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ACUTE CHAGAS DISEASE IN THE MUNICIPALITY OF BELÉM/PARÁ

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ABSTRACT

Chagas disease is a parasitic infection transmitted by hematophagous insects popularly known as "kissing bugs", "hickey" or "suck". The World Health Organization estimates that about 6 to 7 million people are infected worldwide, with the vast majority in Latin America. In Brazil, the northern region is responsible for almost all cases. The general objective of this study is to demonstrate the incidence of acute Chagas disease in the city of Belém/Pará in the years 2021 and 2022. The specific objectives are to determine the type of contamination, verify seasonality, and relate seasonality to the type of contamination. This is an epidemiological, retrospective, and descriptive study that uses publicly accessible data from the Department of Informatics of the Unified Health System on notifications of cases of acute Chagas disease reported in 2021 and 2022. 35 cases of Chagas disease were confirmed in the municipality of Belém in the period studied, the main means of contamination was oral transmission with 31 confirmed cases. The months of August to November represented the period with the highest incidence of the disease, with an increase mainly in cases of oral contamination. These results are probably related to the increase in the consumption of food contaminated with Trypanosoma cruzi. We conclude that acute Chagas disease represents a public health problem and that it is being neglected in combat, treatment and prevention actions.

Keywords: Chagas disease. Infection. Type of Contamination. Public health.

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INTRODUCTION

Chagas disease (CD) is a public health problem mainly in the northern region of Brazil. The negligence of the health system for issues related to the disease is clear, given the incidence rate (IT) and mortality still present in the country (SILVA, 2024). Between 2010 and 2019, 4,540 deaths from Chagas disease were recorded each year in Brazil (GONÇALVES, 2021).

CD was discovered in 1907 by Dr. Carlos Chagas, who was director of the Oswaldo Cruz Institute. This discovery was a milestone for research in the area, as it was the first time that the same researcher identified a parasite, its vector, the phases and cycles of the disease caused. Currently, the disease is considered an anthropozoonosis of high expressiveness in morbidity and mortality scenarios. The disease can evolve from the acute phase to the chronic phase, generating irreversible health problems (FERREIRA, 2021; NASCIMENTO, 2021).

CD is a parasitic infection that can manifest itself in two phases: acute and chronic. It is caused by the flagellated protozoan *Trypanosoma cruzi* (T-cruzi). This parasite can complete its life cycle in more than 150 species of triatomines, and approximately 15 of these species are responsible for transmitting the infection to humans. In Brazil, these hematophagous insects are popularly known as "kissing bugs", "hickeys" and "sucking". The infection occurs when the "kissing bug" ingests contaminated blood and releases T-cruzi in the feces, from then on the protozoan can use the skin with small tissue lesions, mucous membranes or the mouth as a gateway to the body and start the infection (SANTOS, 2022).

The acute phase of the disease is characterized by high-grade parasitemia, lasts a few weeks, has few symptoms, and has a mortality rate below 2%. The chronic phase of the disease, on the other hand, can be defined in a determinate and indeterminate way. The indeterminate form occurs between 4 and 10 weeks and is characterized by seropositivity, with a lack of symptoms or manifestations, while the determinate form occurs 10 to 30 years after acute infection and is characterized by infection of organs such as the heart and colon, generating heart and intestinal problems. The evolution from the indeterminate to the determinate form occurs about 2% per year (FERREIRA, 2021).

According to the World Health Organization (2024), it is estimated that about 6 to 7 million people are contaminated by the T-cruzi parasite worldwide, with the vast majority of these infected people living in Latin America, where the 21 endemic countries of the disease

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are located. Initially, the disease was restricted to the American continent, however, due to the current great globalization, it has reached other continents and spreads through non-vector routes. Contamination occurs most often in rural or suburban areas where it is more common to find the insect vector. When this insect bites humans, or other animals, it defecates and urinates near the bite and the infection of the parasite present in the waste occurs when we instinctively pass our hand on the bite site and bring the feces or urine in contact with an injured area of the skin, eyes or mouth.

An analysis of the epidemiological bulletin of the Ministry of Health highlights the complexity of Chagas disease in Brazil, influenced by factors such as access to health, socioeconomic and hygienic conditions. This highlights the need for a multidisciplinary approach to control, treatment, and prevention. Brazil has one of the highest rates of confirmed cases in Latin America, with rural and poor communities being the most affected, although the increase in cases in urban areas, especially in poor regions, indicates an urbanization of the disease (MATOS, 2024).

