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EPIDEMIOLOGICAL ANALYSIS OF CASES OF ACUTE CHAGAS DISEASE IN BRAZIL BETWEEN 2007 AND 2022

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Abstract: Discovered and described by researcher Carlos Chagas in 1909, Chagas disease is an infection transmissible vectorially, orally, vertically or accidentally, which represents a social and public health problem to this day. The acute phase generally occurs in children between 1 and 5 years of age, with systemic signs and symptoms such as fever, vomiting, diarrhea, anorexia, edema, lymphadenopathy, tachycardia disproportionate to fever (Faget's sign), hepatic and splenomegaly, Romaña's sign, between others. In rare cases, they manifest with myocarditis or meningoencephalitis. The indeterminate chronic phase represents 70 to 80% of cases, with patients being asymptomatic for 5 to 30 years, with normal exams or nonspecific changes, but with positive serology for Chagas. In 20 to 30% of cases, the disease progresses with manifestations of the digestive tract, such as megaesophagus or megacolon, or of the myocardium with chagasic cardiomyopathy. This is called the chronic phase of Chagas disease. The digestive form presents with odynophagia, dysphagia, malnutrition and regurgitation. The cardiac form progresses with dilated cardiomyopathy, heart failure, complex arrhythmias and risk of sudden death. Therefore, every infected individual progress to the chronic phase, whether symptomatic (cardiac and/or digestive) or undetermined (asymptomatic). And, in the Brazilian scenario, it stands out as the fourth cause of death among infectious and parasitic diseases in age groups over 45 years old. In view of the above, this work is a descriptive and retrospective epidemiological study, using secondary data on the number of confirmed cases of acute Chagas Disease in Brazil between the years 2007 and 2022, as well as the forms of infection, outcome, federative state of cases and sex of individuals affected in the same period. The information was obtained by consulting SINAN (Notifiable Diseases Information System) made available by the Information Technology Department of the Unified Health System (DATASUS), at the electronic address (http://www.datasus.gov.br).

Keywords: Chagas Disease, Epidemiology, Brazil

INTRODUCTION

Discovered and described by researcher Carlos Chagas in 1909, Chagas disease is a vector, oral, vertical or accidental transmissible infection that represents a social and public health problem to this day[5].

For the most part, it affects underdeveloped countries in Latin America, corresponding to one of the seventeen most neglected tropical diseases according to the World Health Organization[1,3].

Trypanosoma cruzi, the flagellated parasite that causes Chagas disease, can cause damage to the myocardium and gastrointestinal tract[8], potentially fatal, manifesting signs and symptoms of the disease that classify the acute, indeterminate chronic and chronic phases[4,9].

The acute phase generally occurs in children between one and five years of age, with systemic signs and symptoms such as fever, vomiting, diarrhea, anorexia, edema, lymphadenopathy, tachycardia disproportionate to fever (Faget's sign), hepatic and splenomegaly, Romaña's sign, between others. In rare cases, they manifest with myocarditis or meningoencephalitis[3,10].

The indeterminate chronic phase represents 70 to 80% of cases, with patients being asymptomatic for five to thirty years, with normal exams or nonspecific changes, but with positive serology for Chagas[5,6].

In 20 to 30% of cases, the disease progresses with manifestations of the digestive tract, such as megaesophagus or megacolon, or of the myocardium with chagasic cardiomyopathy. This is called the chronic phase of Chagas disease[1,4]. The digestive form presents with odynophagia, dysphagia, malnutrition and regurgitation. The cardiac form progresses

with dilated cardiomyopathy, heart failure, complex arrhythmias and risk of sudden death[4].

Therefore, every infected individual progress to the chronic phase, whether symptomatic (cardiac and/or digestive) or undetermined (asymptomatic). And, in the Brazilian scenario, it stands out as the fourth cause of death among infectious and parasitic diseases in age groups over 45 years old. [1]

OBJECTIVE

The present study aims to analyze the epidemiological profile of acute Chagas disease in Brazil, from 2007 to 2022, establishing a relationship between the Brazilian states most affected by the pathology, the sex most affected, the modes of infection and the outcomes of the reported cases.

