

PREVALENCE OF CHAGAS DISEASE ASSOCIATED WITH THE MODE OF INFECTION


Letícia Pâmela Garcia Ribeiro do Nascimento¹ 

Laura Maria Vidal Nogueira² 

Ivaneide Leal Ataíde Rodrigues² 

Suzana Rosa André³ 

Victor Viana da Graça⁴ 

Nicole Jucá Monteiro⁵ 

ABSTRACT

Objective: analyze the prevalence of acute Chagas disease and association with mode of infection. **Method:** descriptive, quantitative study conducted in the health region of Tocantins - Pará - Brazil, with 346 cases of acute Chagas disease. The data were obtained in September 2017 and correspond to 2012-2016, from the Information system for health notification diseases. They were analyzed by Pearson's chi-square (χ^2), $p \leq 0.05$, in Excel® 2013.

Results: greater involvement of males (56.93%) and rural residents (56.35%). In urban areas, 110 (94%) contracted the disease orally and seven (6%) by vectorial route. In rural areas, 137 (84%) were infected orally and 26 (16%) vectorially ($p=0.010$).

Conclusions: the control of the disease demands specific public policies aligned to locoregional specificities. Acute Chagas disease was shown to be prevalent with an association between oral infection and urban area residents.

DESCRIPTORS: Chagas Disease; Epidemiology; Health Information Systems; Nursing; Public Health.

PREVALENCIA DE LA ENFERMEDAD DE CHAGAS ASOCIADA AL MODO DE INFECCIÓN

RESUMEN:

Objetivo: analizar la prevalencia de la enfermedad de Chagas aguda y su asociación con el modo de infección. **Método:** estudio descriptivo y cuantitativo realizado en la región sanitaria de Tocantins - Pará - Brasil, con 346 casos de enfermedad de Chagas aguda. Los datos se obtuvieron en septiembre de 2017 y corresponden al periodo 2012-2016, a partir del Sistema de Información de Agravios de Notificación. Se analizaron mediante el chi-cuadrado de Pearson (χ^2), $p \leq 0,05$, en Excel® 2013. **Resultados:** mayor acometimiento del sexo masculino (56,93%) y moradores de la zona rural (56,35%). En las zonas urbanas, 110 (94%) contrajeron la enfermedad por vía oral y siete (6%) por vía vectorial. En la zona rural, 137 (84%) se infectaron por vía oral y 26 (16%) por vía vectorial ($p=0,010$). **Conclusiones:** el control de la enfermedad requiere políticas públicas específicas adaptadas a las especificidades loco-regionales. La enfermedad de Chagas aguda es más prevalente con la asociación entre la infección oral y los residentes de zonas urbanas.

DESCRIPTORES: Enfermedad de Chagas; Epidemiología; Sistemas de Información en Salud; Enfermería; Salud Pública.

¹Unidade de Pronto Atendimento Haroldo Martins e Silva. Belém, PA, Brasil.

²Universidade do Estado do Pará. Belém, PA, Brasil.

³Universidade Federal do Rio de Janeiro. Belém, PA, Brasil.

⁴Universidade da Amazônia. Belém, PA, Brasil.

⁵Secretaria Municipal de Saúde de Belém. Belém, PA, Brasil.

INTRODUCTION

Chagas disease (CD) is a highly prevalent antropozoonosis with expressive morbidity and mortality, constituting a serious public health problem, and the human being is an important reservoir of the protozoan *Trypanosoma cruzi*. The clinical evolution of the disease is divided into an acute and a chronic phase, which may manifest in the indeterminate, cardiac, digestive or cardiodigestive forms⁽¹⁾. According to the World Health Organization (WHO), it is one of the most neglected tropical diseases in the world, with a prevalence of 16 to 18 million people infected by the parasite worldwide⁽²⁾.

Most infected patients develop the chronic form, accompanied by cardiopathy that causes severe consequences to the patient and a high mortality rate⁽³⁾. It is a disease that has been monitored by the Brazilian Ministry of Health and has recently been included in the National Compulsory Notification List, by means of Ordinance no. 264 of February 17th, 2020⁽³⁾.

Corroborating the global scenario, in Brazil, most cases diagnosed with CD show the chronic form, although in recent years, the notification of acute Chagas disease (ACD) has been increasing, raising new concerns, especially because it is attributed to the consumption of contaminated food, i.e., oral infection⁽⁴⁾. The ACD affects mainly people with low purchasing power and more difficult access to health services, especially in the North region of Brazil⁽⁴⁾.

