Cases of Chronic Chagas Disease in the State of Piauí according to the Public reference Laboratory in Health in the Period of 2013-2017

Jossuely Rocha Mendes¹, Jurecir da Silva²*, Tacyana Pires de Carvalho Costa³, Roberto Coelho de Farias⁴, Fabiano Vieira Alves⁵, Francisco Sylvestre Miranda Melo⁶, Rômulo Oliveira Barros⁷, Marcelo Cardoso da Silva Ventura⁸, Jacenir Reis dos Santos Mallet⁹, Gabriane Nascimento Porcino¹⁰

¹Specialist in public health and teaching in higher education. Faeme College. Graduated in biomedicine from the University Maurício de Nassau, PI, Brazil.
²Master in Tropical Medicine at Oswaldo Cruz Institute – IOC- FIOCRUZ, PI. Professor at the Federal Institute of Education, Science and Technology of Piauí, Brazil.
³PhD student in Biomedical Engineering at Brazil University. Professor at the Maurício de Nassau University, PI, Brazil.
⁴Master student in Tropical Medicine at Oswaldo Cruz Institute – IOC- FIOCRUZ, PI. Pharmaceutical-Biochemist at Central Public Health Laboratory Dr. Costa Alvarenga - LACEN, PI, Brazil.
⁵PhD student in Tropical Medicine at Institute Oswaldo Cruz – IOC- FIOCRUZ, RJ. Biomedic at Central Public Health Laboratory Dr. Costa Alvarenga - LACEN, PI, Brazil.
⁶Veterinary medicine student at the Federal University of Piauí. Sanitary inspection agent of the Municipality of Teresina, PI, Brazil.
⁷Specialist in Business Management from the Higher Education Center of Vale do Parnaiba. PI. Administration Assistant at the Federal Institute of Education, Science and Technology of Piauí, Brazil.
⁸Master in Biomedical Sciences from the State University of Maranhão. Professor at the Federal Institute of Education, Science and Technology of Piauí, Brazil.
⁹PhD in Parasitic Biology by the Oswaldo Cruz Foundation – FIOCRUZ, RJ. Coordinator of Fiocruz Regional Office, PI. Professor at the UNIG- University Iguacu, RJ, Brazil.
¹⁰PhD student in Immunology at Ribeirão Preto Medical School, University of São Paulo. PhD in Biological Sciences from the Federal University of Juiz de Fora, MG, Brazil.
*Correspondent Author

Abstract—Chagas Disease (CD) or American trypanosomiasis is a serious infectious disease that presents acute and chronic phases. In Brazil, acute cases of CD are compulsory notification to epidemiological surveillance. Between the years 2013 and 2017, in Piauí state, 350 cases were confirmed in chronic phase, which represent 26.8% of the acute cases registered in Brazil (1304 cases). Therefore, screening of Chagas disease in the chronic phase is of paramount importance for controlling the pathology.

Keywords—Cases Notification, Chagas Disease, Public Health.

I. INTRODUCTION

Chagas disease (CD) is serious infection caused mainly by the flagellate protozoan Trypanosoma cruzi, transmitted mostly by Triatome bugs. Oral contact, organ transplantation, blood transfusion, work accidents and vertical transmission may be other ways to contract the disease¹⁻².

The acute and chronic phases manifest asymptomatically or symptomatically¹⁴. Acute phase takes around 4 to 12 weeks, when the parasite might be found in the blood. The parasite multiply inside macrophages in spleen, liver, lymph node, myocardium and tissues, and may cause inflammatory reactions⁵. Chronic phase emerges after acute phase with decrease of IgM and increase of IgG antibody levels. In that moment the body already suffers great damage and treatment is compromised, what means less chance of cure⁶.

The World Health Organization⁷, estimates between 6 and 7 million people with CD worldwide,
highlighting 21 countries in Latin-America, mainly Argentina and Brazil. In the latter, epidemiological surveillance acts through the compulsory notification of cases of acute CD, however researchers have brought discussions on improvements in the reporting process, with the inclusion of chronic cases. In regard to the vector, the natural infections rate of triatomines by flagellates morphologically like Trypanosoma cruzi was around 183 of the 22,896 triatomines in captured inside houses in Piauí state in 2008. A research about main transmissible infectious diseases in serological screening at Blood Centers from Piauí in 2012, showed that out of 49,829 donations, 1,818 were blocked after serological tests and 177 had positive results to CD.