Vector transmission is the main way the disease spreads, and can be by placental transmission, blood transfusion, organ donation and oral transmission. Oral transmission is superior to other types of transmission in the Amazon region, mainly due to the large consumption of açaí and bacaba, which can often be contaminated by the feces of the kissing bug or even through the grinding of the triatomine during the processing of palm fruits. The number of cases of CD due to oral contamination increases in the months corresponding to the açaí harvest in the Amazon region, probably due to the non-use of good handling practices by producers of the fruit. Strategies for standardizing the collection process and good handling practices should be encouraged as a disease control measure (PARENTE, 2020; VASCONCELOS, 2022).

The northern region is responsible for almost all notifications of the disease, and that, within this region, Pará is one of the main states with the highest number of notifications of the disease, with Belém being the capital with the highest incidence among the capitals of the northern region (DE SOUZA, 2021; MARTINS, 2022).

The municipality of Belém was the region with the second highest number of cases of confirmed Chagas disease in the years 2007 to 2020, among the municipalities in the intermediate geographic region of Belém do Pará, with 425 occurrences, with the main mode of contamination being oral transmission of the parasite (RODRIGUES, 2021).

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A possible explanation for the large number of registered cases would be the migration of infected people in other locations to diagnostic reference sites. This makes evident the importance of combating the disease and the need for control strategies (GOMES, 2020; ALMEIDA, 2024).

In this sense, this study aims to demonstrate the incidence of Chagas disease, determine the types of contamination, verify seasonality, and relate seasonality to the types of contamination in the city of Belém/Pará in the years 2021 and 2022.

METHODOLOGY

The present study was an epidemiological, retrospective and descriptive study in which the data used were obtained using information from the Department of Informatics of the Unified Health System (DATASUS) of the Ministry of Health (MS).

Data were obtained and analyzed in September 2024 regarding cases of acute Chagas disease (ACD) notified and confirmed in the Notifiable Disease Information System (SINAN) in the period 2021 and 2022 in the municipality of Belém, Pará, Brazil.

The variables studied were: Number of confirmed cases, type of contamination, month and year of symptom onset.

The information was initially recorded, transported, and stored in Microsoft Office Excel® 2021 spreadsheets and analyzed for the construction of graphs.

The calculation of the incidence rate was performed based on the formula: (number of confirmed cases / number of people exposed to the risk of contamination) * 100,000. For the variable "number of people exposed to the risk of contamination", the estimated number of the population of the city of Belém was used, based on the last demographic census carried out in 2022 by the Brazilian Institute of Geography and Statistics (IBGE).

As this is a study that uses freely accessible public data, it was not necessary to obtain approval from the research ethics committee.

RESULTS AND DISCUSSION

In this study, 35 cases of ACD were confirmed in the city of Belém in the two years studied, which characterizes an annual average of 17.5 cases. According to the last census of the Brazilian Institute of Geography and Statistics (IBGE), the city of Belém had about 1,303,403 inhabitants in 2022 (IBGE, 2022). This reflects in a DCA incidence rate of 2.68

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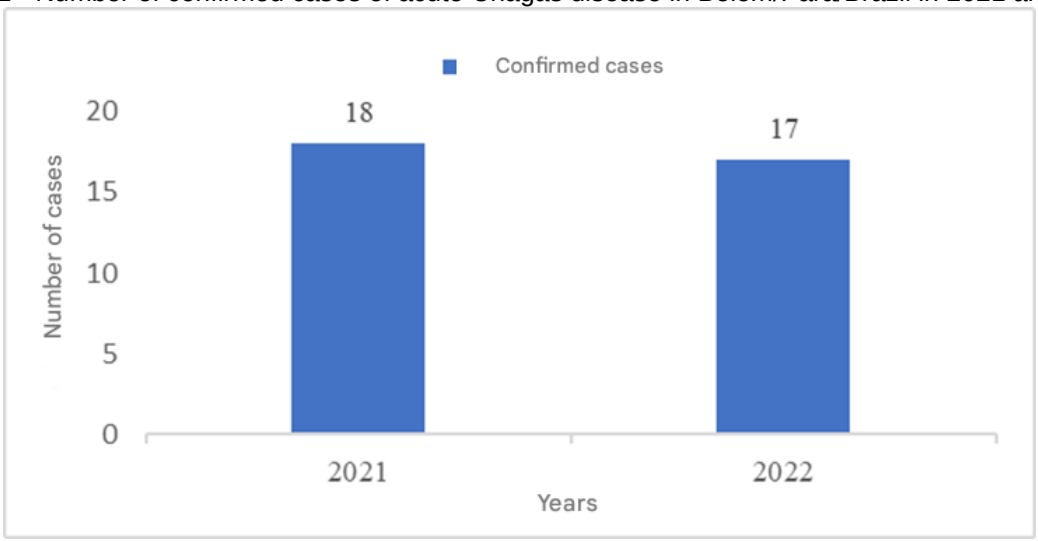
cases per 100,000 population. Figure 1 shows the number of cases of acute Chagas disease reported in 2021 and 2022.

