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ARTICLE

Comparison of beriberi cases in indigenous and non-indigenous people, Brazil, 2013 to 2018

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Abstract *Beriberi is the clinical manifestation of severe and prolonged thiamine (vitamin B1) deficiency. It is a neglected disease that affects low-income populations facing food and nutrition insecurity. The aim of this study was to compare cases of beriberi among indigenous and non-indigenous people in Brazil. We conducted a cross-sectional study using data on cases of beriberi during the period July 2013-September 2018 derived from beriberi notification forms available on the FormSUS platform. Cases in indigenous and non-indigenous patients were compared using the chi-squared test or Fisher's exact test, adopting a significance level of 0.05. A total of 414 cases of beriberi were reported in the country during the study period, 210 of which (50.7%) were among indigenous people. Alcohol consumption was reported by 58.1% of the indigenous patients and 71.6% of the non-indigenous patients (p = 0.004); 71.0% of the indigenous patients reported that they consumed caxiri, a traditional alcoholic drink. Daily physical exertion was reported by 76.1% of the indigenous patients and 40.2% of the non-indigenous patients (p < 0.001). It is concluded that beriberi disproportionately affects indigenous people and is associated with alcohol consumption and physical exertion.*

Key words *Thiamine deficiency, Vulnerable populations, Disease notification, Poverty, Public health surveillance*

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Introduction

The term beriberi is derived from a Sinhalese word meaning "extreme weakness", alluding to the debilitating nature of the disease. It is the clinical manifestation of severe and chronic thiamine (vitamin B1) deficiency and has multiple underlying causes. Although easily treatable, if left untreated it can lead to death[1].

Thiamine is a heat-labile and water-soluble essential vitamin that acts in the metabolism of amino acids, fats, and carbohydrates, playing a vital role in the conversion of carbohydrate to energy (adenosine triphosphate) and ensuring the proper functioning of nerve and muscle cells[2]. According to the World Health Organization (WHO), the Recommended Dietary Allowance for thiamine varies between 0.2 and 1.5 mg/day[3], depending on sex, age, and physical activity. Body reserves of thiamine are completely depleted in 4 to 6 weeks in the absence of intake[4].

Clinical signs of beriberi range from weakness of the legs, paraesthesia, anorexia, indigestion, malaise, edema to peripheral neuropathy, lesions of the brain (Wernicke-Korsakoff syndrome), cardiac insufficiency (wet beriberi), and acute heart failure with cardiogenic *shock* (Shoshin beriberi)[5]. Diagnosis is essentially clinical and performed by observing the response to the administration of thiamine[6].

Beriberi has been reported since the twentieth century as an endemic disease or in outbreaks, especially in developing and underdeveloped countries, in closed communities, and in populations affected by major emergencies, exposed to mycotoxin citreoviridin, or with a monotonous diet[5]. However, information on thiamine status has not been well documented due to the dearth of population-level biomarker data, hampering the determination of the global and regional prevalence of thiamine deficiency disorders (TDDs)[1].

It is worth highlighting that beriberi is a neglected disease and that causes are amplified in low-income areas and related to severe food and nutrition insecurity, poor sanitation and hygiene, and overconsumption of alcohol[7]. The disease predominantly affects young men, prisoners, indigenous peoples, and vulnerable populations, which are priority groups for the National Food and Nutrition Security System (SISAN)[6].

The main policy addressing dietary patterns and nutrient intake in Brazil is the National Food and Nutrition Policy (PNAN), published in 1999 and updated in November 2011 by Ministerial Order 2,715. The policy aims to improve the population's food, nutrition, and health status by promoting healthy eating habits and improving access to nutritional care services provided by the country's public health system, the Sistema Único de Saúde (SUS) or Unified Health System[6], focusing on major nutritional problems: overweight and obesity at all life stages, iron deficiency anemia, vitamin A deficiency, and other emerging nutrient deficiencies such as thiamine deficiency[8].

