

## SPATIAL DISTRIBUTION OF ACUTE CASES OF CHAGAS DISEASE REPORTED FROM 2010 TO 2020 IN THE STATE OF AMAZONAS

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**ABSTRACT:** This study aimed to investigate the epidemiology of acute cases of Chagas disease notified in the State of Amazonas between the period from 2010 to 2020. Data were obtained from the portal of the Sistema de Informação de Agravos de Notificação-SINAN, considering the number of cases per municipality of notification. 140 cases of Acute Chagas Disease were notified, distributed in 23 of the 62 municipalities of the State of Amazonas, 82 (59%) were male individuals, with a greater predominance in the age group of 20-39 years old, having 45 (32.1%) cases. As for the race/color variable, the highest number was among brown people with 101 (72.1%) notifications. The oral route prevailed as the main form of disease transmission with 93 (66.4%) records. Infection by the oral route of *T. cruzi* is the most important route of transmission of CD in the State of Amazonas, the occurrence of transmission is associated in most cases with the consumption of foods such as açaí juice and has been reported frequently over the years between municipalities.

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**KEYWORDS:** Chagas Disease; Acute Cases; State of Amazonas.

## **DISTRIBUIÇÃO ESPACIAL DOS CASOS AGUDOS DE DOENÇA DE CHAGAS NOTIFICADOS DE 2010 A 2020 NO ESTADO DA AMAZÔNIA**

**RESUMO:** este estudo se propôs a investigar a epidemiologia dos casos agudos de Doença de Chagas notificados no Estado do Amazonas no período de 2010 a 2020. Os dados foram obtidos no portal do Sistema de Informação de Agravos de Notificação - SINAN, considerando o número de casos por município de notificação. Foram notificados 140 casos de Doença de Chagas Aguda, distribuídos em 23 dos 62 municípios do Estado do Amazonas, 82 (59%) eram indivíduos do sexo masculino, com maior predominância na faixa etária de 20-39 anos de idade com 45 (32,1%) casos. Quanto a variável raça/cor, a maior registro foi entre pardos com 101(72,1%) notificações. A via oral, prevaleceu como a principal forma de transmissão da patologia com 93 (66,4%) registros. A infecção pela via oral do *T. cruzi*, é a mais importante via de transmissão de DC no Estado do Amazonas, a ocorrência da transmissão está associada na maioria das vezes ao consumo de alimentos como o suco de açaí, e tem sido reportada com frequência ao longo dos anos entre os municípios.

**PALAVRAS-CHAVE:** Doença de Chagas; Casos Agudos; Estado do Amazonas.

## **DISTRIBUCIÓN ESPACIAL DE LOS CASOS AGUDOS DE ENFERMEDAD DE CHAGAS NOTIFICADOS DE 2010 A 2020 EN EL ESTADO AMAZÓNICO**

**RESUMEN:** Este estudio tuvo como objetivo investigar la epidemiología de los casos agudos de la enfermedad de Chagas notificados en el Estado de Amazonas en el período de 2010 a 2020. Los datos fueron obtenidos del portal del Sistema de Información de Enfermedades de Notificación - SINAN, considerando el número de casos por municipio de notificación. Se notificaron 140 casos de Enfermedad de Chagas Aguda, distribuidos en 23 de los 62 municipios del Estado de Amazonas, 82 (59%) fueron individuos del sexo masculino, con mayor predominio en el grupo etario de 20 a 39 años con 45 (32,1%) casos. En cuanto a la variable raza/color, el mayor número fue entre los morenos con 101 (72,1%) notificaciones. La vía oral predominó como principal vía de transmisión de la enfermedad con 93 (66,4%) registros. La infección por vía oral de *T. cruzi* es la vía de transmisión más importante de la EC en el Estado de Amazonas, la ocurrencia de la transmisión está mayoritariamente asociada al consumo de alimentos como el jugo de açaí, y ha sido reportada con frecuencia a lo largo de los años entre municipios.

**PALABRAS CLAVE:** La Enfermedad de Chagas; Casos Agudos; Estado de Amazonas.

### **1. INTRODUCTION**

American Trypanosomiasis, also known as Chagas Disease, is an infectious disease caused by *Trypanosoma cruzi*, a neglected disease transmitted through vector, oral, transfusion, congenital and laboratory accidents. The World Health Organization (WHO) estimates that there are around seven million people worldwide infected with *T. cruzi*, and in Brazil there are at least one million people infected (DIAS, 2016; WHO, 2022).

CD is endemic in 21 Latin American countries, it is a serious social and public health problem in countries where populations are in a situation of social vulnerability, living in precarious housing and inadequate hygienic-sanitary conditions due to the absence of public policies, which include, among other things, vector control and improve housing, health and education conditions for these populations (DIAS, 2016; PINHEIRO *et al.*, 2017).

In the Brazilian Amazon, oral transmission of CD has been increasing over the years, becoming the main form of infection in this region, this increase is justified by the consumption of foods such as açaí juice contaminated either by feces or by the presence of triatomine itself accidentally crushed in food (FERREIRA *et al.*, 2014); MADEIRA *et al.*, 2021; SANTOS *et al.*, 2021).

