

The Epidemiological Profile of Acute Chagas Disease in the State of Pará from 2013 to 2017

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Abstract— Objective: This research aimed to know the epidemiological aspects of acute Chagas disease in the state of Pará between 2013 and 2017. Method: This is a descriptive and documental study, with a quantitative approach, based on data from the National Information System of Acute Notification (SINAN). Results: The health regions with the highest number of reported cases of Acute Chagas Disease were reported, and it was possible to investigate the epidemiological aspects in the regions of Tocantins, Marajó II and Metropolitan I, leading the municipalities of Ananindeua, Breves, Abaetetuba, Belém, Cametá,

Igarapé Miri; between the months of August and November, coinciding with the harvest of açaí in the State. The socioeconomic profile of the individuals that the disease most affects is the male gender, between 20 and 39 years, with prevalence in the brown race. The most frequent mode of transmission is oral, its confirmation by laboratory tests. Conclusion: With this, the areas where high numbers of cases of the disease are occurring were identified, which need greater attention from the Health Secretariats, to elaborate preventive and educational measures, becoming the biggest challenge when fighting Chagas Disease and its chronification in the State of Pará.

Keywords— *Epidemiological Profile, Chagas Disease, Notification in SINAN.*

I. INTRODUCTION

Chagas disease or American Trypanosomiasis is a parasitosis caused by the protozoan *Trypanosoma cruzi*; an anthroponosis of high prevalence and expressive morbimortality; it presents clinical manifestations resulting from the evolutionary process of infection, which are evidenced and characteristically described in two distinct stages, called acute phase and chronic phase (Brazil, 2017).

The mode of transmission of Chagas' disease so far detected are the most diverse, including the classic or vector form, which occurs when *Trypanosoma cruzi* is eliminated by triatomine feces after blood repast (Souza; Pova, 2016). However, there are other forms of transmission called secondary, i.e., other routes outside the classic biological cycle of the parasite (Brazil, 2017).

The form of oral transmission of the disease is represented as the most serious medium, as it has a marked parasitic load in relation to the other contamination routes. As a result, the epidemiological profile assumes a new form due to the ingestion of food contaminated with the presence of the parasite or the presence of feces in the (core of) açaí, when there is not the proper sterilization of this food (Simões et al., 2017).

Thus, Barreto et. al. (2015), state that the disease affects 6-7 million people worldwide, with an annual incidence of 28,000 cases in the Americas; Chagas disease is endemic in 21 Latin American countries, but has spread to other continents due to the migration of infected people. Chagas disease presents an epidemiological profile in the state of Pará characterized by outbreaks of oral transmission in the municipalities of the state. This form of transmission shows the epidemiological complexity of this disease, whose records, from 2007 to 2014, identify 884 acute and chronic cases of the disease in 39 municipalities in the state, and in the microregion of Belém, about 130 new and autochthonous cases are reported annually (Júnior et al., 2017).

The Northern region of Brazil contributed with the highest percentage of cases in the country with 91.1% confirmed notifications of Chagas disease (CD), being

registered in the state of Pará about 75% of all cases occurring in Brazil, and more than 50% of people manifest the onset of symptoms between the months of August and November because it is the period that corresponds to the harvest of açaí in the state of Pará (Brazil, 2015).

Epidemiological surveillance has detected cases of oral transmission, especially in the north of the country, where there is an increase in ecotourism by tourists from several countries. The Amazonian cuisine of indigenous origin is appreciated, among them açaí. Thus, many tourists may be being exposed to the risk of contracting Chagas disease, ultimately increasing the number of contaminated people in non-endemic countries (Ferreira; Branquinho; Leite, 2014).

From the problem in question, we bring as a question of research: what are the epidemiological aspects of acute Chagas disease in the state of Pará between 2013 and 2017?

The choice of the subject occurred during our research on the subject in general, when we realized that there were few scientific papers that addressed the epidemiological profile of Chagas disease in the country and especially in the northern region. In this sense, we were stimulated by the interest in the topic of conducting this research, which allowed us to have a current vision of CD disease in the state of Pará.

In this sense, the objective of this study was to know the epidemiological aspects of acute Chagas disease in the state of Pará between 2013 and 2017.