MATERIALS AND METHODS

This is a descriptive and retrospective epidemiological study, using secondary data on the number of confirmed cases of acute Chagas disease in Brazil, as well as the forms of infection, outcome, federative state of cases and sex of affected individuals.

The information was obtained by consulting the Notifiable Diseases Information System (SINAN) made available by the Information Technology Department of the Unified Health System (DATASUS), at the electronic address (http://www.datasus.gov.br), referring to the period from 2007 to 2022 and the standards set out in Resolution 466 of December 12, 2012 and its supplements from the National Health Council/Ministry of Health were strictly followed.

The data were analyzed in a descriptive way, for this, the authors used the free software Jasp.

RESULTS AND DISCUSSIONS

Chagas disease is a parasitic condition endemic in many parts of Latin America, has a geographic distribution that reflects complex interactions between environmental, social and public health factors[2,6]. Caused by the parasite Trypanosoma cruzi and transmitted primarily by the insect vector known as kissing bug, this disease has a spectrum of clinical manifestations, ranging from asymptomatic acute forms to chronic conditions that can result in serious complications [1,4].

The geographic distribution of Chagas Disease is particularly heterogeneous, influenced by vector ecology, housing conditions, cultural practices, and the presence and effectiveness of public health programs. In Brazil, the disease has traditionally been more prevalent in rural areas, where housing offers ideal conditions for sheltering the vectors1. However, socioeconomic changes and population migrations have altered this pattern, expanding the risk area to urban and non-endemic regions[6].

Graph 1 aims to illustrate the distribution of cases of acute Chagas Disease by region of Brazil, providing a visualization of the burden of the disease in different states over a given period. This type of visualization is essential for identifying areas of high transmission, evaluating the success of control and prevention strategies, and guiding future efforts to combat this neglected disease, as well as identifying areas of possible underreporting of the disease. By analyzing geographic patterns over time, researchers and health authorities can adapt resources and strategies to meet the specific needs of each area, seeking to reduce the prevalence and eventual elimination of Chagas Disease as a public health problem in Brazil.

Analyzing Graph 1, we can see a pattern of geographic distribution of Chagas Disease that is not uniform across the country. States such
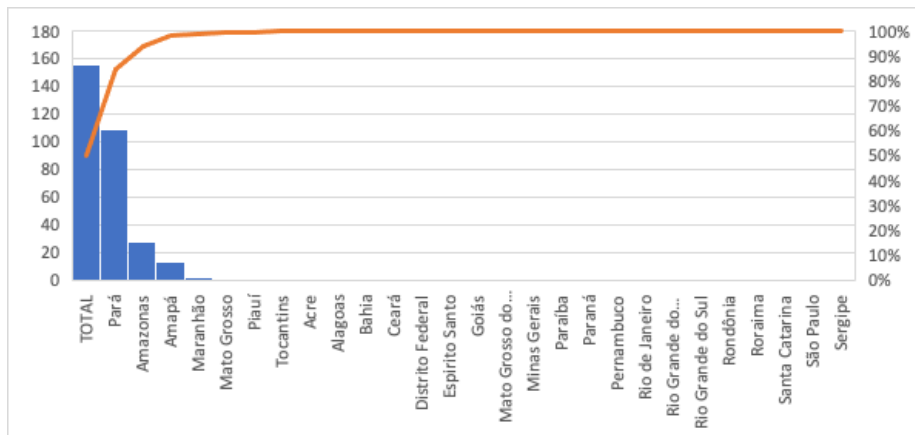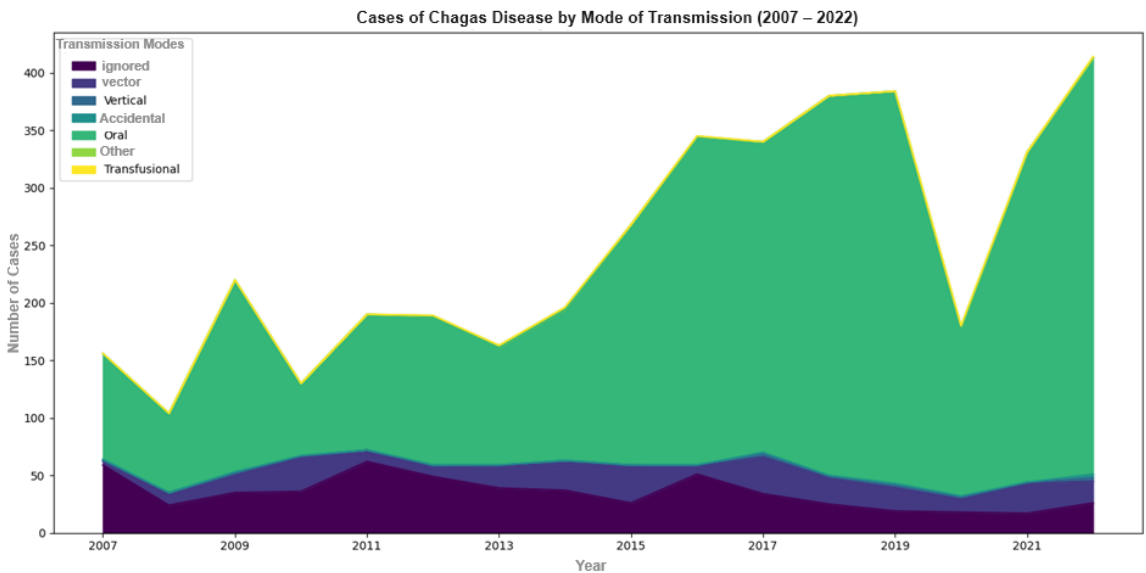
Graph 1 Geographic distribution of Chagas Disease