It is also important to highlight food and nutrition surveillance directed at traditional peoples and communities and other vulnerable populations who experience nutritional inequities. The latter affects predominantly children and women living in pockets of poverty, with particularly high prevalence of chronic malnutrition being found among indigenous children (26%), Quilombolas (16%), people living in the country's Northeast region (15%), and families receiving assistance from cash transfer programs (15%)[9].

Thus, food security and nutrition status monitoring data provide a basis for the analysis and diagnosis of cases of beriberi and the formulation of criteria for the stratification of risk and vulnerability to identify the right level of care and services for distinct subgroups of patients[10].

Beriberi is an important public health issue because it is a debilitating and potentially lethal disease that can cause outbreaks and epidemics with rapid onset of symptoms and death often occurring within a few days[7].

In 2006, an outbreak of beriberi in the southeast of the state of Maranhão affected 434 people and resulted in 40 deaths. Associated risk factors included alcohol abuse and physically demanding labor[11]. In 2008, there was an outbreak of beriberi in indigenous communities in the Municipality of Uiramutã in Roraima. The people affected belonged to the Ingaricó and Macuxí indigenous groups and had a history of low thiamine intake and overconsumption of caxiri, a traditional alcoholic drink[12].

Considering that a national epidemiological survey of beriberi has yet to be undertaken, the aim of this study was to analyze sociodemographic, clinical, and behavioral data of reported cases of beriberi in the country and compare cases in indigenous and non-indigenous people.

Ciência & Saúde Coletiva, 28(7):1993-2002, 2023

Methods

We conducted a cross-sectional study using time series data on cases of beriberi during the period July 2013-September 2018 derived from beriberi notification forms on the FormSUS platform, as described by Assunção et al.[13].

The data were downloaded in Excel format from the platform in November 2018. The FormSUS was developed by the SUS's Department of Informatics (DATASUS) for the creation of Web forms and follows all legal and regulatory norms and standards and the SUS's information and information technology security policies[14].

The FormSUS beriberi form was designed by the Office for the Coordination of Food and Nutrition (CGAN) based on the items listed in the beriberi clinical investigation and notification form contained in the Reference Guide for Epidemiological Surveillance and Nutritional Care in Cases of Beriberi[6].

The definition adopted for notifiable cases was that proposed by the Ministry of Health: any individual in a situation of risk showing characteristic signs and symptoms of beriberi. Situations of risk include regular strenuous physical exertion (e.g., manual labor), excessive alcohol use, a monotonous diet, hyperemesis gravidarum, and diarrhea. Characteristic signs and symptoms include paraesthesia and/or leg pain, partial loss of sensation, reflexes, and muscle strength (difficulty walking), tachycardia (palpitations), divergent blood pressure, water hammer pulse, jugular venous distention, systolic heart murmurs, gallop rhythm, dyspnoea, leg swelling, sudden cardia arrest associated with lactic acidosis and shock, ophthalmoparesis, nystagmus, cerebellar ataxia, and memory deficit[6].

Cases of wet beriberi, dry beriberi, Shoshin beriberi, and Wernicke-Korsakoff syndrome were defined according to Ministry of Health criteria[6].

The study variables were taken from the latest version of the FormSUS beriberi form, which was updated in 2014. The outcome of interest was whether the patient was indigenous or not.

The study variables were as follows: 1) sociodemographic aspects: race/color, place of residence, sex, age, age group, education level, social program(s) beneficiary, monthly family income; 2) clinical, behavioral, and health service aspects: patient history of beriberi, family history of beriberi, daily physical exertion, whether the patient was a smoker or drinker, drinking frequency, consumption of caxiri, hospitalization, type of entry into the health service, signs and symptoms, type of comorbidities, case classification, treatment with thiamine, progression of the case; and 3) constructed variables: indigenous (yes, no); does manual labor. Given that manual labor is a risk factor for the disease, the dichotomous variable "does manual labor" was derived from the items "main occupation" and "main activity" in the FormSUS beriberi form, based on the Brazilian Classification of Occupations[15].