II. METHOD

It is a descriptive study, of the documental type with quantitative approach, which had as scenario the state of Pará, which is situated in the North region of Brazil, with extensive area of rain forest, and tropical climate. The state has six Meso-regions comprising 22 Microregions, in a total of 144 municipalities. Pará has an area of 1,247,955.381 km² and an estimated 8,272,724 inhabitants in the year 2016 (IBGE, 2016).

The data collection was carried out through a documental research, using the database in the Aggravates Notification Information System (SINAN-NET) in the period 2013-2017, seeking to identify some variables such as: the number of cases notified and confirmed by municipalities, likely oral route infection and evolution of deaths, age group, race, likely site of infection, likely mode of infection (transfusion, vector, vertical and accidental).

The inclusion criterion used was all cases of Acute Chagas Disease (ACD) notified and confirmed in SINAN, which occurred in the state of Pará, during the period proposed by the survey; and exclusion of all cases notified unconfirmed from the ACD by SINAN; in addition to cases notified and confirmed outside the period proposed by the survey.

The data analysis was performed through a descriptive survey where a spreadsheet was used in the Microsoft Excel program of Windows version 2013 and the result plotted in tables and graphs.

Regarding the ethical and legal aspects, the study obeyed Resolution 510/16, which provides on the rules applicable to research in human and social sciences in its sole paragraph, which states that "will not be registered or evaluated by CEP/CONEP. Research using publicly accessible information, under the terms of Law No.

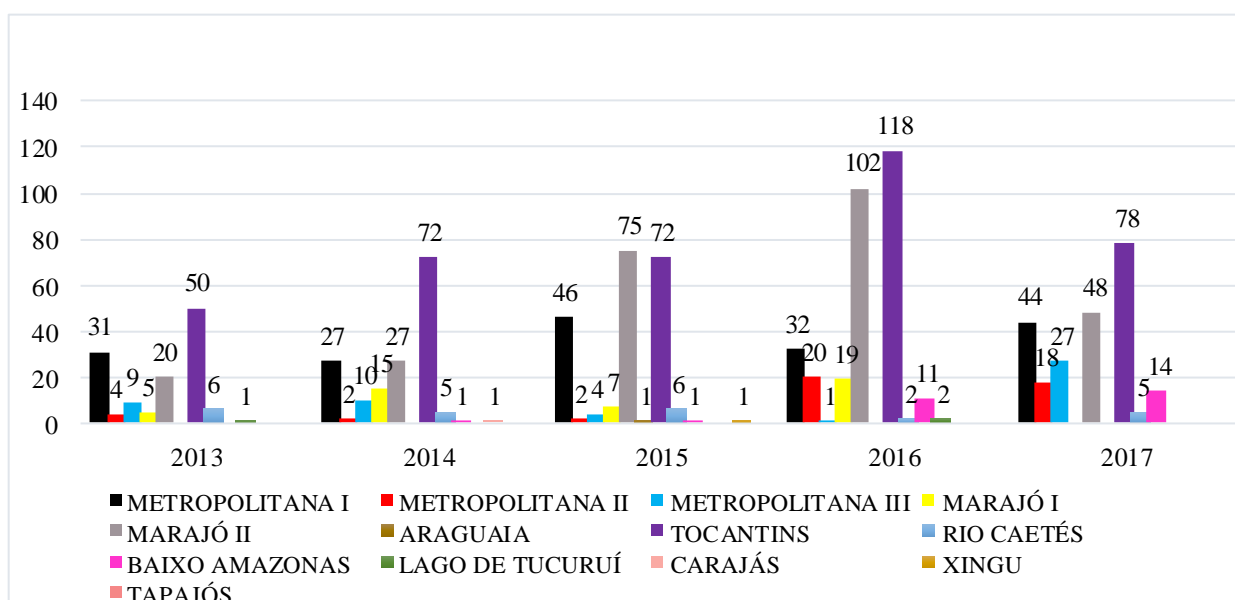
12,527/11", so there was no need for approval by the ethics committee.

The risks were not feeding the system with the notifications of cases for investigation of the disease and aggravated compulsory notification. The benefits of the research were to obtain information on the current epidemiological situation of Chagas disease in the state of Pará and to propose better preventive measures to reduce the number of cases.

III. RESULTS

During the last 5 years analyzed here, the region with the highest number of reported cases of Chagas Acute disease was Tocantins, with 390 notifications during the survey period; followed by the Marajó II region with 272 cases (Graph 1).