Source: Research data
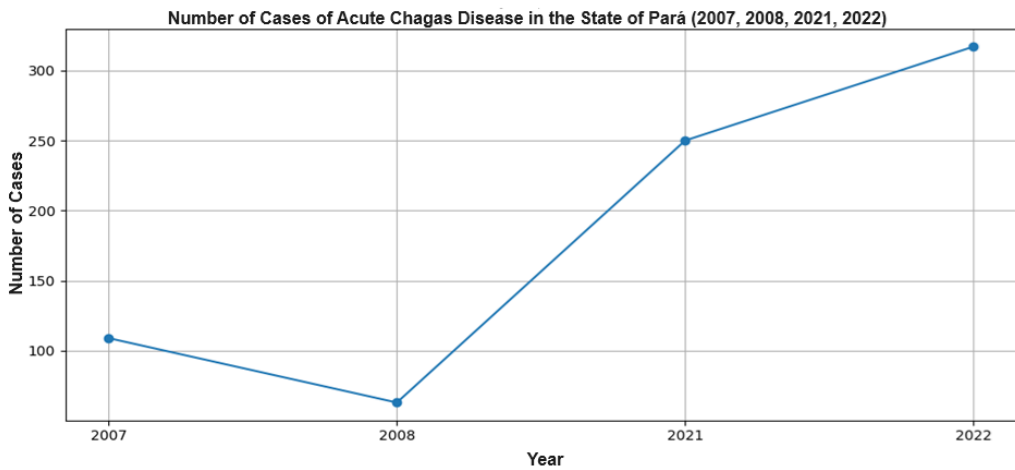
Graph 2 Highlight of cases of Chagas Disease in the State of Pará

Source: Research data

Graph 3 Means of transmission for Chagas Disease

Source: Research data

as Pará and Amapá have considerably higher numbers of cases compared to other states such as Alagoas and Santa Catarina, where no cases were recorded in the years observed. Pará, in particular, stands out with the highest number of cases in almost all years analyzed, which may indicate specific environmental, social and public health conditions that facilitate the transmission of the disease[6].

Chagas disease, a critical parasitic disease that persists as a significant public health challenge, presents regional epidemiological nuances that demand attention. The State of Pará, located in the North of Brazil, emerges as a focus of special interest due to the disproportionate number of cases reported over the years. The area, characterized by its vast tropical forest, riverside communities and growing urbanization, offers a complex scenario where ecological, socioeconomic and cultural factors converge to influence the transmission of *Trypanosoma cruzi* [9,10].

