

## Epidemiological overview of chagas disease in the state of Amazonas, from 2004 to 2014

*Panorama epidemiológico da doença de chagas no estado do Amazonas, no período de 2004 a 2014*

*Panorama epidemiológico de la enfermedad de chagas en el estado de Amazonas, en el período de 2004 a 2014*

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### RESUMO

**Justificativa e Objetivos:** A doença de Chagas (DC), causada pelo *Trypanosoma cruzi*, protozoário flagelado, descoberto a mais de 100 anos, sendo ela difundida nas américas, principalmente na América do Sul, acometendo milhões de pessoas pelo mundo. É cada vez mais crescente o número de indivíduos acometidos com a DC na região da Amazônia Ocidental e estão relacionados a diversos fatores, porém o consumo de bebida contaminada é a principal parcela de contribuição para a elevação nos registros da doença na região. Este estudo tem como objetivo descrever e analisar o panorama epidemiológico da doença de Chagas no estado do Amazonas de 2004 a 2014. **Métodos:** Trata-se de um estudo ecológico, onde foram utilizados somente dados secundários obtidos do Sinan referentes aos casos notificados de infecção por *T. cruzi* em todo o estado do Amazonas. **Resultados:** Constatou-se que no período de 2004 a 2014 que no estado do Amazonas ocorreram um total de 100 casos de DC, tendo maior ocorrência nos anos de 2007 e 2010, durante os meses de abril e dezembro, com maior frequência da faixa etária de 20-39 e no gênero feminino. **Conclusão:** Constatou-se a necessidade de implementar um serviço de controle epidemiológico eficaz para monitoramento da via de transmissão DC e de seus vetores, pois trata-se de um problema de saúde pública que pode estar ligada a determinantes sociais e culturais, sendo indicado a promoção de atividades educativas para a conscientização da comunidade a respeito desta enfermidade.

**Descritores:** Epidemiologia. Tripanossomíase Americana. Amazônia

### ABSTRACT

**Background and Objectives:** Chagas disease (CD), caused by *Trypanosoma cruzi*, a flagellate protozoan, was discovered over 100 years ago, spread throughout the Americas, mainly in South America, affecting millions of people around the world. CD affects several people in the Western Region of Amazonia, with increasingly frequent numbers due to several factors that contribute to the increase of cases in the region. but the consumption of contaminated drink is the main way of transmission of the disease in the region. This study aims to describe and analyze the epidemiological panorama of Chagas disease in the state of Amazonas, from 2004 to 2014. **Methods:** This is an ecological

study, where only secondary data obtained from Sinan referring to reported cases of *T. cruzi* infection in the entire state of Amazonas were used. **Results:** a total of 100 cases of CD were reported in the state of Amazonas, from 2004 to 2014, with a higher occurrence in 2007 and 2010, during April and December, with a higher frequency in the 20-39 age group and in women. **Conclusion:** the need to implement an effective epidemiological control service to monitor the CD transmission route and its vectors was identified, because it is a public health problem that may be linked to social and cultural determinants. The promotion of educational activities to raise awareness of the community of this disease.

**Keywords:** Epidemiology. American trypanosomiasis; Amazonia.

## RESUMEN

**Justificación y Objetivos:** La enfermedad de Chagas (EC), causada por *Trypanosoma cruzi*, protozoo flagelado, descubierto hace más de 100 años, siendo difundida principalmente en América del Sur, afectando a millones de personas por el mundo. EC está afectando varias personas en la Amazonía Occidental con cifras cada vez más frecuentes debido a varios factores que contribuyen a la elevación en los casos en la región, uno de los principales es la forma oral. Este estudio analizó el panorama epidemiológico de la EC en el estado de Amazonas, de 2004-2014. **Métodos:** Se trata de un estudio poblacional, retrospectivo y descriptivo ejecutando colecta y análisis de datos referentes a los casos relatados de infección por *T. cruzi* en, el estado de Amazonas, datos secundarios provenientes del Sistema de Información de Agravios de Notificación del Sistema Único de Salud, través del Banco de Datos del Sistema Único de Salud. **Resultados:** Se constató que de 2004-2014 en el estado de Amazonas ocurrieron un total de 100 casos de EC, teniendo mayor ocurrencia en los años de 2007-2010, durante los meses de abril y diciembre, con mayor frecuencia del grupo de edad de 20-39 y en género femenino. **Conclusiones:** Se constató la necesidad de implementar un servicio de control epidemiológico eficaz para monitoreo de la vía de transmisión EC y de sus vectores, pues se trata de un problema de salud pública que puede estar vinculada a determinantes sociales y culturales, promoción de actividades educativas para la concientización de la comunidad acerca de esta enfermedad.