Graph 1: Presents the distribution of confirmed cases of Chagas Acute disease, according to the regions of reported occurrences between 2013 and 2017 (Pará, Brazil, 2019).

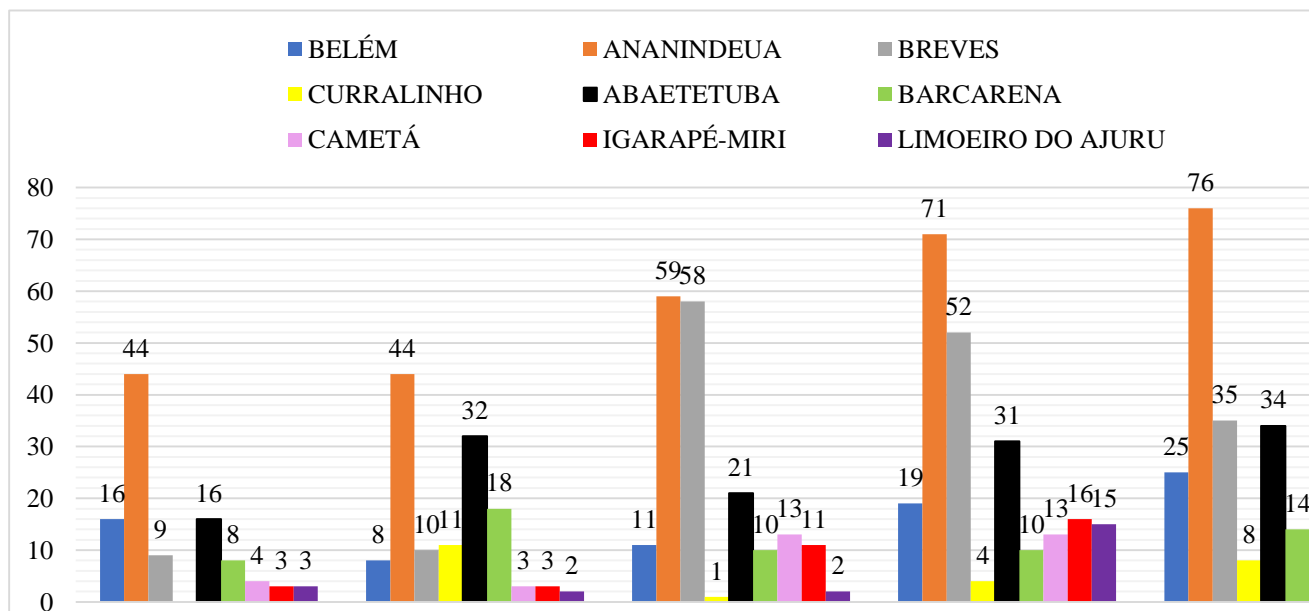


Source: Elaborated by the authors of the research, with data from the SINAN (2019).

Analyzing data from the municipalities of the health regions from 2013 to 2017, a higher number of notifications were found in the following municipalities: Ananindeua - with 294 cases, followed by Brief - 164

cases, Abaetetub - with 134 cases, Belém with 79 cases, Cametá with 48 cases, Igarapé-Miri with 44 cases; throughout the entire period studied (Graph 2).

Graph 2: Distribution of Chagas' disease Acute, according to the municipalities in the health regions with the highest number of notifications: Metropolitan I, Marajó II and Tocantins in the period from 2013 to 2017. (Pará, Brazil, 2019).