Within this context, Graph 2 aims to expose the epidemiological situation of Chagas Disease in Pará, highlighting the annual case count and shedding light on trends and possible outbreaks over time. The graphical presentation of these data not only highlights the burden of the pathology in the region, but also serves as a crucial indication of the need for continued and intensified efforts in terms of prevention, vector control and treatment. The analysis of this temporal distribution is a fundamental step towards understanding the dynamics of the disease and guiding effective public health policies, aiming to mitigate the impact of Chagas Disease on the population of Pará.

Graph 2 demonstrates that there are significant fluctuations in the number of cases over the years, suggesting a possible variation in the effectiveness of control measures or the occurrence of external factors that impact transmission. For example, in Pará, there was a significant increase in cases from 2015 onwards, reaching a peak in 2019, followed by a decrease in 2020, and a new increase in 2021 and 2022. These fluctuations can be attributed to specific outbreaks, probably related to oral transmission, a phenomenon that has gained more recognition in recent years.

In the data, it appears that the North region, especially the state of Pará, concentrates the majority of cases, which can be explained by the presence of vectors in wild environments and the practice of eating habits that include the consumption of potentially contaminated foods[3, 5]. Furthermore, the increase in cases in Amapá and Amazonas also draws attention and requires further investigation into environmental and urban management practices that may be influencing the transmission cycle.

The decline seen in some states may reflect the success of vector control campaigns and public health initiatives. However, the resurgence in certain years points to the need for continued monitoring and adaptation of control strategies, especially in areas where transmission does not appear to be completely interrupted.

Graph 3 reveals the means of transmission of Chagas Disease, revealing the prevalence of specific infectious routes. Essential for understanding the epidemiology of the disease, it highlights the importance of health strategies targeted at each mode of transmission, from the traditional vector to the increasing oral transmission.

The distribution of cases of acute Chagas Disease by route of transmission illuminates crucial aspects of the epidemiological profile of the disease in Brazil. Graph 3 demonstrates that oral transmission represents the largest portion of cases throughout almost the entire period analyzed, with a notable increase from 2009 onwards and substantial peaks in subsequent years, such as 2015, 2016, 2019, and more recently in 2022.

This pattern highlights the growing relevance of this transmission route, which is associated with the ingestion of food contaminated by the parasite: *Trypanosoma cruzi,* such as fruit juices and sugarcane juice[5,6].

Although fewer in number compared to the oral route, vector transmission, associated with the kissing bug, has shown persistence over the years, with some annual variations, showing that, despite efforts to eradicate the vector, there are still significant challenges. Categories such as vertical transmission (from mother to child), accidental and transfusion are much less representative, but their constant presence requires attention for prevention and diagnosis strategies.

There are a considerable number of cases in which the mode of transmission was classified as "ignored", indicating flaws or difficulties in the epidemiological investigation. Despite a declining trend over the years, the presence of this category highlights the need to improve surveillance and transmission tracking capabilities.

The predominance of oral transmission and the persistence of vector transmission indicate that public health measures must be multifaceted, attacking different fronts. In addition to vector control, it is essential to educate the population about safe practices for preparing and consuming food, as well as improving sanitary and hygiene conditions.

Data analysis suggests that there has been an evolution in the transmission patterns of acute Chagas Disease in Brazil. The continued increase in cases of oral transmission demands an expanded focus on public health strategies to address this route. Furthermore, the existence of less common but persistent modes of transmission highlights the need to maintain a holistic and vigilant approach, with continued research efforts to understand and mitigate all potential modes of transmission.

The data shows that, despite significant advances in some areas, Chagas Disease continues to be a significant health problem in the country, with worrying trends that require an adaptive and evidence-based response. The recognition of oral transmission as a predominant route poses an additional challenge to disease control, which must be meticulously addressed by public health policies.

Graph 4 examines the distribution of Chagas Disease by sex, illustrating differences and similarities in the incidence between men and women. This panorama is fundamental for the development of public health policies that consider gender nuances in the transmission and treatment of the disease.

Analysis of data on the incidence of acute Chagas Disease in Brazil from 2007 to 2022, separated by gender, offers an illuminating insight into the impact of the disease on different populations.

The numbers indicate that both men and women were significantly affected by acute Chagas Disease over the years analyzed. In many years, the incidence between genders appears quite close, suggesting that the disease does not select its hosts based on gender, which may reflect the nature of disease transmission, which is often associated with vectors and environmental and social factors. that affect both genders in similar ways.

