



Seroepidemiological survey on Chagas disease in renal patients undergoing hemodialysis

Inquérito soroepidemiológico sobre a doença de Chagas em doentes renais submetidos à hemodiálise
Estudio seroepidemiológico sobre la enfermedad de Chagas en pacientes renales sometidos a hemodiálisis

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ABSTRACT

Background and Objectives: Chagas disease (CD) remains a neglected tropical disease endemic to Latin America. Its relevance is amplified among populations at high cardiovascular risk, such as patients with chronic kidney disease, who generate substantial costs to the healthcare system. This study aimed to investigate the seroprevalence of CD among individuals undergoing hemodialysis in the Cariri region of Ceará, Brazil. **Methods:** A seroepidemiological survey was carried out at a hemodialysis referral center in southern Ceará, involving 231 patients evaluated using an indirect immunofluorescence assay (IFA). The study was approved by the Research Ethics Committee (protocol no. 7.547.446). **Results:** One reactive case was identified, corresponding to a prevalence of 0.43%. The profile of the studied population revealed social vulnerability, low educational attainment, multiple comorbidities, and limited knowledge about the disease. **Conclusion:** Thus, it can be concluded that, despite the low prevalence found, Chagas disease remains relevant as a surveillance topic, especially among chronic kidney disease patients. Health education strategies, periodic screening, and monitoring should be strengthened to ensure greater safety, early diagnosis, and better care for this population.

Keywords: *Epidemiological Surveys. Trypanosoma cruzi. Chagas Disease.*

RESUMO

Justificativa e Objetivos: A doença de Chagas (DC) persiste como uma doença tropical negligenciada e endêmica na América Latina. Sua relevância é ampliada em populações de alto risco cardiovascular, como pacientes com doença renal crônica, que incorrem em custos expressivos ao sistema de saúde. O objetivo deste estudo foi investigar a soroprevalência da DC em indivíduos submetidos a tratamento hemodialítico no Cariri cearense. **Métodos:** Realizou-se um inquérito soroepidemiológico em um centro de referência em hemodiálise no sul do Ceará, com 231 pacientes avaliados por meio do teste de imunofluorescência indireta. A pesquisa foi aprovada pelo Comitê de Ética em Pesquisa (parecer nº 7.547.446). **Resultados:** Foi identificado um caso reagente, correspondendo a uma prevalência de 0,43%. O perfil da população estudada revelou vulnerabilidade social, baixa escolaridade, múltiplas comorbidades e conhecimento limitado sobre a doença. **Conclusão:** Assim, conclui-se que, apesar da baixa prevalência encontrada, a doença de Chagas continua sendo relevante como tema de vigilância, especialmente entre pacientes renais crônicos. Estratégias de educação em saúde, triagem periódica e monitoramento devem ser fortalecidas para garantir maior segurança, diagnóstico precoce e melhor cuidado a essa população.

Descritores: *Inquéritos Epidemiológicos. Trypanosoma cruzi. Doença de Chagas.*

RESUMEN

Justificación y Objetivos: La enfermedad de Chagas (EC) persiste como una enfermedad tropical desatendida y endémica en Latinoamérica. Su relevancia se acentúa en poblaciones con alto riesgo cardiovascular, como los pacientes con enfermedad renal crónica, que incurrir en costos significativos para el sistema de salud. El objetivo de este estudio fue investigar la seroprevalencia de la EC en individuos sometidos a hemodiálisis en la región de Cariri de Ceará. **Métodos:** Se realizó una encuesta seroepidemiológica en un centro de referencia de hemodiálisis en el sur de Ceará, con 231 pacientes evaluados mediante pruebas de inmunofluorescencia indirecta. El estudio fue aprobado por el Comité de Ética en Investigación (protocolo n.º 7.547.446). **Resultados:** Se identificó un caso positivo, correspondiente a una prevalencia del 0,43%. El perfil de la población del estudio reveló vulnerabilidad social, bajo nivel educativo, múltiples comorbilidades y conocimiento limitado sobre la enfermedad. **Conclusión:** Por lo tanto, se puede concluir que, a pesar de la baja prevalencia, la enfermedad de Chagas sigue siendo un tema de vigilancia relevante, especialmente entre los pacientes con enfermedad renal crónica. Se deben fortalecer las estrategias de educación sanitaria, el cribado periódico y el seguimiento para garantizar una mayor seguridad, un diagnóstico precoz y una mejor atención a esta población.