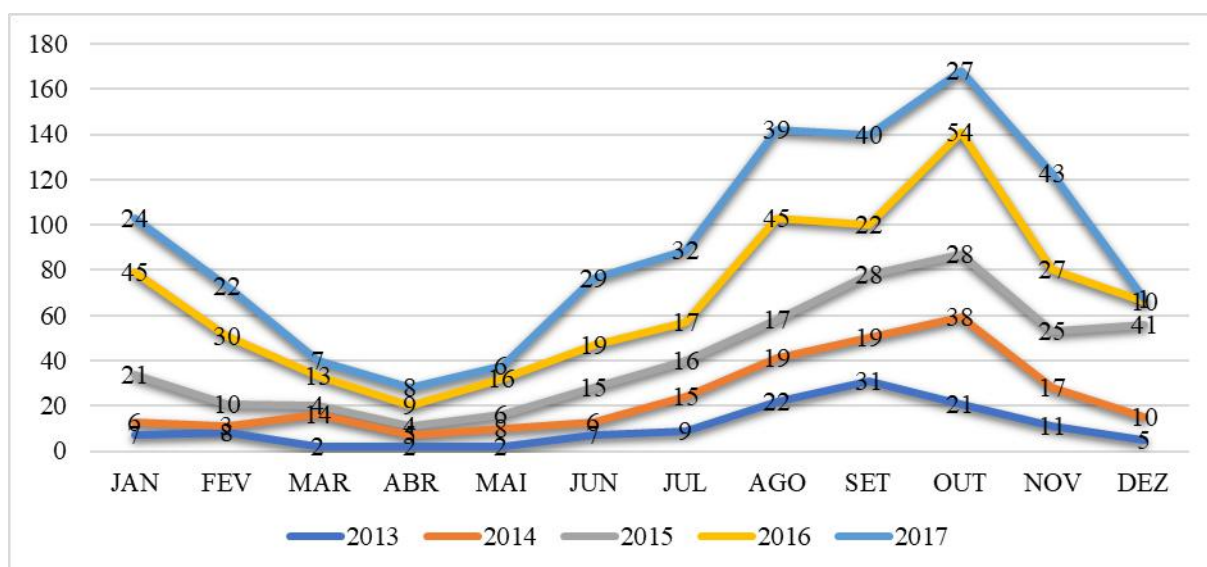


Source: Elaborated by the authors of the research, with data from the SINAN (2019).

According to graph 3, it is observed that the numbers of reported cases of Chagas Acute disease occur every year in the month of January, showing a high rate of notification of cases of the disease, and having a sharp

drop over the months until April. From the month of May, there was a growing increase in the number of cases, and in the month of August to November there was the highest incidence of notifications in all the years studied.

Graph 3: Distribution of confirmed cases of acute Chagas disease, notified in the period 2013 to 2017 according to the month of notification (Pará, Brazil, 2019).



Source: Elaborated by the authors of the research, with data from Sistema de Informação de Agravos de Notificação - SINAN (2019).

Table 1 presents the distribution by gender, age group and race. It is observed that the disease reached more the male sex, with 608 cases; the female one registers 483 cases. In relation to the age group, it was observed that there was more occurrence in people between 20 and 39 years of age - with 385 cases; followed by the group from

1 to 19 years of age - with 314 cases; and the age group from 40 to 59, with 258 cases. In the issue related to racial ethnicity, the brown race was highlighted, with 682 cases; followed by the black race, with 269 cases; and the white race with 88 cases.

Table 1: Sociodemographic profile of individuals reported with Chagas disease in Pará, according to the month and year of the first symptom, from 2013 to 2017 (Pará, Brazil, 2019).

Variables	2013	2014	2015	2016	2017	Total	%
Gender							
Male	77	88	120	170	153	608	55,7%
Female	49	72	95	137	130	483	44,3%
Age range							
White skin/Ign	-	-	-	-	-	-	-
<1 ano	1	1	3	2	-	7	0,64%
1 – 19	38	50	37	96	93	314	28,7%
20 – 39	42	60	77	114	92	385	35,2%
40 – 59	31	28	58	69	72	258	23,6%
60 +	14	21	21	26	26	108	9,89%
Race							
Ign/White skin	-	4	7	6	2	19	1,74%
White skin	11	19	13	26	19	88	8,06%
Black skin	4	7	3	12	243	269	24,6%
Yellow skin	1	2	1	-	1	5	0,45%
Brown Skin	85	128	190	262	17	682	62,5%
Indigenous	1	-	1	1	1	4	0,36%

SOURCE: Elaborated by the authors of the research, with data from Sistema de Informação de Agravos de Notificação - SINAN (2019).

In table 2, it can be observed that the most frequent mode of transmission highlighted was through the oral route with 866 cases, having as confirmation criteria in its

majority laboratory tests that count 1,145 cases. Thus, the disease presents a low lethality and a high morbidity and mortality.

Table 2: Distribution of cases of acute Chagas' disease, according to: mode of infection, criteria for confirmation and evolution, reported from 2013 to 2017 (Pará, Brazil, 2019).