The social and geographical characteristics of the region, together with cultural diversity, have enabled the identification of cases of ACD in municipalities that have açai as a local economic force. According to data available on the Tabnet/Datasus platform, between 2007 and 2016, 1,579 cases of ACD were confirmed in the state of Pará (PA), with the Metropolitan I, Tocantins, and Marajó II health regions having the highest number of confirmed cases of the disease⁽⁵⁾.

Of the 1,579 cases of ACD in the state, there was a significant concentration of notification between the months of July and December, a period that coincides with the açai harvest⁽⁶⁾. Acai is a typical fruit from the tropical climate and is widely consumed by the general population, rich in protein, fiber, lipids, vitamin E, and minerals such as manganese, copper, boron, and chromium, with a high caloric value⁽⁷⁾. In addition, açai is one of the main foods of the riverside populations, often being the main meal⁽⁸⁾.

An alternative for ACD prevention, implemented as a public policy, was the blanching of the fruits, which leads to the inactivation of the protozoan. It is a technique of immersing the açai in natura in water with a temperature of 80°C for ten seconds and, soon after, immersed in cold water for rapid cooling⁽⁹⁾. This process has become mandatory throughout the state for the artisanal beaters (people who extract the juice from the fruit), who spread throughout all localities, aiming to ensure quality to the product to be marketed and consumed domestically.

In this context, the objective of this study was to analyze the prevalence of acute Chagas disease and its association with the mode of infection in the health region of Tocantins-PA.

METHOD

A descriptive, retrospective study with a quantitative approach, developed with secondary data from ACD in the Tocantins-PA-BR health region, consisting of the

municipalities: Abaetetuba, Baião, Barcarena, Cametá, Igarapé-Miri, Limoeiro do Ajuru, Moju, Mocajuba, Oeiras do PA and Tailândia. The state of PA is made up of 13 health regions, namely: Araguaia, Baixo Amazonas, Carajás, Lago de Tucuruí, Marajó I, Marajó II, Metropolitana I, Metropolitana II, Metropolitana III, Rio Caetés, Tapajós, Tocantins and Xingu, which congregate 144 municipalities and an average area of 8,664.50 km².

The Tocantins health region has 605,119 inhabitants, distributed in nine municipalities, all of which have riverine and floodplain populations with significant production and consumption of açai. Thus, the choice of the region was due to its epidemiological profile, since it has a high prevalence of ACD and geographical, economic, and cultural characteristics that favor the cultivation and consumption of the fruit.

The data were obtained in September 2017 and concern the cases of ACD notified and confirmed in the Information system for health notification diseases (SINAN), made available by the Regional Office of the State Secretary of Public Health, in a bank format. All notified and confirmed cases of ACD in the Tocantins-PA health region between 2012 and 2016 were included, and there was no exclusion of data.

The variables studied were: i) socio-demographic - age, gender, race/color, and place of residence; and ii) epidemiological - year of occurrence, means of contamination, and evolution of the disease.

Data were transported and stored in electronic spreadsheets in Excel® 2013 software and analyzed using Pearson's chi-square test (χ^2) to verify possible association between variables, with $p \leq 0.05$ being considered. The study was approved by the Ethics and Research Committee of the Undergraduate Nursing Course of the Pará State University, under opinion number 2,449,156.

RESULTS

From the 346 cases studied, there was a predominance of disease in males with 197 (56.93%) cases, mulattoes with 272 (78.61%) cases, and in the 20 to 39 age group with 123 (35.54%) cases. As for the place of residence, 195 (56.35%) cases were reported among rural residents (Table 1).

Table 1 - Sociodemographic profile of cases of acute Chagas disease in the Tocantins-PA health region, from 2012 to 2016. Belém, PA, Brazil, 2020 (continues)

Variables	2012	2013	2014	2015	2016	Total	%
Gender							
Female	39	17	31	27	35	149	43,06
Male	42	26	32	34	63	197	56,93
Total	81	43	63	61	98	346	100
Age group							
< 1 year	2	-	-	1	-	3	0,86
1 to 4	3	-	2	-	6	11	3,17
5 to 9	9	8	8	8	6	39	11,27

10 to 14	12	7	5	4	11	39	11,27
15 to 19	3	2	7	5	8	25	7,22
20 to 39	25	11	25	27	35	123	35,54
40 to 59	20	6	14	13	17	70	20,23
60+	13	3	5	8	7	36	10,4
Total	87	37	66	66	90	346	100
Race							
Ign/Blank	4	3	1	-	-	8	2,31
White	26	5	7	6	8	52	15,02
Black	1	2	3	1	3	10	2,89
Asian	-	1	2	-	-	3	0,89
Brown	55	26	53	59	79	272	78,61
Indigenous	1	-	-	-	-	1	0,28
Total	87	37	66	66	90	346	100
Residence Area							
Ign/Blank	5	1	-	2	-	8	2,31
Urban	57	17	25	15	26	140	40,46
Rural	23	19	41	49	63	195	56,35
Peri-urban	2	-	-	-	1	3	0,89
Total	87	37	66	66	90	346	100

Source: Ministry of Health/Secretariat of Health Surveillance (SVS) – Notifiable Diseases Information System.

