

# CHAGAS DISEASE IN BRAZIL FOCUSING ON THE STATE OF TOCANTINS AND THE IMPORTANCE OF BLOOD BANKS IN IDENTIFYING NEW CASES



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*Doença de Chagas no Brasil, foco no estado do Tocantins e a importância dos bancos de sangue para a identificação de novos casos*

*La enfermedad de Chagas en Brasil, centrándose en el estado del Tocantins y la importancia de los bancos de sangre para identificar nuevos casos*

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132

## ABSTRACT

As the vector control of *Triatoma infestans* was conducted in Brazil, the transmission profile of Chagas disease (CD) has changed, with an increase of interest to other pathways, including transfusion. This study aimed to analyze the CD in Brazil, focusing on the state of Tocantins, and make an analysis of the importance of blood banks in the delimitation of new cases. Sectional study was conducted in a period from 2007 to 2014. The northern region, in which is situated the state of Tocantins, concentrates 90% of cases of Brazil. Today, 80% of the cities in Tocantins are at risk of having transmission of the disease due the invasion of homes by wild vector species, caused by the environmental impact resulted from the action of man in natural areas. The largest number of people infected in Tocantins is in the age group of potential blood donors. Due studies demonstrating the effectiveness in controlling transfusion transmission and methods of detection of CD in blood donors, we can conclude that blood banks have importance in the screening and diagnosis of new cases.

**Keywords:** Blood Safety, Chagas Disease, Trypanosoma cruzi.

## RESUMO

Como o controle do vetor *Triatoma infestans* foi realizada no Brasil, o perfil de transmissão da doença de Chagas (CD) foi modificado, com um aumento do interesse de outras vias, incluindo a transfusão. Logo este estudo teve como objetivo analisar o CD no Brasil, com foco no estado de Tocantins, e fazer uma análise da importância dos bancos de sangue na delimitação de novos casos. Um estudo transversal foi realizado em um período de 2007 a 2014. A região Norte, onde está situado o estado de Tocantins, concentra 90% dos casos do Brasil. Hoje em dia, 80% das cidades em TO estão em risco de ter a transmissão da doença, devido a invasão de casas por espécie selvagem vetor, causado pelo impacto ambiental resultante da ação do homem em áreas naturais. O maior número de pessoas infectadas no Tocantins está na faixa etária de potenciais doadores de sangue. Devido estudos que demonstram a eficácia no controle da transmissão e métodos de detecção de CD em doadores de sangue

transfusão, podemos concluir que os bancos de sangue têm importância no rastreamento e diagnóstico de novos casos.

**Palavras-chave:** Hemovigilância, Doença de Chagas, *Trypanosoma cruzi*.

## RESUMEN

Como el control contra el *Triatoma infestans* se llevó a cabo en Brasil, el perfil de la transmisión de la enfermedad de Chagas (CD) ha sido modificado con un aumento del interés de otras vías, incluyendo la transfusión. Pronto este estudio fue analizar el CD en Brasil, centrándose en el estado de Tocantins, y analizar la importancia de los bancos de sangre en la delimitación de los nuevos casos. Un estudio transversal se llevó a cabo en un período de 2007 a 2014. El Norte, que está en el estado de Tocantins, se concentra el 90% de los casos en Brasil. Hoy en día, el 80% de las ciudades de A están en riesgo de transmisión de enfermedades debido a la invasión de viviendas a la especie salvaje vector, causadas por el impacto ambiental de la actividad humana en áreas naturales. El mayor número de personas infectadas en Tocantins se encuentra en el grupo de edad de los potenciales donantes de sangre. Debido a los estudios que demuestran la eficacia en el control de transmisión y métodos de detección de CD en donantes de sangre de transfusión, podemos concluir que los bancos de sangre son importantes para la detección y el diagnóstico de nuevos casos.

**Descriptores:** Seguridad de la Sangre, Enfermedad de Chagas, *Trypanosoma cruzi*.

## INTRODUCTION

Chagas disease (CD) is a chronic, systemic and parasitic infection whose etiologic agent is a flagellate protozoan, *Trypanosoma cruzi* (*T. cruzi*) (Mandal, 2014; WHO, 2015). It is exclusive of the Americas, although there is concern in transmission to other continents, and can be transmitted by different vector species such as *Triatoma infestans*, by blood (transfusion), vertical (placental), oral and accidental laboratory pathways (Coura, 2015; Sosa-Estani and Segura, 2015).