Variables	2013	2014	2015	2016	2017	Total	%	
Infection mode								
Ign/ white skin		31	31	17	41	-	120	10,9%
Transfusion		-	-	-	-	-	-	-
Vector		11	17	23	5	26	82	7,51%
Vertical		-	-	-	-	-	-	-
Accidental		-	-	-	-	1	1	0,91%

Oral	83	112	175	260	236	866	79,3%
Other	1	-	-	1	-	2	0,18%
Criteria for confirmation							
Ign/white skin	3	3	2	9	4	21	1,92%
Laboratory	119	151	205	393	277	1.145	104,9%
Clinical-epidemiological	3	6	8	5	13	35	3,20%
In research	1	-	-	-	3	4	0,36%
Evolution							
Ign/white skin	12	11	15	21	42	101	9,25%
Alive	112	146	197	280	239	974	98,2%
Death by the notified bill of review	2	3	3	6	2	16	1,46%
Death from another cause	-	-	-	-	-	-	-

SOURCE: Elaborated by the authors of the research, with data from Sistema de Informação de Agravos de Notificação - SINAN (2019).

Regarding the mode of evolution of Chagas' disease, it can be observed that the largest portion of 974 cases evolved to remission of clinical manifestations, while 101 ignored or white cases and 16 cases resulted in deaths by the reported wrongdoing.

IV. DISCUSSION

We found that in the year 2013 to 2017 the health region with the highest number of reported cases of acute Chagas disease was the Tocantins region with 390 cases; followed by the Marajó II region with 272 cases. The Regional Health Units are 13 administrative units of the State Health Secretariat of Pará (SESPA) distributed throughout the state, aiming at decentralizing services and reducing geographical barriers to better serve the citizen (Sespa, 2019).

According to Freitas (2016), Pará is one of the states of Brazil in the northern region of the country, considered the largest portal of access to the Brazilian Amazon, whose capital is Belém. It is composed of 6 mesoregions, divided into 22 microregions, with 144 municipalities, having approximately 1,248,042 Km² is the second largest state in Brazil.

The Marajó II Health Region has 285,389 inhabitants, distributed in 07 municipalities (Portel, Bagre, Currealinho, Anajás, Breves, Melgaço and Gurupá); about 61.61% of the population lives below the poverty line, with an economically active population of 5.35% in the 18-29 age group; and 7.88% in the 30-64 age group, with an illiteracy rate of 3.75% of the population. The regional gross

domestic product (GDP) per capita R\$ 18,820.00. The region presents many social problems, including sanitary conditions: child labor, insufficient water and sewage services, and lack of selective garbage collection (Sespa, 2016).

The Metropolitan Health Region I has 2,039,298 inhabitants in 05 municipalities (Belém, Ananindeua, Marituba, Santa Bárbara do Pará and Benevides), with regional per capita GDP of R\$ 10,233.00, with 22.97% of the population having formal employment; 19.26% below the poverty line, which corresponds to 392,706 inhabitants; with an illiteracy rate of 5.3%. Regarding the urban sanitary situation of the region, 90.7% of the sanitary exhaustion is done by general or pluvial net, and in the rural area it has 9.3% of the sanitary exhaustion (Sespa, 2016).

In the Tocantins Health Region, it has 605,119 inhabitants, with 10 municipalities. It is composed by Barcarena, Abaetetuba, Igarapé-Mirim, Cametá, Moju, Oeiras do Pará, Thailand, Baião, Mocajuba and Limoeiro do Ajuru, with the economically active population in the age group of 18 to 29 years, which corresponds to 14.14% of this total; 30 to 64 years, 21.93%. However, only 0.16% of the population works in formal employment; 53.47% of the population lives below the poverty line, which corresponds to 261,450 inhabitants. The rate of child labor is 12.54%, and of illiteracy is 14.3%. Only 65.37% of the urban area is supplied with drinking water; while in the rural area, 15.41% is supplied by a general distribution network (Sespa, 2016; IBGE, 2017).

The results indicate that Chagas Acute Disease has been occurring over the years with the increase in the number of notified and confirmed cases, with the highest number of confirmed cases being 2016, with 327 cases. In the period 2000 to 2016, 16,807 (suspected cases) were notified in 130 of the 144 municipalities in the state of Pará, and 2030 confirmed cases of Chagas' Disease acute in 81 of these municipalities in the state (Santos, 2017).