The prevalence (P) of cases of beriberi in the indigenous and non-indigenous population during the study period was calculated using the following formula:

$$P = \frac{\text{Number of cases of beriberi during the study period}}{\text{Population during the study period}}$$

The statistical analysis was performed using STATA® version 14.0 (Stata Corporation, College Station, Texas, USA). The qualitative variables were described using absolute frequencies and proportions. Measures of central tendency and dispersion were calculated for age. Possible risk factors were assessed using a 2 x 2 table. Differences between the indigenous and non-indigenous groups were analyzed using the chi-squared test or Fisher's exact test, adopting a significance level of 0.05.

This research was conducted in accordance with the norms and standards set out in National Health Council Resolution 466/2012[16] and the study protocol was approved by Maranhão Federal University Hospital's research ethics committee and the National Research Ethics Committee (reference numbers 2.888.343 and CAAE 83673418.7.0000.5086, respectively, 11 September 2018).

Results

A total of 414 cases of beriberi were reported in the country between 2013 and 2018, 210 of which (50.7%) were among indigenous people and 204 (49.3%) in non-indigenous people. Prevalence was 25 cases per 100,000 population among indigenous people and 0.10 cases per 100,000 population in non-indigenous people. The mean age of patients was 43.9 ± 0.7 years. Those affected by the disease were predominantly males aged between 18 and 59 years; however, this result was not statistically significant. In the majority of cases (69.0%), education level was either not informed or low.

With regard to patient history of beriberi, 102 (48.6%) of the indigenous patients reported having had beriberi at least once ($p < 0.001$), while 59 out of 177 (33.3%) mentioned that at least one family member had had the disease ($p < 0.001$). Seventy-one out of 138 indigenous patients (51.4%) had wet beriberi, while 23 (69.7%) out of 33 non-indigenous patients had dry beriberi ($p < 0.001$) (Table 1).

A total of 122 (58.1%) indigenous patients reported alcohol consumption, compared to 146 (71.6%) non-indigenous patients ($p = 0.004$). Forty-two out of 122 (34.4%) indigenous patients drank alcohol between 5 and 7 times a week, compared to 81 (55.5%) out of 146 non-indigenous patients ($p < 0.001$) (Table 2). Fifty-four out of 76 (71.0%) indigenous patients reported that they consumed caxiri.

Most indigenous patients (160 or 76.1%) reported daily physical exertion ($p < 0.001$), while 152 (72.4%) did manual labor ($p < 0.001$). The majority of non-indigenous patients (85.6%) needed to be admitted to hospital ($p < 0.001$) (Table 2).

The most common types of signs and symptoms were paresis (73.4%), edema (49.5%), paraesthesia in the arms and legs (44.4%), difficulty walking (51.4%), and loss of muscle strength (58.2%). The least common symptom was calf pain, followed by asthenia, dyspnoea, weight loss, nausea and vomiting, tachycardia, confusion, diplopia, and divergent blood pressure. Almost all cases (99%) were treated by administering oral doses of 300 mg thiamine.

Comorbidities were recorded in 102 out of 408 (25.0%) cases with information on this variable. The most common comorbidities were high blood pressure (9.4%) and severe liver disease (6.0%), while the least common were and diabetes mellitus, heart disease, anemia, chronic kidney disease, neurological sequelae, epilepsy, neoplasm, mental disorder, gastrointestinal surgery, tuberculosis, and leprosy, among others.

One of the cases, reported in 2015, was a pregnant woman in the third semester. The patient was a 24-year-old homemaker from the Karajá Xambioá indigenous group and lived in the Warylyty village in Santa Fé do Araguaia, Tocantins. She reported daily physical exertion and that she was a beneficiary of a food basket distribution program. She was admitted to hospital with classic signs of beriberi and hyperemesis gravidarum. She was classified as having dry beriberi and had not had the disease before.

There were three deaths over the study period (in 2014, 2015, and 2016): two men aged 30 and 42 years from Brasilândia do Tocantins and Palmas, Tocantins; and a 54-year-old woman from Tocantinópolis, also in Tocantins. They were all brown, smokers, and had a low education level and monthly income of up to one minimum wage. The woman was a homemaker, while the men were both laborers, had severe liver disease, and were alcoholics. One of the men was classified as having Shoshin beriberi and the other Shoshin beriberi and Wernicke-Korsakoff syndrome. The woman was classified as having dry beriberi.