Figure 1 - Number of confirmed cases of acute Chagas disease in Belém/Pará/Brazil in 2021 and 2022



Source: Authors, 2024.

The findings are below those found in the study by Rodrigues (2021) who showed that Belém is the second city with the highest number of confirmed cases of ACD among the municipalities in the intermediate geographic region of Belém between the years 2007 and 2020, with 425 notifications and an annual average of 28.33 cases.

Parente (2020) observed that the municipality of Belém was the third city in Pará with the highest total number of confirmed cases of ACD, totaling 162 infections diagnosed between 2010 and 2017, resulting in an annual average of 20.25 cases. This average is higher than that found in this study.

In addition, Alexandre (2023) points out that Belém is an important tourist spot that receives visitors from all over the world and makes the dissemination of DCA a a risk factor for it to be disseminated to other regions.

A possible explanation given by Correia (2021) for the incidence of DCA in the city of Belém is the large number of rural areas in its surroundings and the tendency of human behavior to exploit and deforest the place where it lives, burning and exploiting forests, generating an ecological imbalance and increasing the risks of domiciliation of the vector insect. The incidence of the disease in centers such as Belém is also associated with the rate of socioeconomic inequality, causing vulnerable groups to be more exposed to contamination. In this way, the fight against the disease is directly linked to actions to

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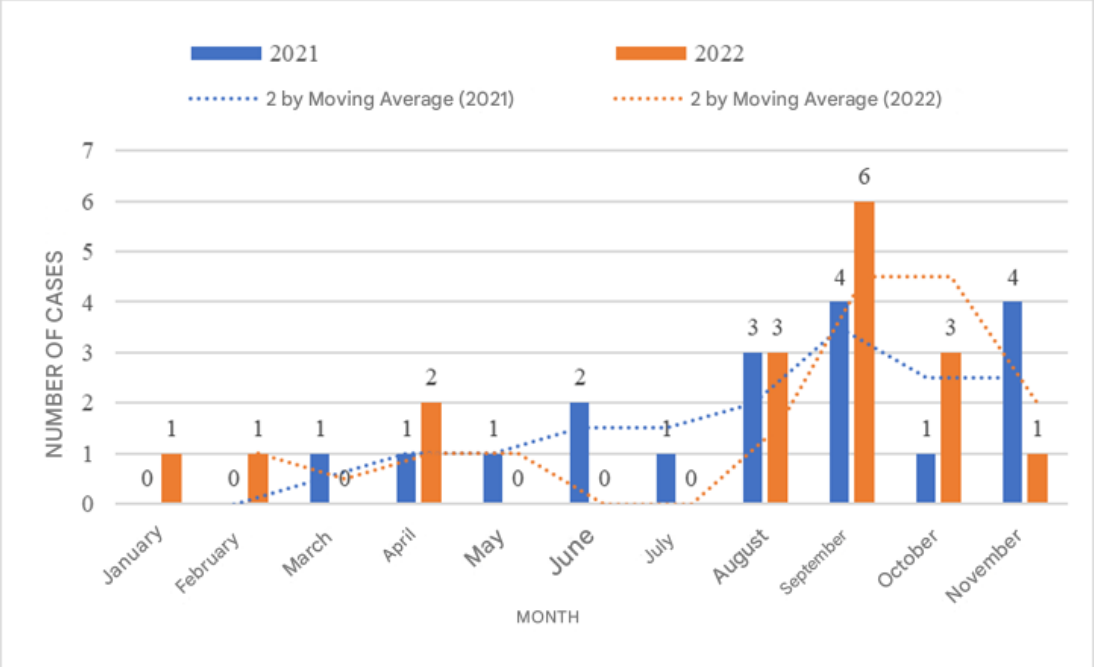
reduce social inequality and access to basic rights, since the root of the problem is in political issues and not in individual actions.