A general upward trend in reported cases was observed in both genders until 2019, with notable peaks in 2016 for men and a steady increase until 2018 for women, indicating a variation in exposure to the vector or an increase in awareness and in diagnosing the disease. Interestingly, there is a sharp drop in 2020, which could be associated with changes in behavior or overburdened healthcare systems due to the COVID-19 pandemic. Subsequently, the numbers return to an upward trend in 2021 and 2022.
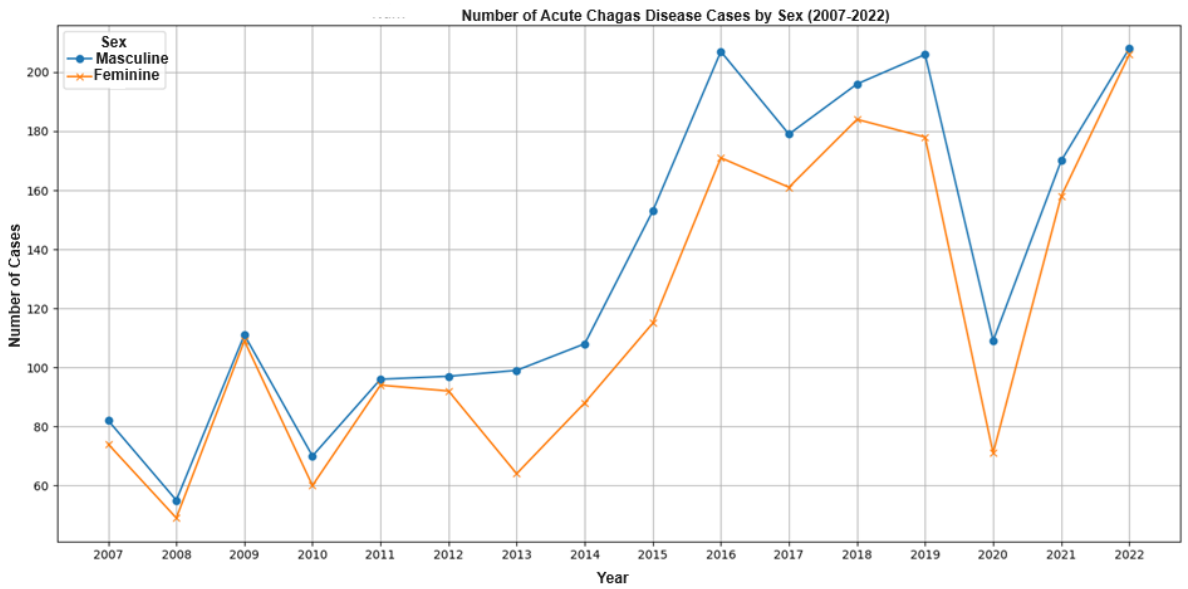
Graph 4 Stratification of Chagas Disease by Sex
Source: Research data
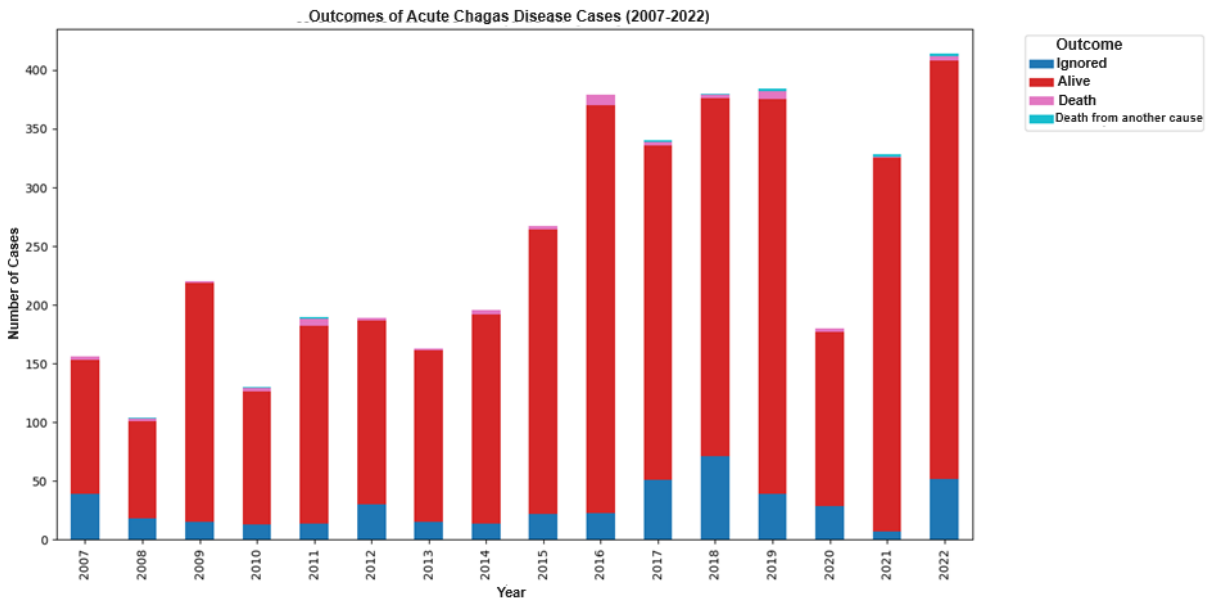
Graph 5 Disease outcome
Source: Research data