In relation to the municipalities with the highest number of reported cases of acute Chagas disease, Ananindeua, Breves and Abaetetuba are the most prominent. Adding to our study, the Council of Municipal Health Departments of the State of Pará emphasizes that between 2013 and 2017, eleven of the thirteen health regions presented notifications of acute Chagas disease, with Metropolitan Regions I, Tocantins, Marajó I and II standing out with the highest number of cases, and among them the municipalities most affected: Ananindeua, Abaetetuba, Breves, Belém, Barcarena, Cametá and Igarapé-Miri (Consems-Pa, 2018).

The municipalities of Pará as Abaetetuba, Igarapé-Miri, Cametá, Moju and Barcarena and Marajó archipelago (Portel, Ponta de Pedras and Anajás) stand out in the production of açaí in Pará, supplying the fruit to the metropolitan region. In Belém, the daily consumption is around 200,000 liters/day in the harvest period, being the second most consumed food in the capital. The processing of açaí in Pará is done by hand (beaters), with extraction of the pulp of the fruit with the help of a pulping machine (Santos, 2017).

According to IBGE (Brazilian Institute of Geography and Statistics), the production of açaí in the State of Pará has increased over the years, being the largest producer, with over 13,000 producers; responsible for 54% of national production, reaching around 800,000 tons per year (Tavares, Homma, 2015; IBGE, 2017).

Extractivism is an important socioeconomic role for the State of Pará, highlighting the management of açazais. Around 25,000,000 families carry out activities related to the extraction, transportation, marketing and industrialization of the fruit, because in addition to the regional market, it meets national and international demand. Food subsistence is guaranteed by fish, açaí pulp, water flour (Brandão, 2015). Among the various plant resources, açaí is considered the staple food of riverine populations and low-income families (Mendonça, Bernardes & Del Bianchi, 2014).

In studies related to etiological agents in the processing of açaí, it was found that the fruit is very exposed during its handling. Throughout the pulp production chain, the main

problems are: contamination from technical and hygienic problems; sanitary deficiencies to which the pulp is submitted in small artisan establishments, compromising the health of consumers (Silva, Ferreira & Lacerda, 2017).

The months in which the highest number of notifications occurred are related to the period of the açaí harvest in the state of Pará. Collaborating with our study, Santos et al. (2018), Júnior et al. (2017), Souza & Povoá (2016), Brazil (2015), highlight that acute Chagas disease presents itself: in the first semester with a lower number of notifications, indicating a seasonal pattern of the disease; having an increase in the second semester between the months of August and December, coinciding with the period of higher production of Açaí in the state of Pará.

Thus, the Northern region presented in the period 2012-2016 the highest proportion of cases in the country with 97.1% between the months of August and February of the following year, considering the national average in this period which is 79% of reported cases of Chagas disease (Brazil, 2019).

Thus, Ferreira, Branquinho & Leite (2014), warns about the problem that guides the sanitary quality in pulp processing, because açaí is often involved in the oral transmission of CD, damaging the national / international marketing.

On the other hand, Guimarães et al. (2017), argue that CD is a major public health problem in the Amazon region due to its vast area of forest and associated with the common disorderly deforestation in the region, which contributes to the growth of the vectorial population, consequently contributing expressively to the emergence of endemic outbreaks in the region. Marin-Neto (2017), points out that deforestation has contributed to the contact of people with new types of hematophagous insects that start to inhabit the homes in general of the poorest with precarious housing.

We observed that the acute Chagas disease reaches more the male sex with 608 cases in relation to the female, with 483 cases. In relation to the age group, it was observed a greater involvement in people between 20 and 39 years old with 385 cases, in which the breed stood out the brown with 682 cases of disease. Reinforcing our data, the epidemiological bulletin of Acute Chagas' Disease of 2019, presents the age group between 20 and 49 years with a predominance of individuals called black and brown (Brazil, 2019).

In the same sense, Júnior et al. (2017), Santos et al. (2018), speak of the epidemiological profile of Chagas Disease in the period from 2007 to 2014: it affected more brown people, in the adult age group of 18 to 59 years,

having its main form of oral contamination associated with the ingestion of contaminated regional fruit juices, such as açai and bacaba.