Palabras Clave: *Estudios Epidemiológicos. Trypanosoma cruzi. Enfermedad de Chagas.*

INTRODUCTION

Chagas disease (CD), or American trypanosomiasis, is a parasitic disease caused by the protozoan *Trypanosoma cruzi*. Although historically associated with Latin America, globalization and intense migratory flows have reshaped its epidemiology, turning it into a global concern that challenges the health systems of non-endemic countries, which are often unprepared to diagnose and manage the infection.^{1,2,3} Despite this global spread, Brazil continues to bear a high disease burden: it is estimated that between 1.2 and 2.4 million people are infected in the country,⁴ and the disease is responsible for a significant number of annual deaths.^{5,6}

Chagas disease is transmitted primarily by vectors of the genus *Triatoma* (kissing bugs), but also through congenital transmission, blood transfusions, organ transplants, and oral transmission.^{7,8} The disease progresses from an acute phase—which is often asymptomatic—to a chronic phase characterized by slow and devastating progression.⁹ In this phase, the parasite can cause irreversible tissue damage, leading to severe cardiac manifestations (such as Chagas cardiomyopathy, often associated with heart failure and sudden death) and gastrointestinal megavisceral conditions (megaesophagus and megacolon).¹⁰

The chronic nature and complexity of these sequelae result in high social and healthcare costs for health systems, due to the need for complex clinical management, treatment of disabilities, and significant loss of patient productivity over the course of a lifetime.¹⁰ The disease is particularly threatening for patients with chronic kidney disease (CKD), as immunosuppression—especially following kidney transplantation—can reactivate the disease and lead to graft loss or death. Despite this imminent and well-established risk, there is a critical and persistent gap in the literature regarding the actual seroprevalence of CD in this vulnerable population, which hinders the development of effective protocols for pre-transplant screening and postoperative surveillance. Thus, this study sought to investigate the seroprevalence of CD in chronic kidney disease patients undergoing hemodialysis in a historically endemic region, the Cariri region of Ceará, in order to generate solid scientific evidence to support the immediate implementation of screening, surveillance, and health education initiatives.

METHODS

This is a cross-sectional seroepidemiological study conducted at a hemodialysis referral center in southern Ceará. The study population consisted of patients diagnosed with CKD undergoing regular hemodialysis.

During the data collection period, which took place in June 2025, 231 patients on regular hemodialysis were

considered eligible to participate in the study, corresponding to all individuals who attended the clinic during the month of the study. From this total, all present patients who agreed to participate and signed the Informed Consent Form (ICF) were included. The document recorded no formal refusals or losses due to absence on the day of data collection, since all patients present during the data collection shift were invited to participate and evaluated.

Thus, the total number of participants evaluated corresponds exactly to the number of eligible patients who were at the clinic during the defined period, reflecting a 100% participation rate among those present.

Data were collected using a sociodemographic and health questionnaire, and blood samples were collected for serological analysis. Anti-*T. cruzi* IgG antibodies were detected using the indirect immunofluorescence (IFI) technique. Titers of 1/64 or higher were considered positive. No comparison was made between groups (reactive vs. non-reactive), since only one participant tested serologically reactive.

The data were analyzed using descriptive statistics (absolute and relative frequencies) with appropriate software.

This study followed the ethical principles of Resolution 466/2012 of the National Health Council and was approved by the Research Ethics Committee of the Federal University of Cariri, under opinion No. 7,547,446, on May 5, 2025, with CAAE: 85291524.2.0000.5698 under protocol No. 147029/2024.

RESULTS

The sample consisted mainly of males (59.7%), with the majority aged between 60 and 69 (26.4%). Low educational attainment was a striking characteristic, with 40.7% of participants being illiterate or having not completed elementary school. A household income of up to one minimum wage was reported by 68.0% of the sample (Table 1).