There are notable fluctuations from one year to the next, which may be related to episodic outbreaks of the disease, variations in surveillance and diagnostic capacity, or changes in practices that affect transmission, such as the consumption of food contaminated by oral transmission. These spikes in incidence deserve detailed investigation to better understand the underlying factors.

In terms of disparities, the data does not show consistent differences between men and women that would indicate a gender bias. However, in some years, such as 2016, the number of cases among men was substantially higher than among women, suggesting the possibility of different risk factors or greater detection or reporting of cases among men.

The data presented do not show a clear and consistent disparity in the incidence of acute Chagas Disease between genders over the years. The observed fluctuations reflect the complexity of the disease's epidemiology, which is influenced by a matrix of environmental, social and behavioral factors. Spikes and variations in incidence underscore the need for ongoing and adaptive public health approaches that consider the spectrum of risks affecting different segments of the population.

Additionally, these data serve as a reminder of the importance of constant surveillance and access to adequate diagnosis and treatment for all populations affected by Chagas Disease.

Graph 5 presents the outcomes of Chagas Disease cases, contrasting successful recoveries with fatalities and unclear data. This insight is critical for evaluating the effectiveness of clinical interventions and for planning improvements in disease management and patient follow-up.

Most cases resulted in living patients, which indicates a good prognosis for those diagnosed and treated. However, there is a significant number of cases classified as "Ignored". This high number suggests gaps in data collection or case monitoring. In 2019 and 2020, the increase in missed cases may be related to difficulties in monitoring due to health systems under pressure from other factors, such as the COVID-19 pandemic.

Death data shows small fluctuations over the years, with some peaks in 2016 and 2019. The constant presence of annual deaths reinforces the importance of early diagnosis and effective treatment of acute Chagas Disease. There is also a category of "Death from another cause", which, although generally low, suggests that the disease may complicate existing clinical conditions or be a competing factor in deaths from other conditions.

The increasing trend in the number of living patients can be interpreted as a reflection of improvements in treatment and disease control strategies. However, the fact that there are still deaths and the increase in the number of cases with ignored outcomes in recent years point to the need for improvements in epidemiological surveillance, case monitoring and the integrity of recorded data.

CONCLUSION

Acute Chagas Disease still represents a public health challenge, the fluctuations observed in annual cases and regional differences highlight the importance of locally adapted approaches, which consider the ecological and social particularities of each region. The persistence of cases over time suggests the need to strengthen prevention, vector control and population education strategies. The importance of robust health systems and active epidemiological surveillance to respond to outbreaks and early detection of cases is also highlighted.

The data also highlight the persistence of acute Chagas Disease as a public health problem in Brazil, with a significant impact on the population. Although the majority of patients survive, the number of deaths, even if small, reinforces the need for preventive measures, better monitoring of cases and more robust health strategies. The "Ignored" outcome category is a call to action to improve disease recording and monitoring systems, ensuring that all cases are adequately documented and that statistics accurately reflect the reality of Chagas Disease in the country.

FINANCING

Not applicable.

CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest.

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