The CD presents an acute and chronic phase (indeterminate asymptomatic or symptomatic cardiac late and/or digestive) (Bezerra *et al.*, 2012; WHO, 2015), and the major part of infected individuals is found in the indeterminate phase for an estimated period of 20 years (Bozelli *et al.*, 2006, Pontes *et al.*, 2010).

The preconized medicamentous treatment in Brazil is benznidazole (Pontes *et al.*, 2010; WHO, 2015), the same being effective in the acute phase but not affecting the intracellular forms of the parasite (Morilla and Romero, 2015). The diagnosis is established through epidemiological suspicion of

people who live or have transited through endemic regions, clinical data and confirmed by serological and parasitological exams specifics to each phase of disease (Noya *et al.*, 2015; Ostermayer and Castro, 1997).

As the vector control of *Triatoma infestans* was controlled in Brazil at 2006, the transmission profile of CD has changed, with an increase of interest to other, including transfusion (Araújo *et al.*, 2014; Sosa-Estani and Segura, 2015).

The Tocantins state, located in the center of the country, is a transition area between Cerrado (Brazilian Savannah) and Amazon forest. It is the youngest state in the country, founded in 1988, having attracted, and still does nowadays, people from different states and regions (Borges *et al.* 2013, Valadares *et al.*, 2013). Here with we can hypothesize that there is a high potential for resurgence in this state, because of the migration and high level of deforestation, which can favor the displacement of new vectors for the urban area and even for being nearby the states of highly incidence of CD in Brazil, which is Pará (data demonstrated in the results). Therefore, the blood banks are important places to

detect new cases because of rules and exams recommended for analysis the donated blood (Silva and Luna, 2013).

On the exposed, this study aimed to analyze the CD in Brazil, focusing on the state of Tocantins, and make an analysis of the importance of blood banks in the delimitation of new cases of CD.

## MATERIALS AND METHODS

Sectional study was conducted in a period from 2007 to 2014, except for data on the evolution of the disease in Brazil (data from 2003 to 2014), using the records of cases about CD on the Information System for Notifiable Diseases (SINAN), from Department of Health, which contains information about compulsory reportable diseases. Data were grouped according regions from the country, by states from the northern region, cities of Tocantins state and age.

A research in the literature was made in data bases of Scielo, Lilacs, Pubmed, Medline and Google Academic, with the descriptors: Chagas disease, blood banks, serological screening and transfusion transmission. It were added original and review articles about the main topic, giving preference on the recent articles, but not disregarding previous studies from this date that were relevant to the theme. The information from literature was confronted with those of the SINAN.

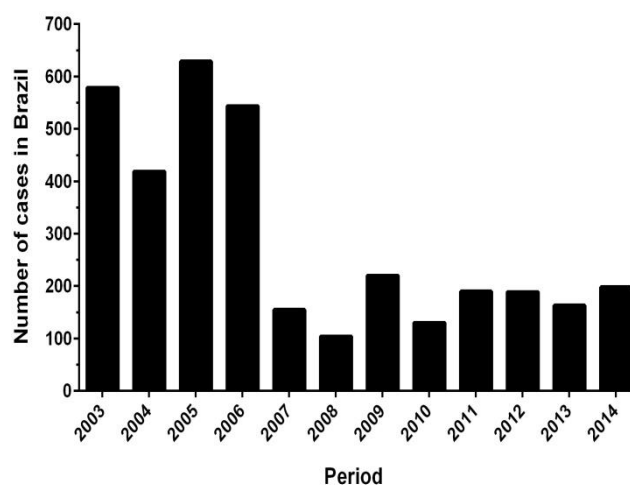
The collected data were grouped and graphics were elaborated to analysis and interpretations using software Graph Pad Prism 6.0.

## RESULTS AND DISCUSSION

The CD is endemic in Central and Latin America and was discovered in 1909 by Brazilian physician Carlos Chagas (1879-1934) (Mandal *et al.*,

2014). It is considered a neglected disease (Bezerra *et al.*, 2012; Botto-Mahan *et al.*, 2015). Since the decade of 50 it was institutionalized by the National Service of Malaria and implanted in 1975 in nationwide the vector control of CD, but only in 1983 the Govern passed specific resources for this control (Silveira and Dias, 2011). With that we observed over the years a decrease in number of cities with presence of *Triatoma infestans* and recently (Ostermayer *et al.*, 2011), in 2006, Brazil received from the Pan American Health Organization a certificate that the country had eradicated this vector (Ferreira and Silva, 2006). All efforts culminated in significantly reduction in number of new cases confirmed of CD in Brazil (Fig. 1).