**Palabras-Clave:** Epidemiología. Tripanosomiasis americana. Amazonas.

## INTRODUCTION

Chagas disease (CD), or American Trypanosomiasis, is a disease caused by the protozoan *Trypanosoma cruzi*.<sup>1</sup> The disease was discovered over 100 years ago by the Brazilian researcher Carlos Chagas.<sup>2,3</sup> CD is widely spread in Central and South America. However, there are also reports in other countries such as Canada, the United States, Spain, Japan and Australia, due to the migration of Latin Americans in recent years.<sup>3,4</sup> In Latin America, chronic CD affects from 7 to 8 million people.<sup>5</sup>

In Brazil, between 1999 and 2007, 53,930 deaths were reported, of an estimated setting where more than 1.9 million Brazilians suffered from Chagas disease.<sup>6</sup> From 2005 to 2010, 756 cases of acute Chagas disease were reported in the country.<sup>7</sup> The Brazilian Amazon states with the highest number of CD were Pará (573 cases, 75.8%), Amapá and Amazonas (54 cases each, 7.1%), out of 688 cases.<sup>8</sup>

The Brazilian Amazonia was for many years evaluated as a non-endemic region for the transmission of American Trypanosomiasis. Today, however, due to the high rates of oral transmission through the ingestion of contaminated food, such as sugarcane juice and *açaí*, the vast triatomine fauna and reservoirs found naturally infected by trypanosomatids alerts the public health system of this region, increasing substantially the endemicity indicators of this disease.<sup>9-12</sup>

The risks of CD transmission in the Amazon Region are a cause for concern, due to the great diversity of infected vectors and increasing human migrations, where the disease is directly linked to the degradation of the natural environment and to the exodus of tria-

tomines from their wild biotopes to the urban region.<sup>13</sup> This concern is even greater with the recent outbreaks of oral transmission, mainly related to the consumption of *açaí*. Epidemiological studies must be carried out to understand the dynamics of this disease. As a result, this study aimed to describe and analyze the epidemiological panorama of Chagas disease in the state of Amazonas, from 2004 to 2014.

## METHODS

This is an ecological study with the collection and analysis of data referring to the reported cases of *T. cruzi* infection in the state of Amazonas, secondary data from the Brazil's Notifiable Diseases Information System (SINAN) collected through the Brazil's Single Health System Database (DATASUS). These data were used to determine the prevalence of infection and to identify the epidemiological profile of *T. cruzi* carriers.

The inclusion criteria were all the positive cases from 2004 to 2014, with variables such as gender, age and way of transmission (oral, vector, accidental). The exclusion criteria in this study were the positive cases out of the research period and variables not comprehended in those previously described.

For the statistical analyses, the software GraphPad Prism 6.0 was used. In order to compare the means relative to the months and age range, the Kruskal-Wallis (Dunns) method was used, with significance of  $p < 0.05$ , regarding gender; the Student's *t*-test was used with significance of  $p < 0.01$ .

Research did not require submission to the Research Ethics Committee (CEP), given it is a study based on secondary sources and because it does not fit within CONEP/MS legislation, resolution 466/2012.

## RESULTS

This study identified that, from 2004 to 2014, the 100 reported cases of Chagas disease in the state of Amazonas was recorded by the Health Surveillance Foundation (FVS/AM) (Table 1). These numbers are divided into 16 out of the 62 municipalities that are part of the state.