It was observed that the months of the second half of the year represented the period with the highest incidence of the disease. It was possible to observe that the seasonality of the appearance of contamination has a tendency to increase in the period from August to November, which represents 71.42% of the total cases registered in the years 2021 and 2022. The month of September represented the period with the highest number of cases (7), followed by August (6), November (5) and October (4). No cases were recorded in December in the years studied. Figure 2 shows the distribution of ACD cases during the months in 2021 and 2022.

Figure 2 - Cases of acute Chagas disease confirmed in Belém for each month of 2021 and 2022.



Source: Authors, 2024.

Similarly, in the studies by Martins and Costa (2022), it was observed that DCA contamination in Brazil between 2009 and 2019 was higher in the second half of the year with 62.50% of cases. However, the highest number of contamination was recorded in October with 424 notifications, followed by September with 393 notifications. The açaí harvest that occurs between the months of August and December was put forward as a possible explanation for this trend, which increases the consumption of the fruit that may be contaminated by *T-cruzi* and the parasite is often not eliminated during processing due to handling errors in the production chain.

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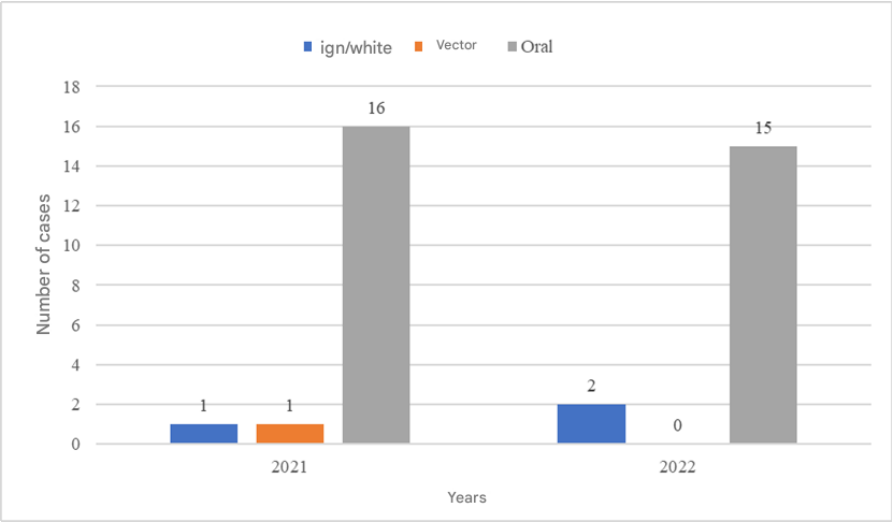
The study by Moraes (2020) on DCA cases in Belém in the years 2007 to 2017 show that 303 cases of the disease were confirmed in the years studied and that 60.7% of these cases occurred in the months of August to November. As justification for this, the warmer and less rainy climate was cited, which makes the environment more conducive to the propagation of the vector insect, the increase in deforestation during this time and the beginning of the açaí harvest, which is often handled inappropriately in terms of its sanitary aspect, and its "wine" can be a means of oral transmission of the disease. Thus, due to the agreement of the studies discussed, it is possible to state that the period of greatest risk of DCA contamination in the municipality of Belém is the months of August to November.

In this study, the results also show that oral contamination was the most present mode of infection during the years studied, representing 31 of the 35 cases of the disease. Thus, it was possible to observe that oral contamination represented 88.57% of cases that occurred in the years studied. In 2021, there were 18 confirmed cases, 16 due to oral contamination, 1 case due to vector contamination, and 1 case was ign/blank. In 2022, there were 17 confirmed cases, 15 due to oral contamination, 2 ign/blank and no cases due to vector contamination. This shows that the main means of spreading DCA in the region is related to the hygienic-sanitary aspects of food. Figure 3 shows the number of cases by mode of infection in the years studied.

Figure 3 - Confirmed cases of acute Chagas disease in the municipality of Belém according to mode of infection in 2021 and 2022.



Source: Authors, 2024.