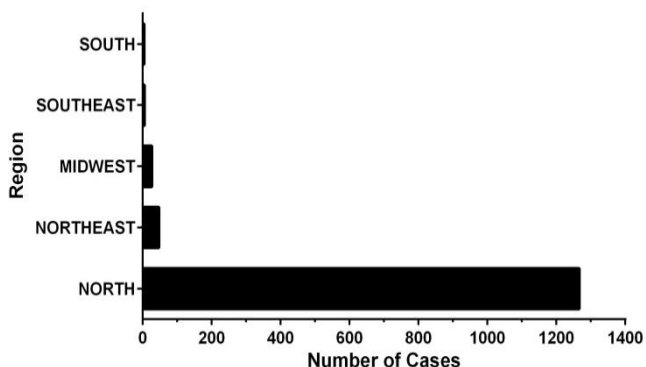
**Figure 1.** Total number of confirmed cases of Chagas disease in Brazil, reported in Information System for Notifiable Diseases – SINAN / Department of Health, in a period from 2003 to 2014.



Dias *et al.* (2000) cite in their study that northeast still needs enhanced attention in the epidemiological context of CD against findings and data from the decade of 90 in the region. On the other hand, the actual information (from 2007 to 2014) of new cases confirmed and reported in SINAN by region of country (Fig. 2) demonstrates the northern presents over 90% from the total of cases. These data corroborate with what the Brazilian Consensus on Chagas Disease says (Brasil, 2005), that CD in

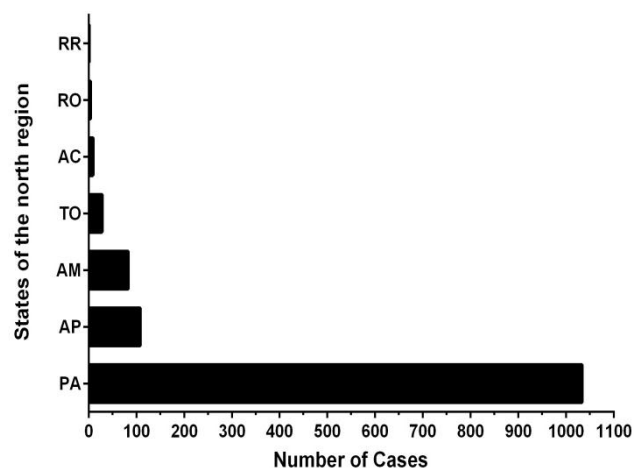
Amazon is a new reality, lacks understanding and studies and is a potentially problematic for public health.

**Figure 2.** Total number of confirmed cases of Chagas disease by region of Brazil, reported in System for Notifiable Diseases – SINAN / Department of Health in a period from 2007 to 2014.



From the total of reported cases in north in period from 2007 to 2014, 1034 (81,6%) occurred in Pará and 28 (2,2%) in Tocantins state (Fig. 3).

**Figure 3.** Total number of confirmed cases of Chagas disease in states of north region of Brasil, reported in System for Notifiable Diseases – SINAN / Department of Health in a period from 2007 to 2014.

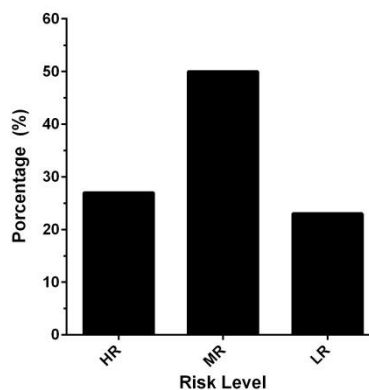


The State of Tocantins is located in the North of Brazil, and borders the states of Goiás, Mato Grosso, Pará, Maranhão, Piauí e Bahia. It was founded in 1988, and a year later, 1989, its capital Palmas was founded. Being the youngest state of the country, consecutively the youngest capital, still

presents a migratory process of people from several regions and states, subject to receive people from regions with high rates of incidence and prevalence of the disease, Pará.

Nowadays, 80% of cities from Tocantins are at risk transmission the disease, due the invasion of homes by wild vector species, caused by the environmental impact resulted from the action of man in natural areas (Ministério da Saúde, 2005). From 139 of Tocantins cities, 37 (25%) are at high risk of disease transmission, 70 (53%) are at medium risk and 32 (23%) are at low risk (Ministério da Saúde, 2005) (Fig. 4).