Complete data at: https://doi.org/10.48331/scielodata.LB0VAV.

Discussion

More than half the cases of beriberi (50.7%) were among indigenous people, despite the fact that this group accounts for a mere 0.43% (896,000 people) of the country's population[17]. Prevalence among this group was 25 cases per 100,000 population.

The findings show the importance of information on patient or family history of the disease in indigenous beriberi patients to help identify the condition and ensure timely therapeutic testing[18], given that beriberi can result in death[1]. Smith et al.[19] suggest that a low threshold of clinical suspicion and early therapeutic thiamine is currently the best approach.

Drinking was more common in the non-indigenous group (71.6%) than the indigenous group (58.1%). This result was statistically significant ($p = 0.004$). The percentage of drinkers among the indigenous group is higher than the rate observed by the First National Survey on Alcohol and Drug Use Patterns among Indigenous Populations, performed in 2007. The survey showed that 38.4% of indigenous people drank, with 44.1% of drinkers reporting alcohol abuse and 22.9% dependence on alchool[20].

Drinking 5 to 7 times a week was more frequent among the non-indigenous group ($p < 0.001$). The health effects of alcohol have been reported by Subramanian et al.[21] in an experiment with rats, which showed that chronic alcohol use causes inhibition in renal thiamin transport, negatively affecting renal thiamin metabolism at the transcriptional and macro level.

Ciência & Saúde Coletiva, 28(7):1993-2002, 2023

Table 1. Sociodemographic and clinical characteristics reported cases of beriberi among indigenous and non-indigenous people. Brazil. 2013-2018.

Characteristics	Reported cases			
	Indigenous			
	Yes n (%)	No n (%)	Total n (%)	P-value[c]
Sex	210 (50.7)	204 (49.3)	414 (100.0)	0.095[a]
Male	143 (68.1)	154 (75.5)	297 (71.7)	
Female	67 (31.9)	50 (24.5)	117 (28.3)	
Age group (years)	210 (50.7)	204 (49.3)	414 (100.0)	0.116[a]
0 to 17	9 (4.2)	6 (3.0)	15 (3.6)	
18 to 39	88 (42.0)	65 (32.0)	153 (37.0)	
40 to 59	84 (40.0)	103 (50.4)	187 (45.2)	
60 and over	29 (13.8)	30 (14.7)	59 (14.2)	
Location	210 (50.7)	204 (49.3)	414 (100.0)	< 0.001[b]
Rural	207 (98.5)	37 (18.2)	244 (59.0)	
Urban	3 (1.5)	167 (81.8)	170 (41.0)	
Education level	121 (37.5)	202 (62.5)	323 (100.0)	NA
Uneducated or did not complete elementary school	78 (64.4)	145 (71.7)	223 (69.0)	
Completed elementary school. but did not complete high school	23 (19.0)	33 (16.4)	56 (17.3)	
Completed high school or above over	20 (16.6)	24 (11.9)	44 (13.7)	
Monthly family income	48 (20.4)	187 (76.6)	235 (100.0)	NA
No income	1 (2.0)	20 (10.7)	21 (9.0)	
Less than 1 minimum wage	29 (60.4)	34 (18.2)	63 (26.8)	
1 minimum wage	15 (31.3)	92 (49.2)	107 (45.5)	
At least 2 minimum wages	3 (6.3)	41 (21.9)	44 (18.7)	
Social program(s) beneficiary	38 (59.4)	26 (40.6)	64 (100.0)	NA
Programa Bolsa Família	18 (47.4)	13 (50.0)	31 (48.4)	
Food basket distribution program	13 (34.1)	0 (0.0)	13 (20.3)	
Retired/continued benefit/pension	0 (0.0)	12 (46.1)	12 (18.7)	
Other	7 (18.5)	1 (3.9)	8 (12.5)	
Patient history of beriberi	210 (50.7)	204 (49.3)	414 (100.0)	< 0.001[a]
Yes	102 (48.6)	18 (8.9)	120 (29.0)	
No	108 (51.4)	186 (91.1)	294 (71.0)	
Family history of beriberi	177 (50.3)	175 (49.7)	352 (100.0)	< 0.001[a]
Yes	59 (33.3)	6 (3.4)	65 (18.5)	
No	118 (66.7)	169 (96.6)	287 (81.5)	
Case classification	138 (80.7)	33 (19.3)	171 (100.0)	< 0.001[b]
Dry beriberi	64 (46.4)	23 (69.7)	87 (50.9)	
Wet beriberi	71 (51.4)	6 (18.2)	77 (45.0)	
Shoshin beriberi	3 (2.2)	0 (0.0)	3 (1.8)	
Wernicke-Korsakoff syndrome	0 (0.0)	4 (12.1)	4 (2.3)	
Progress	135 (47.0)	152 (53.0)	287 (100.0)	NA
Refusal of treatment	45 (33.4)	73 (48.0)	118 (41.1)	
Discharged with sequela	1 (0.7)	5 (3.3)	6 (2.1)	
Discharged without sequela	88 (65.2)	40 (26.3)	128 (44.6)	
Died from beriberi	0 (0.0)	4 (2.7)	4 (1.4)	
Died from other causes	1 (0.7)	30 (19.7)	31 (10.8)	