Oral contamination, although it is the form of contamination with the highest number of cases when analyzing the two years in general, showed a tendency to have more

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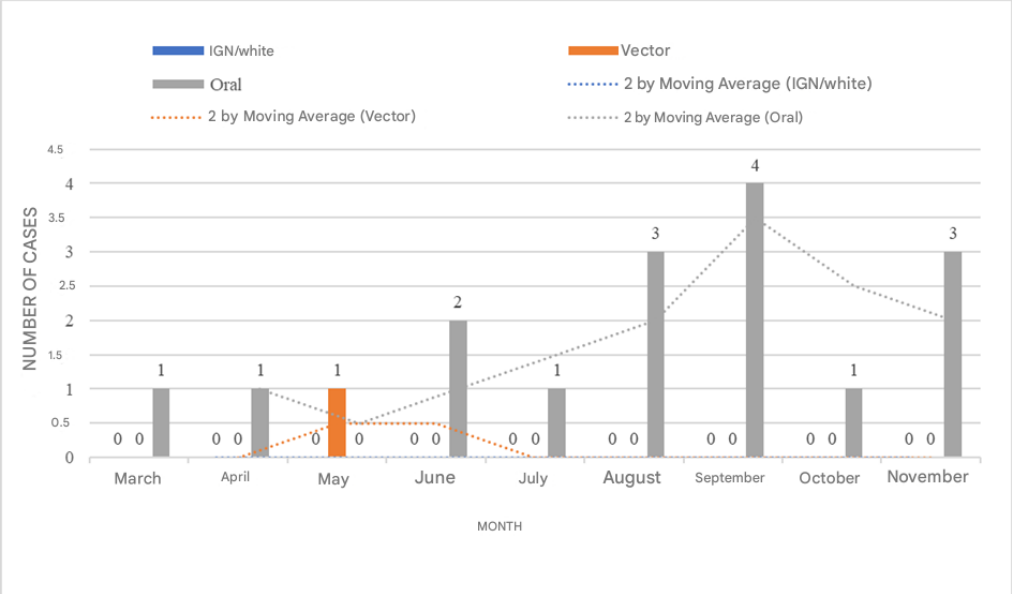
notifications in the second half of the year compared to the first. Of the 31 notifications of oral contamination, 22 were between the months of August and November. In 2021, out of a total of 16 oral contaminations, 11 were in months of the second half of the year, being distributed as follows: 3 in August, 4 in September, 1 in October and 3 in November. In 2022, 11 oral contaminations were also recorded in the second half of the year: 2 contaminations in August, 5 in September, 3 in October and 1 in November. Figures 4 and 5 show the types of contamination during the months of 2021 and 2022, respectively.

Figure 4 - Types of contamination by acute Chagas disease in the months of 2021.



Source: Authors, 2024.

It was observed that there is a non-conformity regarding the data released by the DATASUS system. The total number of cases in 2021 shown when using the combination of the filters "year of first symptom" and "probable mode of infection" (Figure 3) totaled 18 cases, 16 oral, 1 vector, and 1 IGN/blank. However, when the filters "month of first symptom" and "probable mode of infection" (Figure 4) are combined, they total only 17 cases, 16 oral and 1 vector, the IGN/white case is no longer identified. This incompatibility can be observed by analyzing figures 3 and 4 of this study.