**Figure 4.** Percentage of cities in the state of Tocantins that were classified as high risk (HR), medium risk (MR) and low risk (LR) for the transmission of Chagas disease.

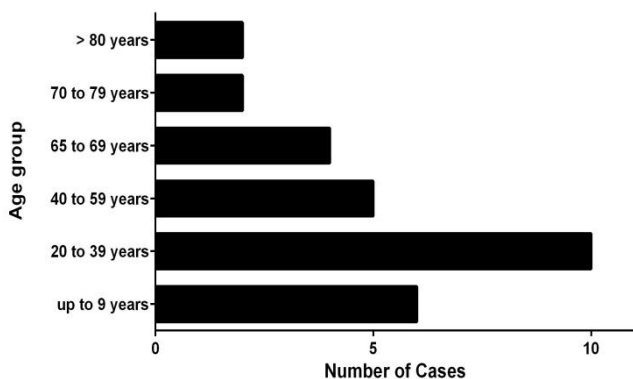


In Tocantins, the case of 2007 occurred in Porto Nacional, in 2008 one in Araguaína and one in Augustinópolis. Two cases from 2009 occurred in Palmas. In 2010 ten cases were reported in Ananás, five cases in Araguaína and one in Palmas. In 2011 ten cases occurred in Ananás and five in Araguaína and one case in Araguaína in 2014. At this period 18 deaths were notified in SINAN caused by CD in Brazil, these, two were notified in the state; one in 2010 and another in 2012. That demonstrates that the state still deals with CD problem, and yet we could bounce that these data can be underreported because there are numerous shortcomings in health there.

In the 50's, the migratory process heading to the city and the beginning of industrialization in Brazil promoted a urbanization of Chagas disease, being responsible by the high prevalence of Chagas donors in the blood banks of Brazil and countries from Latin America (Pereira *et al.*, 2011). That tendency happened in all endemic countries (Moraes-Souza and Ferreira-Silva, 2011), but yet isn't known the real incidence of transmission by blood transfusion in Brazil (Silva and Luna, 2013).

The highest number of people infected in Tocantins is in the age of potential blood donors (Fig. 5) and most of these people live in urban centers (78,8% of the state population) (IBGE, 2010), being potential blood donors and, therefore, possible carriers of the agent; which justifies the concern that transfusion transmission has caused in urban centers (Dias, 2006).

**Figure 5.** Total number of confirmed cases by Chagas disease in the state of Tocantins by age, reported in System for Notifiable Diseases – SINAN / Department of Health in a period from 2007 a 2014.



With the vector control of DC, the transfusion transmission shall gain more attention from health systems and scientific community, and considered the second transmission path and the first in non-endemic countries (Pereira *et al.*, 2011). Even with a decrease in number of new cases (Fig. 1), existing and asymptomatic, or even undiagnosed cases may continue transmitting the CD in this way.

And this concern is not only restricted to endemic countries, but to others due the increase of immigratory rate (Schmunis, 2007).

In Brazil the first diagnosed cases transmitted by transfusion occurred in 1952 and at the end of 70's, it was estimated that about 10.000 new cases/year occurred by this route (Coura, 2015; Liu and Zhou, 2015). With the decline in the prevalence and incidence of CD, that reflects directly in the number of infected donors (Souza, 2009), from 11.08% in 1970 to 0,21% in 2006 (OPAS, 2006).

Due studies demonstrating the effectiveness in controlling transfusion transmission and methods of detection of CD in blood donors (Silva and Luna, 2013; Lunardelli *et al.*, 2007; Dias, 2006; Pereira *et al.*, 2011; Moraes-Souza and Ferreira-Silva, 2011; Souza, 2009). We can infer that blood banks have significant importance not only in control, but also in the screening and diagnosis of new cases, and correct referral for treatment of these patients in the health system. In Tocantins, there is a blood bank coordinator located in the capital Palmas, a regional blood center in the city of Araguaína, a core in Gurupi and several sampling and transfusion plus transfusion agencies spread across different cities. With it having a greater state coverage. However, there is a need for improvement of these system and units.

## CONCLUSION

We can conclude that CD, in Brazil, is apparently in a comfortable situation and that blood banks are important centers for the screening and diagnosis of new cases. Yet is necessary a larger knowledge about this disease and its distribution in the Tocantins state, besides improving the structure of blood banks in the state.

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