[a] Chi-squared test; [b] Fisher's exact test; c significance level < 0.05; NA – not applicable.

Source: Ministério da Saúde, FormSUS.

Table 2. Behavioral and health services characteristics of reported cases of beriberi among indigenous and non-indigenous people. Brazil, 2013-2018.

Characteristics	Reported cases			
	Indigenous			
	Yes n (%)	No n (%)	Total n (%)	P-value[c]
Smoker	210 (50.7)	204 (49.3)	414 (100.0)	0.020[a]
Yes	53 (25.2)	73 (35.8)	126 (30.4)	
No	157 (74.8)	131 (64.2)	288 (69.6)	
Drinker	210 (50.7)	204 (49.3)	414 (100.0)	0.004[a]
Yes	122 (58.1)	146 (71.6)	268 (64.7)	
No	88 (42.0)	58 (28.4)	146 (35.3)	
Drinking frequency (time per week)	122 (45.5)	146 (54.5)	268 (100.0)	< 0.001[a]
1 to 2	42 (34.4)	12 (8.2)	54 (20.1)	
3 to 4	30 (24.6)	21 (14.3)	51 (19.0)	
5 to 7	42 (34.4)	81 (55.5)	123 (46.0)	
Other	8 (6.6)	32 (22.0)	40 (14.9)	
Daily physical exertion	210 (50.7)	204 (49.3)	414 (100.0)	< 0.001[a]
Yes	160 (76.1)	82 (40.2)	242 (58.5)	
No	50 (23.9)	122 (59.8)	172 (41.5)	
Does manual labor	210 (50.7)	204 (49.3)	414 (100.0)	< 0.001[a]
Yes	152 (72.4)	71 (34.8)	223 (53.9)	
No	58 (27.6)	133 (65.2)	191 (46.1)	
Type of entry into the health service	62 (73.8)	22 (26.2)	84 (100.0)	NA
Unscheduled consultations	37 (59.7)	14 (63.6)	51 (60.7)	
Referral after home visit	23 (37.0)	0 (0.0)	23 (27.3)	
Referral from other health facility	2 (3.3)	8 (36.4)	10 (12.0)	
Hospitalization	207 (50.6)	202 (49.4)	409 (100.0)	< 0.001[a]
Yes	14 (6.7)	173 (85.6)	187 (45.7)	
No	193 (93.2)	29 (14.3)		

[a] Chi-squared test; [b] Fisher's exact test; [c] significance level < 0.05; NA – not applicable.

Source: Ministério da Saúde, FormSUS.