According to the described above, it is important to keep control of CD in the state. This study aims to report cases of chronic CD in Piauí state among the years 2013 to 2017, which do not require reporting, based on positive cases detected in a reference laboratory of public health.

II. MATERIAL AND METHODS

For this retrospective study, with a qualitative-quantitative approach, secondary data on the chronic form of CD from the reference laboratory in Public Health of Piauí, Brazil, dating from the years of 2013 to 2017, were used. The data were grouped by year and by the city where the patients were living. To define the distribution of people infected by CD per city in Piauí state, the software ArcGis was used.

The data were obtained through the records of the laboratory system, after careful analysis and proper authorization.

The ethical and legal aspects related to the phases of the research were respected according to the National Health Council under resolution 466/2012 and its complementary rules with Ethics Presentation Certificate number 2.962.707.

III. RESULTS

Over the years 2013 to 2017 there were 4029 suspected cases of CD in the reference laboratory of Public Health of Piauí, Brazil, and 350 of those were tested positive to the disease. The laboratory received and processed suspected samples of chronic CD, which were analyzed, and the diagnosis was confirmed by methods including ELISA, IFI and Chemiluminescence. The age range that showed the highest frequency of positive cases for both females (40.76%) and males (32.80%) was between 41 and 61 years old. However, among males the frequency was higher between 25-41 years old (25.40%) and above 61 years old (28.57%) compared to female (Table 1). In this study, it was not possible to identify gender and age of 4 patients (data not shown in the table).

Table 1 - Frequency of chronic CD according to age and sex in population from Piauí state, Brazil

| Age Range | Female Frequency (%) | Male Frequency (%) | Female + Male Frequency (%) |
|-----------|----------------------|-------------------|-----------------------------|
| 00|--11 | 4 | 44.4 | 5 | 55.6 | 9/ (100) |
| 11|--18 | 14 | 82.3 | 3 | 17.7 | 17/ (100) |
| 18|--25 | 14 | 45.2 | 17 | 54.8 | 31/ (100) |
| 25|--41 | 28 | 36.8 | 48 | 63.2 | 76/ (100) |
| 41|--61 | 64 | 50.8 | 62 | 49.2 | 126/100) |
| 61|--98 | 33 | 37.9 | 54 | 62.1 | 87/(100) |

95% CI | 3.8 to 48.5 | 3.9 to 59 | 346 |

Source: produced by the authors

There are 224 cities in Piauí state, in which 49 (21.87%) had positive cases in this study (Fig 1 B).

The Figure 1 (A and B) shows the distribution of CD cases in all state of Piauí with highlight to the cities of Teresina (n= 186; 53.14%) and Riacho Frio (n= 53; 15.14%) with the most of positive tests.

In the Figure 1C it is possible to see the number of cases per year decreasing over time, with the following occurrences: 2013 with 37.71% of cases (132 to 350), 17.71% in 2014 (62 to 350), 14.57% in 2015 (51 to 350), and 2016 10.86% (38 to 350). However, there was a short increase in 2017 with 19.14% of cases (67 to 350).
IV. DISCUSSION

According to SINAN (Information System of Injury Notification)\(^2\), in the period of this study, 1304 cases of acute DC were notified in Brazil, whereas in Piauí no case was reported. Despite this, the present work shows 350 positive chronic CD cases in 49 cities in Piauí state with the major frequency between 41 and 61 years old, and no significant difference in frequency between female and male. In addition, it is possible to observe that 2.6% of positive cases are of children among 0 and 11 years old. The maternal anti-\textit{T. cruzi} of the IgG fraction can cross the placenta and so all newborns of chronic CD mothers are seropositive until approximately the sixth month of life\(^{13}\).

It has been reported that chronic patients (average age of 54 years old; 34% female and 31% male) arising from different geographical regions from Brazil, assisted between 2011 to 2014 at the Chagas disease ambulatory from the Evandro Chagas Infectology National Institute (INI—Fundação Oswaldo Cruz, Rio de Janeiro, Brazil), are mainly immigrants from the northeast region, where Piauí is located\(^4\).

The socioeconomic inequities and the access to the healthcare systems provided to Brazilian population are characteristics that define the differences of mortality rates from CD. In regard to age, the mortality rates increased in patients over 30 years old, with higher occurrence among individuals between 50 and 64 years old; in addition, men
died five years younger than women\(^6\). CD cases have been reported in various regions of Brazil with a high prevalence of comorbidities. However, there is a tendency to increase the mortality rate in the northern and northeastern regions of Brazil\(^{15-16}\).