In the northern region of Brazil, the States of Pará and Amazonas have concentrated the majority of CD cases, and in the State of Amazonas, oral transmission was responsible for the occurrence of six outbreaks in the last two decades (ORTIZ *et al.*, 2019; BRITO *et al.*, 2022), in this context, This study aimed to investigate the epidemiology of acute CD cases reported in the State of Amazonas from 2010 to 2020.

## 2. METHODOLOGY

Data were obtained from the Sistema de Informação de Agravos de Notificação - SINAN portal, considering the number of cases in the years, from 2010 to 2020 per municipality of notification, in addition to epidemiological variables: sex, race/color, age group and mode of transmission. Data were tabulated in an Excel spreadsheet and organized into tables for better understanding and analysis.

The research did not require submission to the Research Ethics Committee (CEP), as it is a study based on secondary sources and does not comply with CONEP/MS legislation, resolution 466/2012.

## 3. RESULTS

A total of 140 cases of Acute Chagas Disease (ACD) were reported between 2010 and 2020, distributed in 23 of the 62 municipalities in the State of Amazonas (Figure 1). The municipalities of Manaus had the highest frequency with 44 (31.4%); Carauari 27 (19.3%); Santa Izabel do Rio Negro 16 (11.4%), Barcelos 13 (9.3%) and Barreirinha 6 (4.3%) cases (Table 1).

Figure 1 - Spatial distribution of ACD cases from 2010 to 2020 in the State of Amazonas.

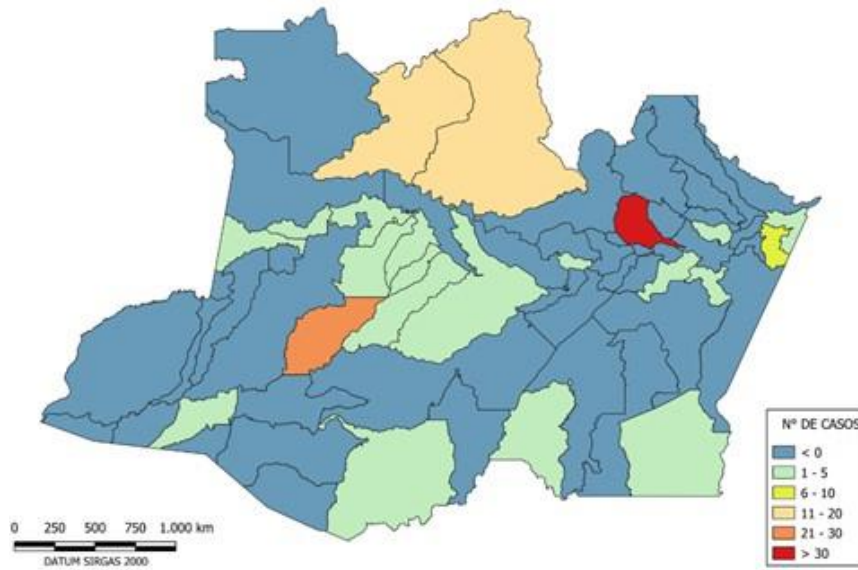


Table 1- Distribution of the number of ACD cases by municipality in the State of Amazonas from 2010 to 2020.

County	Number of cases	%
Autazes	1	0.71%
Alvarães	1	0.71%
Anamã	1	0.71%
Apuí	1	0.71%
Barcelos	13	9.29%
Barreirinha	6	4.29%
Carauari	27	19.29%
Coari	5	3.57%
Eirunepé	3	2.14%
Fonte Boa	1	0.71%
Humaitá	1	0.71%
Juruá	3	2.14%
Labréa	5	3.57%
Manaus	44	31.43%
Nova Olinda	1	0.71%
Parintins	1	0.71%
Santa Izabel do Rio Negro	16	11.43%
Santo Antônio do Iça	1	0.71%
São Paulo de Olivença	1	0.71%
Tabatinga	1	0.71%
Tefé	2	1.43%
Tonantins	1	0.71%
Uarini	4	2.86%
<b>Total</b>	<b>140</b>	<b>100%</b>

Of the 140 notified cases, 82 (59%) were male, with a greater predominance in the age group of 20-39, having 45 (32.1%) cases. As for the race/color variable, the

highest number was among brown people, with 101 (72.1%) notifications. The oral route prevailed as the main form of disease transmission with 93 (66.4%) records (Table 2).