Some of the indigenous patients reported drinking caxiri. Souza and Garnelo[22] reported that cachaça (a liquor distilled from sugar cane) and caxiri were the most commonly abused alcoholic drinks by indigenous peoples in the upper Rio Negro region, Amazonas. More recently, in a study of the use of alcohol in the Sucuba indigenous community in Alto Alegre, Roraima/RR, Pereira and Robaina[23] reported that 71% of the sample drank alcohol and that the most popular drink was caxiri, being consumed by 40% of respondents.

Caxiri is drunk on special occasions, such as celebrations and sacred rituals and ceremonies[24]. However, changes in culture, traditions, and values resulting from contact and integration with non-indigenous society has led to the problem of excessive alcohol consumption in indigenous communities[25,26]. Historically consumed only by indigenous people, caxiri is now sold in local markets[23].

Alcohol is high in calories and has little nutritional value. The greater the abuse of alcohol (when alcohol makes up more than 30% of total caloric intake), the more it affects the metabolism and physiology of enzymes that control carbohydrate, protein, and fat metabolism[27], undermining the absorption of nutrients, such as A, C, and B vitamins, including thiamine[28,29].

A large percentage of the indigenous patients reported doing manual labor and daily physical exertion, which is consistent with the findings of studies of outbreaks of beriberi in Brazil[11] and Gambia[30]. Beriberi may be caused by a combination of chronic thiamine deficiency, elevated alcohol consumption, and manual labor, which

Ciência & Saúde Coletiva, 28(7):1993-2002, 2023

requires high energy intake as minimum thiamine needs rise during periods of increased metabolism[5].

Hospitalization was more frequent among the non-indigenous groups and patients with dry beriberi, suggesting that more severe cases are found in urban areas, possibly due to flaws in epidemiological surveillance and in the detection and follow-up of cases by health services. It is worth highlighting that after outbreaks, such as those in indigenous communities in Roraima and Maranhão reported by Cerroni et al.[12] and Padilha et al.[11], training courses and awareness raising campaigns were developed to help health workers working in indigenous and primary care services recognize signs and symptoms and promote early treatment[6].

Beriberi should be recognized as a problem associated with food insecurity and poverty, as well as a neglected disease related to alcoholism and disproportionately affecting indigenous peoples[13].

Indigenous health has historically been overlooked in Brazil. It was only in the twentieth century (1957) that the Brazilian government officially began to provide indigenous health services on a more consistent basis. However, these services were poorly coordinated and characterized by lack of integration with Ministry of Health services and programs until the end of the 1990s[31]. The enactment of the "Arouca Law" in 1999 (Law 9836) led to changes in the SUS, including the creation of the National Indigenous Health Care Policy (PNASPI) in 2002. Under this policy, indigenous health care services, including primary care, were administered and delivered by the National Health Foundation (FUNASA), until 2010, when Law 12.314/2010 and Decree 7.336/2010 transferred administration to the newly created Special Secretariat for Indigenous Health (SESAI)[32].

This process took almost three years and the transfer of responsibilities created uncertainty over public health actions, leading to the deterioration of indigenous health services. Under this new model, the Ministry of Health's Department of Indigenous Health (DESAI) is responsible for the administration of the Indigenous Health Care Subsystem and promotion of macroregional and national meetings to evaluate the implementation of the PNASPI, and private non-profit organizations are contracted to provide complementary health services[33].

The SESAI faces several major management challenges, including lack of consideration of traditional indigenous medicine by local health managers when developing care activities, in addition to the wielding of political influence in the management of the DSEI, resulting in manger and health staff instability[34].

In recent years, the SESAI and other government bodies and civil society organizations that work with indigenous health have not been able to meet the commitments set out in the legislation related to the provision of comprehensive health care to indigenous peoples. This situation has aggravated health risks associated with infant mortality, chronic diseases (obesity and diabetes), infectious diseases, malnutrition, and mental health problems, such as alcoholism and suicide. It is therefore evident that Brazil's indigenous health policy remains largely ineffective[32].

Deep socioeconomic inequalities in Brazil mean that certain groups are more exposed to intermediary determinants of health[35], making them more vulnerable to health-compromising conditions[36]. Government interventions and policies and civil society action are therefore urgently needed to address social determinants of health, guarantee human rights, and help promote behavioral change towards a transformation of reality[37].