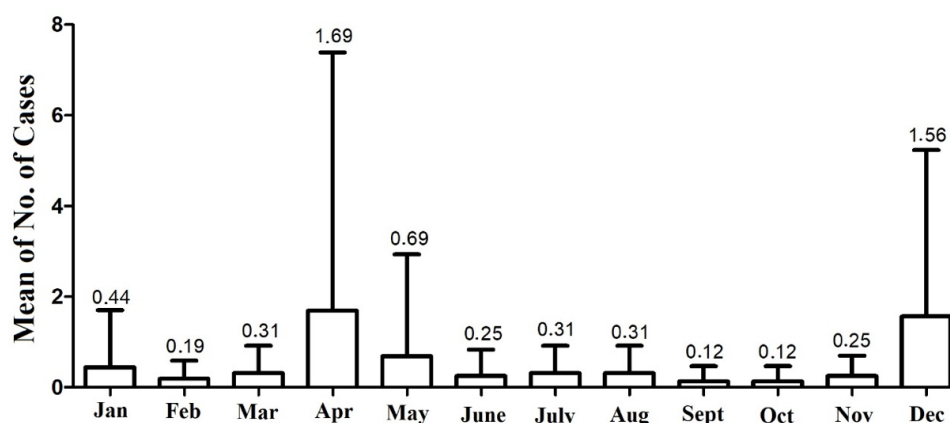
With the collection and analysis of data available, from the municipalities with the highest frequency of CD, those that stood out were: Coari, with 28 cases; the capital city Manaus, with 19; Santa Isabel do Rio Negro, with 16; and Carauri, with 14. Barcelos and Apuí present smaller numbers, 9 and 4 respectively, and the other cities presented only 1 case each.

According to the gender, a higher occurrence was reported in women, with 71 cases, while men presented 29 cases.

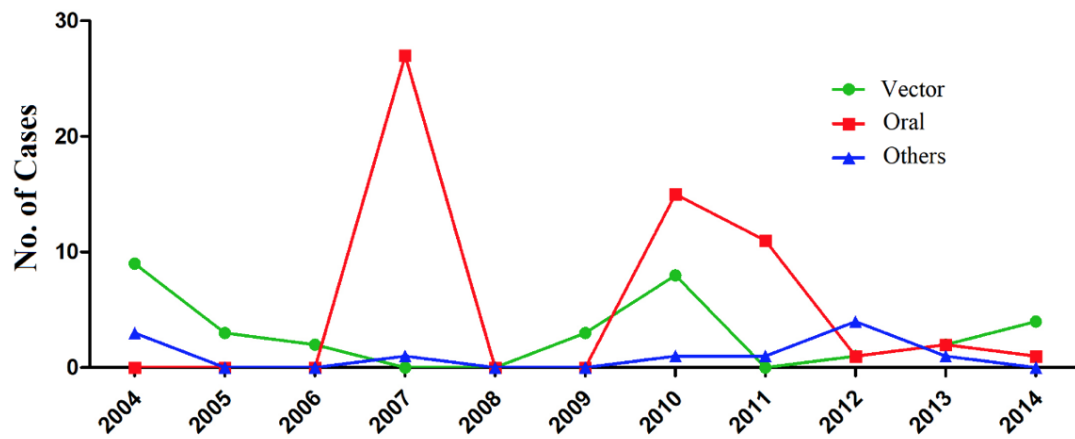
In the analysis of seasonality, the months of April and December presented the highest annual means in the research period (Figure 1).

**Table 1.** Distribution of the number of monthly cases of CD in the municipalities of the state of Amazonas, from 2004 to 2014.