The most prevalent comorbidities were systemic arterial hypertension (SAH), present in 91.8% of participants, and diabetes mellitus (DM), in 33.3%. The majority lived in plastered brick houses (83.1%).

Approximately 19.9% of patients reported having donated blood at some point, and 32.5% had received a blood transfusion. Regarding knowledge of Chagas disease, 64.0% stated they were familiar with the vector insect, but only 51.0% knew how the disease is transmitted. A family history of Chagas disease was reported by 5.2% of the participants.

Serological analysis identified one *T. cruzi*-positive case among the 231 patients evaluated, resulting in a seroprevalence of 0.43%. The positive participant was a

64-year-old man with low educational attainment, low income, and a history of hypertension (HAS) and diabetes mellitus (DM), as well as a history of blood transfusion.

Table 1. Sociodemographic characteristics of the study participants.

Variable	Category	N (%)
Age group	< 35	28 (12.1)
	35–49	52 (22.5)
	50–64	84 (36.5)
	≥ 65	67 (29.0)
Sex	Male	138 (59.7)
	Female	93 (41.3)
	Illiterate	24 (10.4)
Education	Incomplete elementary education	104 (45.0)
	Complete elementary education	11 (4.7)
	Incomplete secondary education	5 (2.1)
	Complete secondary education	61 (26.4)
	Incomplete higher education	3 (1.2)
	Complete higher education	23 (9.9)
Family income	< 1 MW	20 (8.6)
	Up to 1 MW	28 (12.0)
	Up to 2 MW	178 (77.0)
	3–5 MW	4 (1.7)
	≥ 7 MW	1 (0.4)
Occupation	Retired	101 (43.9)
	At home	13 (5.6)
	Other*	117 (50.4)

Abbreviation: N = sample size. MW = minimum wage.

Housing conditions were also analyzed. Most residences were constructed of plastered masonry (n = 192; 83.1%), followed by exposed-brick homes (n = 37; 16.0%) and, to a lesser extent, rammed-earth houses (n = 2; 0.9%). Regarding the number of residents per household, households with three residents were the most common (n = 78; 33.7%), followed by those with two residents (n = 59; 25.5%) and four residents (n = 46; 19.9%). A smaller portion of the sample lived in larger households with five or more people (n = 28; 12.2%), while 20 participants (8.6%) lived alone.

Table 2. Distribution of participants by knowledge of the vector and diagnostic history of Chagas disease.

Variable	Category	N (%)
Knowledge about the vector	Yes	148 (64.0)
	No	83 (36.0)
Knowledge of transmission	Yes	118 (51.0)
	No	113 (49.0)
Family history of CD	Yes	12 (5.2)
	No	219 (94.8)
Personal diagnosis of CD	Yes	0 (0.0)
	No	231 (100.0)

Abbreviation: N = sample size. CD = Chagas disease.

Regarding knowledge of the disease vector, 148 participants (64.0%) stated that they were familiar with the triatomine bug, while 83 (36.0%) reported not recognizing it as a vector insect. As for the mode of transmission, 118 (51.0%) reported knowing how Chagas disease infection occurs, while 113 (49.0%) stated they were unaware of this mechanism (Table 2).

When asked about their family history of Chagas disease, 219 participants (94.8%) reported having no cases in their family, while 12 (5.2%) reported the presence of the disease among their family members. Regarding their personal diagnosis, all respondents (n = 231; 100.0%) reported not having the infection (Table 2).

DISCUSSION

The seroprevalence of 0.43% for *T. cruzi* infection found in this study, although a single-study finding, is of great epidemiological and clinical significance. This rate is considered low and is consistent with other studies conducted in Ceará, which reported prevalences of 0.27% in rural populations and 0.33% among blood donors, suggesting a consistent decline in the circulation of the parasite in the region.¹² This scenario largely reflects the historical success of public health policies in Brazil, particularly the program for controlling household vectors (*Triatoma infestans*) and rigorous serological screening in blood banks, which were crucial for interrupting vector-borne and transfusion-transmitted transmission across most of the country.¹³