Due to the short duration of the acute phase, chronic cases of CD are more sensitive to epidemiological research. Additionally, reference laboratories apply immunological tests to find only IgG, an antibody characteristically reactive in chronic phase of this disease. There is no specific kit to define the acute phase\(^7\) in the standards determined by the ANVISA (Brazilian National Health Surveillance Agency).

The acute phase of CD presents high parasite count, Romanã sign or inoculation chagoma in the skin are main clinical manifestations. However, it is possible to see systemic symptoms as moderate fever, headache, malaise, anorexia and diarrhea. The diagnostic methods used are direct parasitological study via microscopic examination of fresh anti coagulated blood, thin and thick blood smears, or preferably through the identification of motile trypomastigotes in samples following Strout concentration technique. Also a feasible diagnostic method as Polymerase chain reaction (PCR) with host’s peripheral blood or cerebrospinal fluid (CSF) samples. However, is possible to find high incidence of false positives because this method is not fully standardized\(^{17-18}\).

Generally, chronic CD presents low parasitic load and the patients can manifest digestive form of the disease resulting in the formation of mega viscera, which involves mainly esophagus and colon\(^{19-18}\). The standards for diagnosis are serological tests, and the strategy recommended by WHO\(^7\) is to combine epidemiologic information with two different serologic assays since commercial ELISA based tests present heterogenic sensitivity and specificity\(^{18-20}\).

If there is disagreement between the tests, it is recommended to repeat the testing and, persisting the disagreement, a third test with PCR or western blot is recommended\(^{18-21}\). Since CD has been a largely neglected disease it is important to report both acute and chronic manifestations. The diagnosis to chronic CD is complex due to low parasitic load, but notifications of the cases are required to monitor disease incidence throughout the country\(^22\).

V. CONCLUSION

In this work, we show high frequency of DC in Piauí, mostly in the cities of Teresina and Riacho Frio, in the period of 2013 to 2017, with a short increase in the latter. The screening of Chagas disease in the chronic phase is of paramount importance for the control of the pathology and the case reports help to keep attention on health education of the population.

REFERENCES

[1] WHO - World Health Organization. Chagas disease (American trypanosomiasis). FactSheet Nº 340. Available from: <http://www.who.int/mediacentre/factsheets/fs340/en/>., 2017.

[2] Moraes CA. Mortalidade por doença de chagas no estado de Goiás, Brasil, no período de 2006 a 2011. Dissertação para obtenção do título de Mestre em Ciências da Saúde pelo programa de Pós Graduação em Ciências da Saúde da Universidade Federal de Goiás. 2017.

[3] Aguiar FAN, Borges APP, Limonte FH, Borges MA. Doença de Chagas: fator de risco exótico de epilepsia no Brasil. Arquivos Brasileiros de Neurocirurgia: Brazilian Neurosurgery, v. 37, n. S 01, p. A0905, 2018.

[4] Carvalho T. Avaliação de SNPs (Single Nucleotide Polymorphisms) nas diferentes formas clínicas da doença de Chagas. 2018.

[5] Sedlacek EC, Antunes AF, Pereira BVM, Nobre MN, Silva PRL, Silva MRH, Barbosa MGV, Guerra JAO, Barbosa-Ferreira, JM. Alterações ao Doppler tecidual em pacientes com a forma aguda da doença de chagas. ABC., imagem cardiovasc, v. 29, n. 4, p. 112-117, 2016.

[6] Simões TC, Borges LF, Assis ACP, Silva MV, Santos J, Meira KC. Chagas disease mortality in Brazil: A Bayesian analysis of age-period-cohort effects and forecasts for two decades. 2018. PlosNeglected Topical Diseases, 12(9):e0006798,2018 doi: 10.1371/journal.pntd.0006798.

[7] WHO. Chagas disease (American trypanosomiasis). 2014. Availbleat: https://www.who.int/en/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)

[8] Gomes BTL, Castro CG, Silva DB, Sampaio MGV. Aspectos clínicos, sintomatológicos e epidemiológicos relacionados à Doença de Chagas, ocasionada pelo parasita Trypanosoma cruzi. Mostra Científica em Biomedicina, v. 3, n. 1, 2018.