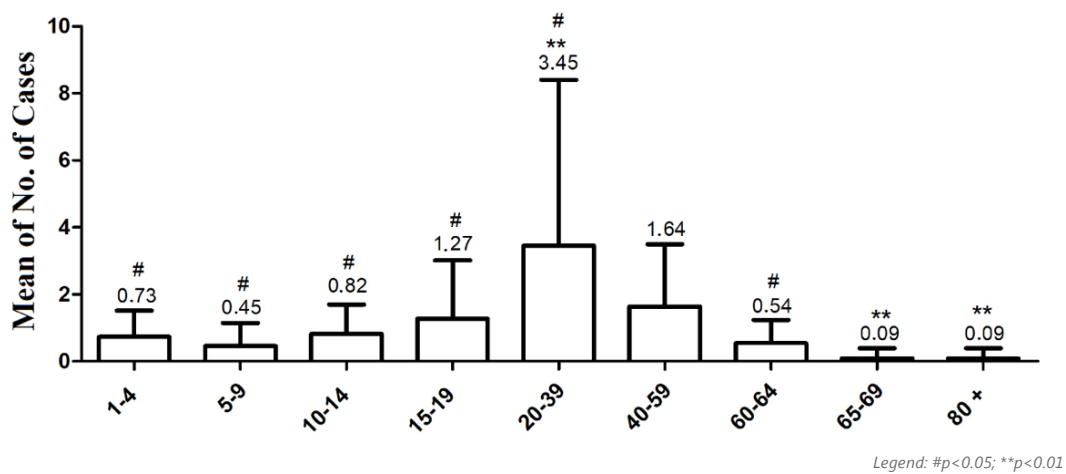
Municipalities	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Anamã	0	0	0	0	1	0	0	0	0	0	0	0	1
Apuí	0	0	0	1	0	1	0	0	0	1	1	0	4
Autazes	0	0	0	0	0	0	0	0	1	0	0	0	1
Barcelos	1	0	0	1	0	0	2	1	0	0	0	4	9
Carauri	0	0	1	0	0	0	0	0	0	0	1	12	14
Coari	0	0	2	23	0	2	0	0	0	0	1	0	28
Eirunepé	0	0	0	1	0	0	0	0	0	0	0	0	1
Juruá	0	1	0	0	0	0	0	0	0	0	0	0	1
Jutaí	1	0	0	0	0	0	0	0	0	0	0	0	1
Manacapuru	0	0	0	0	0	0	0	1	0	0	0	0	1
Manaus	0	1	1	1	9	1	1	2	1	1	1	0	19
Nova Olinda do Norte	0	1	0	0	0	0	0	0	0	0	0	0	1
Santa Isabel do Rio Negro	5	0	1	0	1	0	0	0	0	0	0	9	16
St° Antônio do Iça	0	0	0	0	0	0	1	0	0	0	0	0	1
Tabatinga	0	0	0	0	0	0	0	1	0	0	0	0	1
Tonantins	0	0	0	0	0	0	1	0	0	0	0	0	1
<b>Total</b>	<b>7</b>	<b>3</b>	<b>5</b>	<b>27</b>	<b>11</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>25</b>	<b>100</b>



**Figure 1.** Seasonality of the number of cases of CD in the state of Amazonas, from 2004 to 2014.



**Figure 2.** Number of cases of CD according to their forms of transmission in the state of Amazonas, between 2004 and 2014.



**Figure 3.** Annual mean of cases of CD in the state of Amazonas, between 2004 and 2014, according to the age group.

According to the ways of contamination described from 2004 to 2014, oral contamination was highlighted in 2007, in relation to the other years (Figure 2).

The variable age group presented the highest occurrence between 15 and 59 years old, as it can be observed in Figure 3. It was possible to observe that the age groups with the highest occurrences were: 20-39, 40-59 and 15-19, respectively. The other age groups obtained means less than one case per year. The means values, when compared, present significance ( $p < 0.01$ ) in relation to the mean of 20-39 (3.45\*\*), 65-69 (0.09\*\*) and 80+ (0.09\*\*). In relation to the others, the significance.

## DISCUSSION

The state of Amazonas, from 2004 to 2014, had an annual mean of 9 cases of CD. This is considered low when compared to the Brazilian state of Pará, with a mean of 119,<sup>14</sup> which reinforces the hypothesis that the data from this study may be underreported, considering that

in the state of the Amazonas the access to health services is limited and often far from the communities. Within this mean, related to the months, there was no statistical significance. However, it was possible to observe that in relation to seasonality, in April and December, there were higher annual means of cases in Amazonas due to the fact that in April there was an outbreak through oral transmission of 25 cases in Coari-AM,<sup>15</sup> and in December it may be related to the production of *açaí* (*Euterpe oleracea*), that in this region of the Amazonas estuary, harvesting is more expressive from August to January.<sup>16</sup>

Women also presented a higher contamination rate for CD in this study, which was a different result from the one presented in a study carried out in the region. It may be justified by the increase in the chance of men contracting the disease in 45%.<sup>17</sup> The prevalence of transmission of Chagas disease for women could be justified with their constant search for health services, enabling diagnosis and notification of this group. Moreover, their responsibility in the production of *açaí* juice as subsistence also contributes to it, because they are the immediate consu-

mers, thus increasing the possibility of oral transmission in this gender. The intrusion of this vector in residences is also a way of increasing the probability of transmission of CD, once women remain mostly in domestic activities.