Table 2 - Cases of ACD by sex, race/color, age group and mode of transmission

<b>Category/Subcategory</b>	<b>Number of cases (%)</b>
<b>Sex</b>	
Feminine	58 (41)
Male	82 (59)
<b>Race/Color</b>	
White	13 (9.3)
Indigenous	22 (15.7)
brown	101 (72.1)
Black	4 (2.9)
<b>Age group</b>	
<1	4 (2.9)
1 to 4	10 (7.1)
5 to 9	9 (6.4)
10 to 14	9 (6.4)
15 to 19	16 (11.4)
20 to 39	45 (32.1)
40 to 59	34 (24.3)
60 to 64	4 (2.9)
65 to 69	2 (1.4)
70 to 79	5 (3.6)
>80	2 (1.4)
<b>Form of transmission</b>	
ignored	21 (15)
Oral	93 (66.4)
Vertical	1 (0.7)
Vector	25 (17.9)

#### 4. DISCUSSION

The occurrence of the acute form of Chagas infection began to be frequently reported in some municipalities of the State of Amazonas, the data from this study largely corroborate what was reported in another investigation, which analyzed the data recorded by the Fundação de Vigilância em Saúde in the period between 2004 and 2014, in which 100 cases of CD were reported in 16 municipalities of the Amazon (MENEZES *et al.*, 2019).

Another study, the result of an analysis of the medical records and records of patients with ACD treated between 1980 and 2006 at the Tropical Medicine Foundation - FMT, indicated that the 29 registered cases were of patients from the municipalities of Tefé (11), São Paulo de Olivença (4), Manaus (4), Iranduba (3), Anamã (1), Barcelos (1), Carauari (1), Coari (1), Manacapuru (1), Marã (1) and Tabatinga (1) (MONTEIRO *et al.*, 2010).

There are studies mentioning the occurrence of isolated cases and ACD outbreaks in Amazonas in the period from 1980 to 2016. The outbreaks, specifically, have been

occurring since 2004 in some municipalities such as: Coari, Tefé, Santa Izabel do Rio Negro and Carauari, where they were registered 84 ACD outbreaks between 2004 and 2015, all related to the ingestion of açai juice (MORAIS, 2017).

When evaluating the variables gender, race/color and age group for ACD cases, this study pointed out the predominance of male individuals, of brown color and aged between 20 and 39 years, contradicting the data recorded by the FVS/AM from the period of 2004 to 2014 in relation to the gender variable, which showed a higher occurrence of ACD in women (MENEZES *et al.*, 2019), however, confirmed with the age group variable, in where individuals aged between 20 and 39 years predominated.

Data referring to the 29 acute cases of ACD investigated in the FMT, between 1980 and 2006, showed that 19 (65.5%) patients were male, with a mean age of 17.9 years and 10 (34.5%) female, with a mean age of 27.3 years (MONTEIRO *et al.*, 2010).

Studies carried out in other states of the North Region, reported a higher frequency of ACD in males in the State of Pará (OLIVEIRA *et al.*, 2022), differing in Acre, where women predominated (LIMA *et al.*, 2021). However, with regard to age group, in both states, the most affected population was people aged 20 to 39 years (OLIVEIRA *et al.*, 2022; MORAES *et al.*, 2021; ALENCA *et al.*, 2020).

The predominance of confirmed cases of ACD in males may be related to work activities, such as extracting açai and piassava, increasing men's exposure to the vector and consequently to the disease (MADEIRA *et al.*, 2021).

The higher frequency of ACD in women would have as possible justifications: the greater search for health services, which would allow the diagnosis and faster notification of the disease in this group; the immediate consumption of the açai juice produced for their subsistence; the intrusion of the triatomine in the home, since they mostly remain in domestic activities (MENEZES *et al.*, 2019).

The predominance of young adults aged between 20 and 39 years old affected by ACD could be explained by the fact that this is the most productive age of the individual (FERREIRA *et al.*, 2014). Another factor that could explain this prevalence is the fact that oral transmission is the main route of transmission of the disease in its acute phase, thus explaining the average age group in the State of Amazonas, since the higher frequency of the chronic phase of the disease occurs in the elderly (MENEZES *et al.*, 2019).

Research points to the prevalence of brown individuals affected by the disease in the northern region (SOUZA *et al.*, 2021; SAMPAIO *et al.*, 2020), the greater record of



ACD in brown individuals may be related to the increase in the number of people of this color in the country, also reflecting in the number of cases of the disease over the years. However, it is necessary to correlate other socioeconomic aspects such as family income, schooling and habits that indicate the existence of social inequality, which is significantly reflected in unfavorable living and health conditions in this social group (COUCEIRO *et al.*, 2022).

High rates of oral transmission, attributed to the ingestion of contaminated food, such as sugarcane juice and drinks based on açaí, bacaba and buriti, have contributed to the significant growth of the disease in the Western Amazon (Amazonas, Acre, Rondônia and Roraima). The transmission of *T. cruzi* through the consumption of açaí, is justified by the inadequate cleaning of the fruits in the crushing process to extract the pulp, resulting in the parasite being crushed together with the fruits, contaminating them and, consequently, causing outbreaks by oral transmission of CD, the same may occur with sugarcane, raw material for the production of sugarcane juice (MENEZES *et al.*, 2019; SOUZA *et al.*, 2016).

## 5. CONCLUSION

Currently, infection by the oral route of *T. cruzi* is the most important transmission route of CD in the State of Amazonas, the occurrence of transmission is associated most often with the consumption of foods such as açaí juice and has been reported with frequency over the years between municipalities. A more rigorous municipal sanitary inspection of the commercialization/production of açaí juice, health education activities, are necessary as infection prevention and control measures in these localities.

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