[9] Dias JCP, Ramos Jr. AN, Gonçalo ED, Luquetti A, Shikanai-Yasuda MA, Coura JR, Torres RM, Melo JRC, Almeida EA, Oliveira Jr. W, Silveira AC, Rezende JM, Pinto FS, Ferreira AW, Rassi A, Filho AAF, Sousa AS, Filho DC, Jansen AM, Andrade GMQ, Britto CFPC, Pinto AYN, Rassi Jr. A, Campos DE, Abad-Franch F, Santos SE, Chiari E, Hasslocher-Moreno AM, Moreira EF, Marques DSO, Silva EL, Marin-Neto JA, Galvão LMC, Xavier SS, Valente ASA, Carvalho NB, Cardoso AV, Silva RA, Costa VM, Vivaldini SM, Oliveira SM, Valente VC, Lima MM, Alves RV. II Consenso Brasileiro em doença de Chagas, 2015. Epidemiologia e Serviços de Saúde, v. 25, p. 7-86, 2016.

[10] Gurgel-Gonçalves R, Pereira FCA, Lima IP, Cavalcante RR. Distribuição geográfica, infestação domiciliar e infeccão...
natural de triatomíneos (Hemiptera: Reduviidae) no Estado do Piauí, Brasil, 2008. RevPan-Amazônica Saúde 2010; 1:57-64.

[11] Silva KMR, Rodrigues AMX, Barbosa ML, Santos JS, Costa ACR. Prevalência das principais doenças investigadas na triagem sorológica em unidades de um hemocentro. Revista Ciência & Saberes-Facema, v. 4, n. 1, p. 835-840, 2018.

[12] SINAN - Sistema de Informação de Agravos de Notificação. Informações de saúde – Tabnet. Epidemiológico e morbidade. 2018 Available at: http://www2.datasus.gov.br/DATASUS/index.php?area=0203&id=29878153

[13] Acha RES. Doença de Chagas. Arquivos Brasileiros de Cardiologia, vol. 93 n°6, 2009. http://dx.doi.org/10.1590/S0066-782X20090001300011

[14] Rodrigues-dos-Santos I, Melo MF, Castro L, Hasslocher- Moreno AM, Brasil PEAA, Sousa AS, Britto C, Moreira OC. Ecploring the parasite load and molecular diversity of Trypanosoma cruzi in patients with chronic Chagas disease from different regions of Brazil. Plos Neglected Topical Diseases, 12(11): e0006939, 2018. doi: 10.1371/journal.pntd.0006939.

[15] Vizzoni AG, Varela MC, Sangenis LHC, Hasslocher- Moreno AM, Brasil PEAA, Saraiva RM. Ageing with Chagas disease: na overview of na urban Brazilian cohort in Rio de Janeiro. Parasites &Vectors, 19;11(1):354, 2018. doi: 10.1186/s13071-018-2929-y.

[16] Simões MV, Romano MMD, Schmidt A, Martins KSM, Marin-Neto JA. Cardiomiopatia da Doença de Chagas. International Journal of Cardiovascular Sciences, v. 31, n. 2, p. 173-189, 2018.

[17] Bocchi EA, Bestetti RB, Scanavacca MI, Cunha Neto E, Issa VS. Chronic chagas heart disease management: from etiology to cardiomyopathy treatment. J Am Coll Cardiol2017;70(12):1510–24.

[18] ECHEVERRIA LE, MORILLO CA. American Trypanosomiasis (Chagas Disease). Infectious Disease Clinics, v. 33, n. 1, p. 119-134, 2019.

[19] Rassi Jr., A.; Rassi, A.; Marina-Neto JA. Chagas disease. The Lancet, v. 375, n. 9723, p. 1388-1402, 2010.

[20] Brasil PE, Castro R, Castro L. Commercialenzyme-linkedimmunosorbentassayversuspolymerasechainreaction for the diagnosis of chronic Chagas disease: asystematic review and meta-analysis. Mem Inst Oswaldo Cruz 2016;111(1):1–19.

[21] Andrade JP, Marin Neto JA, Paola AA, Vilas-Boas F, Oliveira GM, Bacal F, Bocchi EA, Almeida DR, Fragata Filho AA, Moreira Mda C, Xavier SS, Oliveira Junior WA, Dias JC. I Latin American Guidelines for the diagnosis and treatment of Chagas’ heart disease: executive summary. ArqBrasCardiol 2011;96(6):434–42.

[22] Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Guia de Vigilância em Saúde. Brasília: ministério da Saúde; 2014.