The right to adequate food is enshrined in the Universal Declaration of Human Rights, adopted in 1948. Fulfilling this right is the duty of the State, which should promote and provide regular and permanent access to quantitatively and qualitatively adequate food. Civil society has the right to demand that the government fulfils its duty and that food corresponds to the cultural traditions of the people to which the consumer belongs and is environmentally, culturally, economically, and socially sustainable[38].

Strategies, tools, and techniques are necessary to analyze and monitor social conditions to reduce the vulnerability of these groups, who have been ill for some time and probably have other deficiencies associated with poverty and food insecurity.

The beriberi problem became more evident during the COVID-19 pandemic, which began in 2020. The FAO's State of Food Security and Nutrition in the World 2021 shows that the number of people living in poverty increased during the pandemic and post-pandemic period. The organization estimates that 10% of the global population (around 768 million people) faced hunger in 2020 and more than 2.3 billion people did not have access to adequate food, representing a worrying increase in the prevalence of food insecurity[39]. In Brazil, the National Survey of Food Insecurity in the Context of the Covid-19 Pandemic[40] revealed that over half of households (55.2%) experienced food insecurity and 9% faced hunger, with prevalence rates being highest in the North and Northeast. It is worth noting that prevalence rates have been on the rise for some time and that this increase did not occur only during the pandemic.

Study limitations are related to the beriberi notification form. The form consists of an Excel worksheet without automated control of data entry errors and missing information and lacking a function preventing the finalization of completed forms due to inconsistencies.

Underreporting of cases of beriberi is a major challenge for epidemiological surveillance. Besides the fact that official figures are not representative of the full extent of the disease among the population, poor quality data hampers planning and decision-making regarding the government response to this public health problem[41]. Quality data is a vital resource in the field of public health, contributing to the efficient allocation of resources and providing valuable inputs to inform strategies to promote the prevention and timely diagnosis and treatment of this neglected disease[42].

It is worth mentioning the Ministry of Health recommendation to include severe and prolonged thiamine deficiency (beriberi) in the national list of notifiable diseases to promote the adoption of appropriate interventions by the government and health professionals and enable the wide-scale monitoring of disease characteristics. Cases of beriberi meet some of the criteria used to select notifiable diseases, including social and economic relevance and vulnerability[43]. Special attention should be paid to priority regions for disease notification, based on current epidemiological knowledge, such as the findings presented in this article, with the aim of generating national databases that enable a more robust analysis, providing a solid basis for guidance, planning, and care response for vulnerable groups.

One of the strengths of this study is that it used a nationwide sample of reported cases of beriberi encompassing sociodemographic, behavioral, and clinical aspects.

The findings of this study provide important insights for health surveillance and the government agencies working with indigenous peoples, such as SESAI and the National Indian Foundation (FUNAI), as well as local, state, and federal governments, revealing priority groups (indigenous peoples and people who drink excessively) for health status monitoring, thiamine supplementation, food fortification, and dietary changes in both indigenous and non-indigenous populations. In addition, health professionals need to be trained in the detection, screening, and early treatment of beriberi[44].

The effective control of beriberi requires the involvement of all sectors of society in the formulation and implementation of prevention policies, programs, and actions aimed at promoting improvements in socioeconomic and nutritional status, care, and health monitoring, and the creation of cross-sector networks that ensure comprehensive care and tackle the conditions that lead to beriberi.

Collaborations

AKM Assunção was responsible for study conception and conducting the research, organized and analyzed the data from the FormSUS, and participated in all stages of the study up to and including the drafting of the final version of the article. MRFC Branco contributed to study conception and helped conduct the research and supervised and participated in all stages of the study up to and including the drafting of the final version of the article. TS Santos, SSB Costa, and JJ Dias Júnior analyzed the data from the FormSUS and contributed to writing the article. MTBA Frota contributed to the critical revision of the article. BLCA Oliveira contributed to data interpretation and writing the article. AM Santos contributed to study conception and participated in all stages of the study up to and including the drafting of the final version of the article.

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