (100,0)
>10	1 (25,0)	0 (0,0)	3 (75,0)
Social class			
C	2 (15,4)	1 (7,7)	10 (76,9)
D or E	3 (9,4)	3 (9,4)	26 (81,3)
Bilingual			
No	4 (13,8)	2 (6,9)	23 (79,3)
Yes	1 (6,3)	2 (12,5)	13 (81,3)
Religion			
None	0 (0,0)	0 (0,0)	1 (100,0)
Catholic	3 (13,6)	2 (9,1)	17 (77,3)
Evangelical	2 (9,1)	2 (9,1)	18 (81,8)
Do you receive social benefits?			
No	2 (22,2)	0 (0,0)	7 (77,8)
Yes	3 (8,3)	4 (11,1)	29 (80,6)
Behavioral characteristics			
Smoking			
No	4 (11,1)	2 (5,6)	30 (83,3)
Yes	1 (11,1)	2 (22,2)	6 (66,7)
Alcoholism			
No	5 (12,5)	3 (7,5)	32 (80,0)
Yes	0 (0,0)	1 (20,0)	4 (80,0)
Physical activity			
Sedentary lifestyle	1 (7,7)	0 (0,0)	12 (93,2)
Irregularly active	2 (10,5)	3 (15,8)	14 (73,7)
Active/very active	2 (15,4)	1 (7,7)	10 (76,9)

Source: The authors (2023).

The average time since diagnosis of DM was 5.9 ± 6.6 years (minimum of 0.1 and maximum of 30 years). Among the clinical characteristics, the mean HbA1c was 9.6 ± 2.7% (minimum of 6.0 and maximum of 15.3%); 189.1 ± 95.3 mg/dL (minimum of 81 and maximum of 423 mg/dL) of venous glycemia; 297.2 ± 332.1 mg/dL (minimum of 90 and maximum of 2.315 mg/dL) of triglycerides; 187.4 ± 52.8 mg/dL (minimum of 109 and maximum of 411 mg/dL) of total cholesterol; 0.9 ± 1.5 mg/dL (minimum of 0.60 and maximum of 1.55 mg/dL) of creatinine and 30.5 ± 9.9 mg/dL (minimum of 12 and maximum of 70 mg/dL) of urea.

Table 2 shows the study participants' clinical characterization and health status frequency distribution.

Table 2 - Frequency distribution of the clinical characterization and health status of the Kaingang indigenous people participating in the study. Campo Grande - MS, Brazil, 2023.

VARIABLE	*n (%)*
Health Condition Characteristics	
Polypharmacy	39 (86,7)
No	6 (13,3)
Yes	
Time to diagnosis of Diabetes *Mellitus*	
< 5 years	22 (48,9)
≥ 5 years	21 (46,7)
Unknown	2 (4,4)
Diabetic Foot	
No	40 (88,9)
Yes	5 (11,1)
Amputation due to Diabetes *Mellitus*	
No	41 (91,1)
Yes	4 (8,9)
Retinopathy	
No	41 (91,1)
Yes	4 (8,9)
Use of insulin	
No	37 (82,2)
Yes	8 (17,8)
Hypertension	
No	17 (37,8)
Yes	28 (62,2)
Body mass index	
Eutrophy	4 (8,9)
Overweight	19 (42,2)
Obesity	22 (48,9)
Clinical Characteristics	
Total Cholesterol	
Normal	33 (73,3)
Amended	12 (26,7)
Triglycerides	
Normal	8 (17,8)
Amended	37 (82,2)
Urea	
Normal	41 (91,1)
Amended	4 (8,9)
Creatinine	
Normal	40 (88,9)
Amended	5 (11,1)

Source: The authors (2023).

Table 3 shows the summary statistics of the *Student*'s t-test for anthropometric measurements: the average waist circumference among women (98.8), the taper index for men (1.31), and the waist-to-height ratio for both sexes (male 0.61 and female 0.66) were significantly higher concerning the cut-off points established in the literature (p<0.001), and the average taper index for women (1.32) was significantly lower (p=0.008).

Table 3 - Summary statistics of the Student's t-test of anthropometric measurements, according to gender, about the Brazilian population. Campo Grande - MS, Brazil, 2023.

VARIABLE	n	$\underline{x}$ *(DP) †	Student's t-test		
			p‡	1-β§	$\underline{x}1-\underline{x}2$ǁ (IC95%)¶
Waist circumference**					
Female	24	98,8 (10,2)	<0,001	73,43	10,83 (6,5 ; 15,2)
Male	21	100,4 (8,9)	0,426	17,86	-1,57 (-5,6 ; 2,5)
Conicity index††					
Female	24	1,32 (0,06)	0,008	51,71	-0,04 (-0,07 ; -0,01)
Male	21	1,31 (0,05)	<0,001	81,82	0,069 (0,04 ; 0,09)
Waist to height ratio‡‡					
Female	24	0,66 (0,07)	<0,001	88,71	0,13 (0,10 ; 0,16)
Male	21	0,61 (0,05)	<0,001	86,76	0,09 (0,06 ; 0,11)

*Mean; † Standard deviation; ‡ p-value (probability of significance); § Power of the test; ǁ Difference of means; ¶ 95% confidence interval; **Reference of 102cm for men and 88cm for women; †† Reference of 1.25 for men and 1.36 for women; ‡‡Reference of 0.52 for men and 0.53 for women. Significance value (α=0.05).
Source: The Authors (2023).