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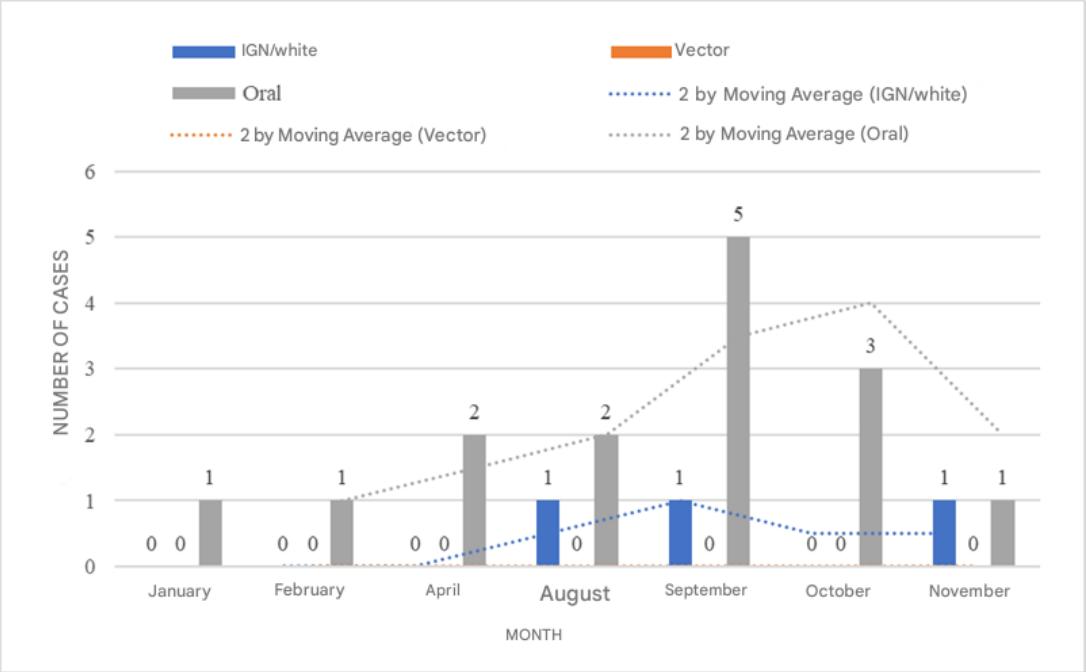
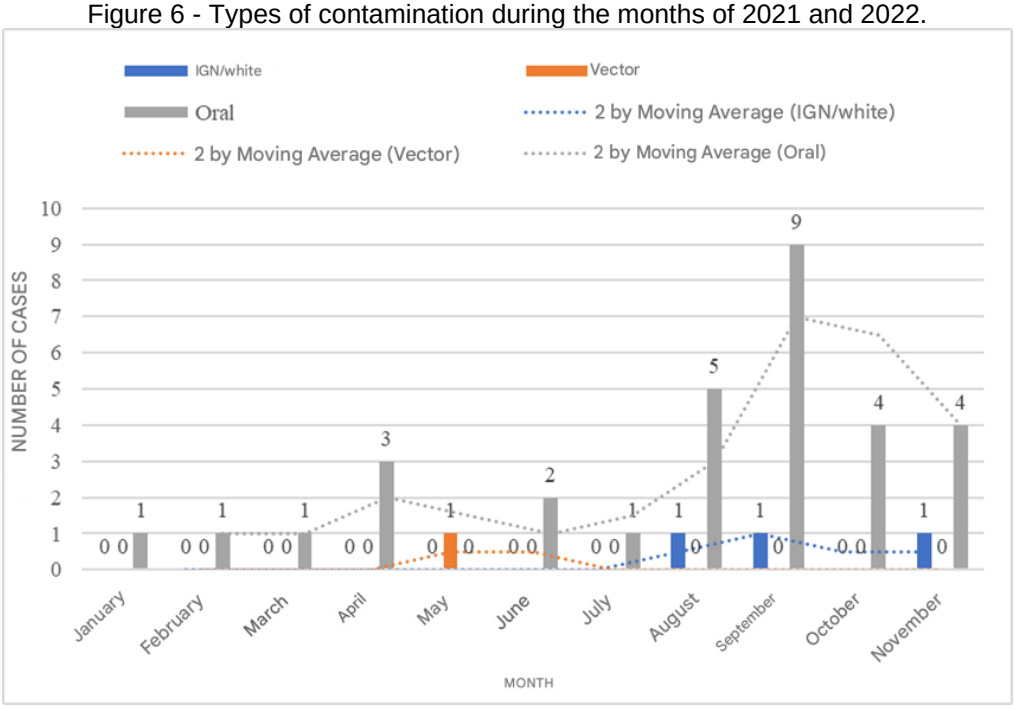
Figure 5 - Types of contamination by acute Chagas disease in the months of 2022.



Source: Authors, 2024.

Figure 6 shows the cases of Chagas disease and types of contamination during the months of 2021 and 2022.

Figure 6 - Types of contamination during the months of 2021 and 2022.



Source: Authors, 2024.

Oral contamination is currently the main form of transmission of Chagas disease, especially in the Amazon region. A possible explanation would be the habitual consumption

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of foods that are commonly associated with acute chagasic contamination, such as: sugarcane juice, açaí, açaí juice, guava juice and bacaba "wine". Açaí, in turn, is considered to be the most responsible for outbreaks of the disease in the Amazon region, so the period of greater oral contamination is directly related to the period of greater consumption of açaí (PACHECO, 2021; PARENTE, 2020). It is worth mentioning that, although açaí is very attractive to the "kissing bug" triatomine, the transmission of the disease by this food is related to improper handling and neglected hygienic-sanitary processes during the processing of the fruit.