We observed that epidemiological aspects of Chagas disease in the state of Pará showed high oral transmission with 866 cases confirmed by laboratory tests. Regarding the evolution of the disease, the chronic/live form stands out, with 974 cases and 16 cases resulting in deaths by the reported wrongdoing.

Most of the cases reported in Brazil between 2000 and 2013 came from the State of Pará, with 87.5% of the Chagas disease (CD) records, and it was observed that the most frequent form of contamination was oral transmission in all years. However, 20% of the cases were closed with the form of transmission ignored or not filled in this field in the notification form (Brazil, 2015).

According to Souza & Pova (2016), the Ministry of Health considers Chagas disease a public health problem, considering that from 2000 to 2013 there were 1,570 cases of the disease in Brazil, 1,081 people contracted it orally, 100 by the vector form, 6 vertical, 372 ignored and 11 by other forms. The northern region of the country contributed in this period with 1,430 reported cases of the disease, in the form of isolated outbreaks in family groups related to oral contamination.

Barreto et. al. (2015), argue that mortality in infected patients in Brazil occurs mainly acutely due to oral contamination, adding 8 to 35% of confirmed cases, compared to the classic form of transmission through the vector at the time of blood repast and deposition of excreta, adding 5 to 10% of cases.

Most individuals diagnosed with Chagas' disease in Brazil are chronic, although in recent years, Acute Chagas' disease has occurred in an expressive manner, generally related to the consumption of typical foods from the Amazon region contaminated by the pathogen, such as sugarcane juice, açai and buriti (Júnior et al., 2017).

The epidemiological surveillance has records of repeated outbreaks by oral transmission in family and community groups, related to the consumption of açai or bacaba, which are food habits of daily cultural food and subsistence of the riverside population of Pará (Santos, 2017).

The form of oral transmission of the disease is represented as the means of greater severity, because it has a marked parasite load in relation to other contamination routes, due to the characteristic of the upper digestive tract provide an area of increased absorption by the circular folds, villi and microvilli, making it much more permeable

to the parasite. As a result, the epidemiological profile takes on a new form, due to the ingestion of food contaminated with the presence of the parasite or feces such as açai, due to the lack of adequate hygienic conditions (Simões et al, 2017).

V. CONCLUSION

This study made it possible to know: the clinical and epidemiological profile of acute Chagas disease within the State of Pará, identifying the health regions with the highest number of reported cases of acute Chagas disease, whose highest rates are the regions of Tocantins, Marajó II and Metropolitan I, where they lead the municipalities of Ananindeua, Breves, Abaetetuba, Belém, Cametá, Igarapé Miri.

As for the epidemiological aspects, the disease affects more the male sex, between 20 and 39 years, with greater prevalence in the brown race. Regarding the epidemiological aspects, the most frequent mode of transmission was by oral route, with the criterion of confirmation by laboratory tests, and the mode of evolution was through clinical manifestations.

We have shown that the increase in the number of cases over the years in the state of Pará may be related to the consumption of açai, bearing in mind that the increase in cases of Chagas' disease coincides with the harvest of the fruit in the state between the months of August and November, which may be contributing to the current epidemiological situation of the disease.

The study allows identifying the areas where the greatest number of cases of the disease are occurring and where they need greater attention from epidemiological health departments. However, the elaboration of strategies is the main axis for the fight against the disease, alerting the sanitary surveillance to investigate in which part of the production chain of açai processing presents a failure, being evidenced that the contamination by oral means is related to the ingestion of contaminated açai, mainly in the most distant regions of the capital, where the fruit producing poles are concentrated. Preventive and educational measures have been the greatest challenge, becoming essentials for the combat, in order to reduce the chronification of the disease in the State.

It is relevant to identify the appropriate tools to ensure that the information used by managers enables the definition of public policies and action planning, so that SINAN data provide information very close to the reality experienced by the population, as a tool to support the planning of control actions. In this sense, we emphasize

that prevention campaigns should be intensified in the State of Pará.

Knowing the clinical and epidemiological profile of Chagas disease is what will allow the dissemination of the data collected for future scientific research, with the purpose of stimulating students and researchers interested in the subject to develop new research, also contributing as a source of information for health surveillance.

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