Table 4 shows the summary statistics of Pearson's chi-square test for anthropometric measurements. There was an association between gender and waist circumference, in which there was a higher prevalence of women with a waist circumference higher than that reported in the literature (p=0.002), and between gender and the conicity index, in which 88.9% of women had measurements lower than those reported in the literature (p<0.001).

Table 4 - Summary statistics from Pearson's chi-square test of anthropometric measurements about gender and age group. Campo Grande - MS, Brazil, 2023.

VARIABLE	Pearson's chi-square test					
	SEX			AGE GROUP		
	Male n (%)	Female n (%)	*p*	Adult n (%)	Elderly n (%)	*p*
Body mass index						
Eutrophy	2 (50,0)	2 (50,0)		2 (50,0)	2 (50,0)	
Overweight	11 (57,9)	8 (42,1)	0,383	14 (73,7)	5 (26,3)	0,383
Obesity	8 (36,4)	14 (63,6)		14 (81,8)	4 (18,2)	
Waist circumference*						
Below the reference	13 (76,5)	4 (23,5)		13 (76,5)	4 (23,5)	
			0,002			1,000

Equal to or greater than the reference	8 (28,6)	20 (71,4)		21 (75,0)	7 (25,0)	
Conicity index†						
Below the reference	2 (11,1)	16 (88,9)		13 (72,2)	5 (27,8)	
			<0,001			0,732
Equal to or greater than the reference	19 (70,4)	8 (29,6)		21 (77,8)	6 (22,2)	
Razão cintura e estatura‡						
Below the reference	1 (100,0)	0 (0,0)		0 (0,0)	1 (100,0)	
			0,467			0,244
Equal to or greater than the reference	20 (45,5)	24 (54,5)		34 (77,3)	10 (22,7)	

*Reference of 102cm for men and 88cm for women; †Reference of 1.25 for men and 1.36 for women; ‡Reference of 0.52 for men and 0.53 for women. Significance value (α=0.05).).
Source: The authors (2023).

DISCUSSION

It should be noted that indigenous peoples differ from one another. One reason is the distinctions between ethnic groups, territorial areas, socio-economic inequalities, and the length of contact with the surrounding society. When they have closer contact with this society, they absorb behaviors that replace their traditions and customs[3].

Although historical and cultural manifestations strongly influence smoking among indigenous peoples, the high prevalence of this habit is a risk behavior that favors the development of chronic diseases[3,13]. Even though little is known about national epidemiological data to quantify the trend of alcoholism and smoking, studies show that their frequency has intensified[13].

Despite all the advances in health care, managing DM2 is still far from adequate[14]. It should be noted that maintaining the HbA1c level at 7% is considered one of the main goals for glycemic control in most individuals with DM[15]. Therefore, the biggest challenge in the management of DM2 is to achieve this HbA1c parameter due to the difficulty in controlling glycemia due to the disproportion between the absorption of carbohydrates and the action of insulin[14].

A study indicated that the main aggravating factors to the condition of vulnerability and restricted access to health services among the indigenous population were low socioeconomic and educational levels[16]. Similarly, another study revealed that low schooling and income are of great relevance to understanding the health-disease process of indigenous peoples since they are elements that interfere with accessibility to health services and, consequently, illness[17]. Another study found that individuals from lower socioeconomic classes have poor housing conditions, fewer opportunities for education, and less access to health care[18].

Furthermore, a study with the indigenous Mura population of Autazes (Amazonas) revealed that 60.2% received income from some social benefit from the federal government, and 59.4% had a family income of less than one minimum wage[13]. In the Munduruku indigenous group, 61.7% received social benefits, and 40.3% received less than the minimum wage[5]. This ethnic group showed a risk of DM2 associated with low income[5]. In a study of the Xavante population in Mato Grosso, a third of the sample had an income of up to one minimum wage, and 10% had no income[19]. In this study, 80% of Kaingang indigenous people received social benefits, and 71.1% belonged to socioeconomic class D or E, reinforcing the social vulnerability of this population group. In this context, the relationship between vulnerability and low socioeconomic status, factors that influence health-disease conditions and are related to the epidemiological transition and rapid urbanization, is reiterated[3].

A study identified a high prevalence of overweight, especially among indigenous women of the Xikrin (Mebengôkre) ethnic group, who deserve in-depth research to facilitate intervention programs[20]. Therefore, the literature shows that the factors associated with overweight and obesity are different between the sexes[20-21], similar to what was observed in this study.

In other studies on chronic non-communicable diseases (CNCDs), the predominance of females in seeking primary care services has been pointed out in a similar way to the Brazilian population in general[21]. This was also reflected in the anthropometric data of this study, in which women were at greater risk of cardiovascular disease. Therefore, developing strategies with early diagnosis and treatment actions to reduce the risk factors for DM2 complications is essential to serve these indigenous populations and encourage a national popular education policy based on sociocultural aspects and health determinants[22].