Santos (2019) shows that the high cost of maintaining the bleaching method, the main safety measure against Chagas disease in açaí production, means that this procedure is not performed by some producers, especially those from lower-class neighborhoods, which exposes the most socioeconomically vulnerable population to an increased risk.

It is important to adopt protective measures to prevent the transmission of *T. cruzi* through açaí juice sold by local merchants and produced at home. These actions must be supported and supervised both by the responsible agencies and by the population itself, to ensure the safety and well-being of consumers. This is fundamental, because açaí juice, if mishandled, can transmit the disease and is closely linked to the local culture, being an important part of traditional food and contributing to the generation of employment and income in the state of Pará (ASSIS; LIMA, 2024; CORDEIRO, 2024).

In this sense, the government of the state of Pará has adopted quality control measures, such as the State Açaí Quality Program (PEQA), established by Decree No. 2,475, of 09/10/2010, under the coordination of the Secretariat of Agricultural Development and Fisheries (SEDAP), with the objective of promoting actions to develop the trade and consumption of açaí (PARÁ, 2010). In addition, State Law No. 7,655, of 10/25/2011, which provides for standards for processing establishments and commercialization of artisanal foods of animal and vegetable origin, and State Decree No. 326 of 01/20/2012, which establishes the standards for the artisanal processing of açaí and bacaba, establish the requirements for the regulation of açaí commercialization points and the hygienic-sanitary requirements for the optimal handling of the fruit seeking to prevent diseases transmitted by food (PARÁ, 2011; PARÁ, 2012).

However, in view of the results of the data presented and the number of cases of acute Chagas disease transmitted through oral contamination and probable transmission

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through açaí, it calls into question the efficiency of the measures adopted and the compliance with current regulations regarding the quality control of the fruit.

CONCLUSION

The scenario of acute Chagas disease in the municipality of Belém/Pará was worrisome due to the number of diagnosed cases and the incidence rate verified in the period that the study proposed to analyze.

The main means of contamination of acute Chagas disease was by oral transmission, probably due to the frequent consumption of food and beverages associated with the presence of feces and urine of the "kissing bug" or even the triatomine itself.

The months of August to November had the highest numbers of confirmed cases, and an increase in notifications of contamination by oral transmission was also noticed in these months. Other forms of contamination remained stable during the year.

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REFERENCES

1. Alexandre, K. V., et al. (2023). Medidas profiláticas da Doença de Chagas e regiões de maior presença do *Trypanosoma cruzi*. *Revista Brasileira Interdisciplinar de Saúde–ReBIS, 5*(4).

2. Almeida, M. L., et al. (2024). Epidemiologia da Doença de Chagas aguda no Brasil entre 2013 e 2023. *Revista Eletrônica Acervo Saúde, 24*(4), e15955. https://doi.org/10.25248/reas.e15955.2024

3. Assis, S. N., & Lima, R. A. (2024). Doença de Chagas: Uma reflexão sobre o processamento artesanal e industrial do açaí. *Revista Valore, 9*.

4. Cordeiro, R. A. M., et al. (2024). Influência da produção do açaí (*Euterpe oleracea* Mart.) na geração de renda e fortalecimento da agricultura familiar. *Observatório de la Economía Latinoamericana, 22*(6), e5289. https://doi.org/10.55905/oelv22n6-029

5. Correia, J. R., et al. (2021). Doença de Chagas: Aspectos clínicos, epidemiológicos e fisiopatológicos. *Revista Eletrônica Acervo Saúde, 13*(3), e6502. https://doi.org/10.25248/reas.e6502.2021

6. da Costa Matos, D., et al. (2024). Contexto brasileiro da Doença de Chagas: Perspectivas atuais sobre epidemiologia, vetores e diagnóstico. *Brazilian Journal of Implantology and Health Sciences, 6*(5), 455–467.

7. de Moraes, J. C., et al. (2020). Registro epidemiológico da Doença de Chagas aguda no município de Belém-Pará no período de 2007 a 2017. *Brazilian Journal of Health Review, 3*(4), 9117–9127. https://doi.org/10.34119/bjhrv3n4-225

8. Ferreira, A. M. (2021). *Doença de Chagas* (Unpublished doctoral dissertation). [Institution details incomplete; further information needed for full citation].