The profile of the seropositive elderly male participant with multiple comorbidities (hypertension and diabetes) and a history of blood transfusion encapsulates the classic trajectory of Chagas disease infection in Brazil. The disease, historically linked to rural populations and poor housing conditions, manifests clinically decades after primary infection, which explains its higher prevalence in older age groups.¹⁴ The coexistence of hypertension and diabetes—comorbidities that are highly prevalent in the dialysis population—creates a scenario of synergistic cardiovascular risk, in which chronic Chagasic heart disease, if present, may have its progression accelerated or masked by other cardiac conditions.¹⁵

In addition, the sociodemographic profile of the study sample—characterized by low levels of education and income—reflects what is known as the “social face” of Chagas disease. The disease remains firmly linked to social determinants of health, where poverty and lack of access to information perpetuate a cycle of neglect.¹⁶ This study highlighted a critical gap in patients’ knowledge of the disease: although most recognize the insect vector, nearly half are unaware of the modes of transmission. This disconnect between recognizing the “barbeiro” and understanding the actual risk of the disease reveals a shortcoming in health education strategies, which must go beyond simply identifying the vector and address the complexity of transmission, the existence of the chronic asymptomatic phase, and the importance of early diagnosis.¹⁷

In this context, the recent implementation of mandatory reporting for chronic Chagas disease in 2023 marks a milestone for Brazilian public health.¹⁸ The measure aims to bring the disease out of epidemiological invisibility, enabling more accurate mapping of actual prevalence, the planning of care policies, and the guarantee of access to treatment. However, the success of this policy depends on the engagement and training of health professionals in

primary and specialized care to suspect the disease, order diagnostic tests, and manage chronic cases—many of which, as found in this study, are incidentally diagnosed during screenings or investigations for other conditions.

Finally, the limitations of this study must be acknowledged. As this was a cross-sectional study conducted at a single referral center, the results cannot be generalized to the entire dialysis population in the state. Furthermore, the use of a single serological method (IFI) for screening, while valid, would ideally be supplemented by a second test using a different antigenic principle (such as ELISA) for diagnostic confirmation, as recommended by the WHO.¹⁹ Future research could expand the sample to include other dialysis centers, covering both rural and urban areas, and incorporate molecular biology techniques (PCR) to assess the presence of parasitemia, especially in seropositive cases, thereby providing an even more comprehensive picture of the Chagas disease situation in this critically important population.²⁰

The seroprevalence of Chagas disease among patients with chronic kidney disease undergoing hemodialysis in the Cariri region of Ceará was low (0.43%). However, the socioeconomic vulnerability profile, the high prevalence of comorbidities, and insufficient knowledge about the disease in this population require ongoing attention. It is recommended that serological screening be maintained, epidemiological surveillance efforts be strengthened, and health education strategies targeting this high-risk group be developed.²¹

This study identified the seroprevalence of Chagas disease in patients with chronic kidney disease undergoing hemodialysis in the Cariri region, finding only one reactive case among 231 participants. This finding corroborates the trend of declining classical vector-borne transmission but reinforces the importance of maintaining regular screening, given that patients immunosuppressed by uremia may experience reactivation or severe complications.²² It was also possible to describe the participants' profile, characterized by older age, low educational attainment, and limited income, which highlights this group's clinical vulnerability and the need for ongoing educational initiatives within hemodialysis services.

Thus, it is concluded that, despite the low prevalence found, Chagas disease remains a relevant issue for surveillance, especially among patients with chronic kidney disease. Health education strategies, periodic screening, and monitoring should be strengthened to ensure greater safety and early diagnosis.

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AUTHORS' CONTRIBUTIONS

José Geraldo de Alencar Santos Júnior contributed to the drafting of the abstract, review, and statistics. **Francisco Roberto de Azevedo** contributed to the literature review, drafting of the abstract, introduction, methodology, and data collection. **Estelita Lima Cândido** contributed to the drafting of the final version of the article. **Maria Elizabeth Pereira Nobre** contributed to the drafting of the final version of the article and performed the spelling check. **Cíntia de Lima Garcia** analyzed the data and revised the discussion section.

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.

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