The most frequent mode of infection was the oral route, with 255 (73.59%) cases, and in 55 notifications (15.89%) there was no record of the form of contamination. There was laboratory confirmation of the diagnosis in 330 (95.37%) cases, and regarding the clinical evolution, it can be observed that 309 (89.30%) evolved to remission of disease manifestations, while seven (2.02%) resulted in death (Table 2).

Table 2 - Clinical-epidemiological information of cases of acute Chagas disease in the Tocantins-PA health region, from 2012 to 2016. Belém, PA, Brazil, 2020 (continues)

Variables	2012	2013	2014	2015	2016	Total	%
Mode of infection							
Ign/Blank	13	4	16	2	20	55	15,89
Vector	3	8	11	10	2	34	9,82
Vertical	1	-	-	-	-	1	0,28
Oral	70	24	39	54	68	255	73,69
Other	-	1	-	-	-	1	0,28
Total	87	37	66	66	90	346	100

Criterion Confirmation							
Ign/Blank	-	1	1	-	3	5	1,44
Laboratory	87	34	59	65	85	330	95,37
Clinical/epidemiological	-	2	6	1	2	11	3,17
Total	87	37	66	66	90	346	100
Progress							
Ign/Blank	13	1	4	3	9	30	8,67
Clinical remission	74	36	61	62	76	309	89,3
Death	-	-	1	1	5	7	2,02
Total	87	37	66	66	90	346	100

Source: Ministry of Health/SVS - Notifiable Diseases Information System.

In Table 3, it is observed that 195 cases were residents of rural areas and 140 of urban perimeters. Among the residents in rural areas, 137 were infected by ingesting food contaminated with *Trypanosoma cruzi* and 26 by penetration of the etiologic agent at the time of the bite by the "barbeiro" (*Triatoma brasiliensis*). In urban areas, 110 cases of oral transmission and seven cases of vectorial transmission were identified.

Table 3 - Confirmed cases per zone of residence according to mode of infection of acute Chagas disease in the Tocantins-PA health region, from 2012 to 2016. Belém, PA, Brazil, 2020

Mode of infection	Ign/Blank	Urban	Rural	Peri-urban	Total	%
Ign/Blank	-	22	31	2	55	15,89
Vector	1	7	26	-	34	9,82
Vertical	-	1	-	-	1	0,28
Oral	7	110	137	1	255	73,69
Others	-	-	1	-	1	0,28
Total	8	140	195	3	346	100

Source: Ministry of Health/SVS - Notifiable Diseases Information System.

In the distribution, eight cases had no record of place of residence, of which one was of vector transmission and seven of oral transmission, besides, three cases being from peri-urban areas, two with no record of the mode of infection and one of oral transmission. In total, oral infection was more prevalent with 255 (73.69%) cases.

From the data in Table 3, it was possible to select 280 cases that correspond to the sum of the two main forms of contamination, oral and vectorial, of residents in urban and rural areas. Table 4 shows that oral infection is more prevalent, with 247 (88%) cases. Among the cases that live in urban areas, 110 (94%) contracted the disease orally and seven (6%) by vectorial route, and among those who live in rural areas, 137 (84%) were

infected orally, and 26 (16%) by vectorial route. The data indicate an association between place of residence and route of infection for ACD.

Table 4 - Distribution of confirmed cases of acute Chagas disease in the Tocantins-PA health region, from 2012 to 2016. Belém, PA, Brazil, 2020

Infection Mode	Urban Area		Rural Area		Total		χ^2	p-value
	n	%	n	%	N	%		
Vectorial	7	6	26	16	33	12	6,509354228	0,010730847
Oral	110	94	137	84	247	88		
Total	117	100	163	100	280	100		

Source: Ministry of Health/SVS - Notifiable Diseases Information System.

DISCUSSION

ACD was highly prevalent in the region studied and there was evidence of an association between oral infection and living in urban areas. In the sociodemographic profile, most infected individuals were male, in the age range of 20 to 39 years, which strengthens the relationship between Chagas infection and açai extraction activity, predominant in the region, performed primarily by males, configuring greater exposure to *Trypanosoma cruzi* than those who work in the extraction of other products⁽¹⁰⁾.