Revista ARACÊ
ISSN: 2358-2472

9. Gomes, G., et al. (2020). Perfil epidemiológico da Doença de Chagas aguda no Pará entre 2010 e 2017. *Pará Research Medical Journal, 4*, 0–0.

10. Gonçalves, W., et al. (2021). Caracterização epidemiológica das mortes por Doença de Chagas ocorridas no Brasil no período de 2010 a 2019. *Research, Society and Development, 10*(10), e592101019096. https://doi.org/10.33448/rsd-v10i10.19096

11. Instituto Brasileiro de Geografia e Estatística. (2022). *Censo demográfico: Características da população e dos domicílios*. Belém, Brazil: IBGE. Retrieved September 18, 2024, from https://www.ibge.gov.br/cidades-e-estados/pa/belem.html

12. Martins, I. F., & de Pina Costa, A. (2022). Perfil epidemiológico da Doença de Chagas aguda no Brasil entre 2009-2019. *Pubvet, 16*(5). https://doi.org/10.31533/pubvet.v16n05a1139.1-10

13. Nascimento, L. P. G. R., et al. (2021). Prevalência da Doença de Chagas associada ao modo de infecção. *Cogitare Enfermagem, 26*, e73951. https://doi.org/10.5380/ce.v26i0.73951

14. Organização Mundial da Saúde. (2024). *Doença de Chagas (também conhecida como tripanossomíase americana)*. Retrieved September 20, 2024, from https://www.who.int/publications/i/item/chagas-disease-fact-sheet-(portuguese-pdf).pdf

15. Pacheco, L. V., et al. (2021). Transmissão oral da Doença de Chagas: Uma revisão de literatura. *Research, Society and Development, 10*(2), e31910212636. https://doi.org/10.33448/rsd-v10i2.12636

16. Pará. (2010). *Decreto nº 2.475, de 10 de setembro de 2010*. Dispõe sobre a implementação do programa estadual de qualidade do açaí, e dá outras providências. Retrieved October 3, 2024, from https://www2.mppa.mp.br/sistemas/gcsubsites/upload/94/decretos%20estaduais/PA%20Decreto%20n%C3%82%C2%A6%202_475,%20de%2009%20de%20setembro%20de%202010.pdf

Revista ARACÊ
ISSN: 2358-2472

17. Pará. (2011). *Lei nº 7.565, de 25 de outubro de 2011*. Dispõe sobre normas para licenciamento de estabelecimentos processadores, registro e comercialização de produtos artesanais. Retrieved October 3, 2024, from https://www.legisweb.com.br/legislacao/?id=208571

18. Pará. (2012). *Decreto nº 326, de 20 de janeiro de 2012*. Dispõe sobre requisitos higiênicos sanitários para a manipulação de açaí e bacaba por batedores artesanais. Retrieved October 3, 2024, from https://www.legisweb.com.br/legislacao/?id=233159

19. Parente, M. F., et al. (2020). Cenário epidemiológico da Doença de Chagas no Estado do Pará, Brasil. *Brazilian Journal of Health Review, 3*(1), 1223–1234. https://doi.org/10.34119/bjhrv3n1-097

20. Rodrigues, A. D. D. P. S., et al. (2021). Cenário da Doença de Chagas aguda na Região Geográfica Intermediária de Belém/PA. *Brazilian Journal of Development, 7*(12), 111225–111239. https://doi.org/10.34117/bjdv7n12-075

21. Santos, D. R., de Sousa Gonçalves, D. L., & dos Santos, W. L. (2022). Doença de Chagas: Uma revisão integrativa. *Revista JRG de Estudos Acadêmicos, 5*(10), 1–15. https://doi.org/10.5281/zenodo.6783579

22. Santos, P. C. (2019). *Produção do vinho de açaí no município de Belém: Boas práticas de processamento e transmissão oral da Doença de Chagas* (Unpublished doctoral dissertation). [Institution details incomplete; further information needed for full citation].

23. Silva, A. B., et al. (2024). Entraves que permeiam a Atenção Primária à Saúde para o manejo e controle da Doença de Chagas no Brasil. *Revista Eletrônica Acervo Saúde, 24*(7), e17773. https://doi.org/10.25248/reas.e17773.2024

24. Vasconcelos, A. C., Cartágenes, S. C., & da Silva, T. F. (2022). Açaí e a transmissão da Doença de Chagas: Uma revisão. *Research, Society and Development, 11*(16), e532111638638. https://doi.org/10.33448/rsd-v11i16.38638