Several studies indicate that the increase in the incidence and prevalence of DM2 is associated with an aging population, growing urbanization, and lifestyles such as sedentary lifestyles, inadequate diet, and obesity, which are also observed among indigenous people. They also pointed out that age is an important indicator of risk factors for chronic diseases[3,5,7]. In addition, the occurrence of chronic non-communicable diseases increases throughout life, which can lead to a demand for medium and high-complexity procedures, rehabilitation services, hospitalization, and long-term care[23].

These people's way of subsisting has changed through contact with non-indigenous people, leading to physical inactivity or a sedentary lifestyle, which is an important risk factor for the development of chronic diseases. Therefore, knowing the risk factors is important to understand the epidemiological picture in detail[24].

A sedentary lifestyle can make it difficult to manage DM2 and contributes to the accumulation of body fat, leading to an association with various chronic diseases. In this study, physical activity, sedentary lifestyles, and being irregularly active were present in 32 (71.1%). It is known that regular physical activity combined with a balanced and healthy diet helps to control body weight and reduce visceral fat, the risk of DM, and cardiovascular diseases. This was also reflected in another study, which identified a high prevalence of overweight and obesity (33.5% and 14.8%, respectively)[25].

Body mass index (BMI), waist circumference (WC), and waist-to-height ratio (WHtR) are used to assess the risk of developing chronic diseases[26]. WC, for example, has been proposed as one of the recommended anthropometric predictors of visceral fat and risk of metabolic diseases[27].

The relevance of this study is noteworthy, but the literature lacks information on the association of anthropometric variables with sociodemographic aspects, living conditions, and types of food consumed by Brazilian indigenous peoples. There is also a lack of specific anthropometric and metabolic cut-off points for indigenous peoples, which makes it impossible to compare results between ethnic groups.

Several studies in specific communities point to a high prevalence of overweight and obesity in indigenous adults[3,5,7]. Obesity is associated with an increased risk of heart disease and stroke[28].

On the other hand, a study of indigenous Guarani and Terena women found that 40.3% were overweight and 30.9% were obese[3]. In addition, abdominal adiposity was present in 57.7% of the women studied, indicating a very high risk of cardiovascular disease. In another study among the Xavantes, a high frequency of 35% overweight and 50% obesity was identified[6]. These findings align with other studies on indigenous peoples in Brazil and worldwide, showing that excess weight is associated with accelerated nutritional transition[13,25].

Among these variables, the nutritional assessment showed that indigenous people of the Mura ethnic group from Autazes -AM showed higher neck circumference, waist-to-hip ratio, conicity index, body age relative to real age, and body fat percentage[13].

In the National Health and Nutrition Survey of Indigenous Peoples, conducted in Brazil in 2008/2009, the average BMI for all indigenous women in Brazil was higher (25.2 kg/m^2) than the BMI limit considered adequate. Concerning BMI values by macro-region, the lowest average was found in the North (23.7 kg/m^2), while the highest was found in the South/Southeast (26.2 kg/m^2). The proportion of women with some degree of overweight was 45.9%, with a higher frequency of overweight (30.2%) compared to obesity (15.7%)[29].

In the results of the study of the indigenous Mura, waist circumference (WC) was increased by 48.6%, and in hypertensive patients, it increased to 74.4%. The average conicity index (CI) was 1.2[13]. The study of indigenous Xavantes found that the increased risk of metabolic complications was more prevalent among men (38.8%) than women (16.0%)[30]. In the present study, anthropometric data and parameters were increased, indicating cardiovascular risk and the need for educational strategies. It must be considered that the indigenous population is economically vulnerable, with its cultural and social specificities, making the risk even greater.

Therefore, it is essential to develop educational, early diagnosis, and self-care actions culturally adapted to each indigenous population to provide strategies for improving the quality of life of individuals with DM and, above all, reducing risk behaviors. In this sense, it is recommended that public health policies be promoted that raise awareness and encourage changes in lifestyles and behavior, as well as environmental and social changes among indigenous peoples.

As the study's main methodological limitations, it is worth emphasizing that making more precise inferences about the foods consumed was impossible because this study did not address eating habits. In addition, the lack of specific anthropometric and metabolic cut-off points for indigenous peoples makes comparison difficult.

CONCLUSION

The findings of this study show a high prevalence of overweight among Kaingang indigenous people with DM2, especially among women. The average waist circumference among women, the conicity index for men, and the waist-to-height ratio for both sexes were significantly higher than the cut-off points established in the literature. There was also an association between gender and waist circumference, with a higher prevalence of women with a waist circumference higher than that predicted in the literature.

Further studies are needed to gather information on indigenous peoples, covering demographic, epidemiological, and anthropometric aspects. Furthermore, the scarcity of more robust studies, coupled with the lack of methodological standardization applied in current studies, makes it impossible to substantiate these issues in a detailed and precise manner.

Finally, it is necessary to implement strategies to prevent and control overweight among indigenous people. These strategies should aim to maintain healthy eating habits and traditional lifestyles and emphasize the importance of physical activity.

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