Regarding race, those who declared themselves as brown showed a higher percentage of illness (78.61%), like the findings of a study conducted in the city of Barcarena-PA, which identified 74.7% of brown people. In the study conducted in the city of Salvador-BA, there was a predominance of blacks associated with the prevalence of the disease⁽⁷⁾. The ethnic profile identified in the studies corresponds to the racial characteristics of the places studied. The miscegenation with blacks is more prevalent in Salvador, and in PA, and besides the black, there is a strong presence of indigenous people, especially in the ancestry.

In the studied health region, the cases of ACD are distributed throughout the geographic space, with predominance in rural areas. However, the urbanization process has been contributing to the displacement of the disease from rural areas to urbanized spaces, favoring its dissemination⁽¹¹⁾. It is noteworthy that, besides this change in the profile of reported cases according to the zone of residence, which has already been appearing for the years 2017 and 2018 on the DATASUS website with the data studied, one can establish a relationship between the variables zone of residence and mode of infection of ACD, confirming an association.

Thus, the high oral contamination is related to eating and hygiene habits, essentially the consumption of foods contaminated with the vector's excrements⁽¹²⁾. The açai was the food with the highest association with Chagas disease in the North region in recent years, either by contamination of the fruit or the pulp through vector droppings or infected reservoir animals in endemic areas⁽⁴⁾. This is a scenario that has demanded a response from the public health surveillance system, due to its wide consumption and commercialization, both in the domestic and international markets.

A study on the risk of oral infection associated with the consumption of contaminated

food concluded that the oral transmission of ACD is related to the consumption of poorly sanitized food, such as the juice of açai and bacaba, typical fruits of the region⁽¹²⁾. *Trypanosoma cruzi* can survive in açai pulp for different periods, and by ingesting sugarcane juice contaminated by infected triatomines, as evidenced in a study conducted in the city of Marcelino Vieira⁽¹³⁾.

In this context, a study on factors that contribute to the increase in contamination and illness by ACD, especially in the state of PA, concluded that the high number of cases may be associated with the ingestion of açai contaminated by triatomine feces, which deposits trypanosomes in the fruit⁽⁹⁾. The increase in the number of cases, whose first symptoms occur in the months from August to November, strengthens the thesis of transmission through the ingestion of contaminated açai, since it corresponds to the harvest period of the fruit, leading to increased consumption and wide manipulation.

Given the severity, in 2012 a sanitary policy measure was established by the State Department of Public Health, for the registration of handmade beaters of açai, with determination of hygienic-sanitary requirements for handling, in order to prevent outbreaks of Foodborne Diseases (FTS) and thus minimizing the risk of illness⁽⁹⁾. Regarding the vectorial transmission, it is possible to relate it to the forest areas still present in the region, configuring greater susceptibility to disease. This is because individuals living in rural areas are susceptible to contracting Chagas disease due to the poor infrastructure of their homes⁽⁴⁾.

In this study, 95.37% of the ACD cases were laboratory confirmed, according to data made available by the Regional Office of the Secretary of State for Public Health, like the findings of a survey conducted in three states (PA, Amapá, and Maranhão) that included 233 acute cases of the disease, all confirmed by laboratory tests. Thus, it is identified that the backlog for confirmation of cases is available, which favors the use of the recommended therapeutic conduct⁽⁴⁾.

The limitations of this study are that it was conducted with data from secondary sources, which may imply underreporting of cases, as well as possible inconsistencies in the records made in the various health services. In addition, the high number of ignored and/or blank variables limited the knowledge of the real situation of ACD in the studied region. Another limitation was that the study was carried out in only one health region of the state, lacking expansion.

CONCLUSION

The Tocantins health region draws attention for concentrating a significant number of cases of ACD throughout the studied period. In the state of PA, it was the region that most contributed to the magnitude of the morbidity and mortality indicators of the disease, demanding specific public policies that are aligned with the locoregional specificities.

The epidemiological data of the disease indicated oral transmission as the most responsible for the spread of the disease, attributable to the consumption of açai, given the economic and cultural specificities of the region. This fact leads to the urgent need to establish inter-institutional partnerships to face the problem, reaching all its aspects, from the production, transportation, packing, and handling of the açai.

A plan to address the problem is necessary to reduce the occurrence of cases, considering the possibility of chronicity of the disease, requiring specialized assistance for long periods, causing burden to the Health System and greater human suffering. Thus, investing in the agricultural and commercial area is essential to strengthen health practices of health promotion and disease prevention.

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Corresponding author:

Nicole Jucá Monteiro

Universidade do Estado do Pará – Belém, PA, Brasil

E-mail: nicolejuca@gmail.com

Role of Authors:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - LPGRN, LMVN, ILAR, SRA, VVG, NJM

Drafting the work or revising it critically for important intellectual content - LPGRN, LMVN, ILAR, SRA, VVG, NJM

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