When observing the age group in the young-adult phase (20-39), it was presented the highest mean, differently from what the national data indicates. From 1980 to 2010, the elderly people aged 60 or older have the higher prevalence in the population that mainly covers the chronic form of CD.<sup>18</sup> Such information may be related to the vector form, which is present in endemic regions, differently from the records in the northern region, where the incidence by oral transmission is the main way of transmission of the disease in its acute phase, thus explaining the mean of the age group in the state of Amazonas.

The presence of *T. cruzi* in fruit-based drinks from palm trees, such as *açaí* (*Euterpe oleracea*), occurs when they are not sanitized in the grinding process of extracting the pulp from the fruit, resulting in the parasite being ground along with the fruit and contaminating it, and, consequently, leading to an outbreak by oral transmission of Chagas disease.<sup>19</sup> The agencies responsible for supervising this production are public institutions of sanitary surveillance in food security, which should monitor all the productive stages, as of the orientation to the producers who harvest the fruits, in storage and transport and, finally, the good practices of hygiene in the pulp preparation.<sup>20</sup>

Proof of the survival of the protozoan in the *açaí* pulp submitted to different treatments is in the preservation of the virulence of the parasite in the mixture maintained for up to 24 hours at room temperature, for 144 hours under refrigeration (4°C) and for up to 26 hours under freezing conditions (-20°C), which demonstrates that the transmission of this disease possible occurs under these conditions.<sup>20</sup>

It is worth noting that *T. cruzi* is present in other *açaí*-based (*Euterpe oleracea*) drinks, *Oenocarpus bacaba*, sugarcane juice and babassu palm hearts produced in artisanal forms, and it may present two ways of transmission: metacyclic trypomastigotes and epimastigotes.<sup>21</sup>

There is the possibility of contaminating certain mammals with *T. cruzi*, such as marsupials, *paca* (*Cuniculus paca*), armadillo (*Tolypentis tricinctus*), among others, given they are all wild and used as a food source for some families, mainly those from the rural area. Furthermore, domestic animals that are not confined may be links between the cycle of wild and domestic transmission.<sup>3,18,22</sup>

Although the oral route has a higher rate of contamination of the local population of Amazonas, the vector transmission is prevalent in all the years of study, differently from the oral transmission found in 2007. This fact may be correlated with the intervention of surveillance in the ways of vector and transfusion transmissions.<sup>18</sup>

Nevertheless, reports of oral transmission are increasing in the Amazon region. These data is justified with the implementation of a specific program (Intergovernmental Initiative for the Surveillance and Prevention

of Chagas Disease in the Amazon Region – AMCHA), created in 2004, for mapping and detecting the disease transmission routes, even though it is still considered ineffective.<sup>3,19,22</sup>

There is also the occurrence of triatomines in both, intra and peridomestic environments, which may as well contribute to the increase of up to 16% in the transmission of Chagas disease.<sup>23</sup> The presence of the insect in these environments may be due to deforestation, its capacity to adapt to new vertebrate hosts, the presence of natural biotopes in the vicinity of residences and the attraction to light of some species of triatomines.<sup>9</sup>

Other ways of contagion are considered undetermined because they do not include the contamination origin, affecting mainly the professionals from the Health area, laboratory workers, vector capture actions in endemic areas, experimental initiatives with infected mammals and cultures, aerosols of infected materials, surgical infection and blood collection from people with acute infection. In these cases, safety deficiencies in the transport of contaminated materials, making the professionals more susceptible to infection, and corroborating the low prevalence when compared to the other ways of transmission of the study.<sup>24</sup>

With the Epidemiological Surveillance providing educational interventions and supervising the appropriate use of individual and collective protection equipment, it is possible to avoid the increase in undetermined number of cases.<sup>24,25</sup>

A total of 100 cases of CD occurred in the state of Amazonas, between 2004 and 2014, with a higher occurrence in 2007 and 2010, during April and December, more frequently in the age group of 20-39, and in women. The need to implement an effective epidemiological control service to monitor the CD transmission route and its vectors is also of utmost importance. This is a public health problem, which may be linked to social, environmental and cultural determinants, and the promotion of educational activities to raise awareness of the community of this disease is indicated.

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