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Chagas disease: a reference and epidemiology center

Doença de Chagas: serviço de referência e epidemiologia

Enfermedad de Chagas: servicio de referencia y epidemiologia

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ABSTRACT

Objective: To describe a reference center for Chagas disease and the clinical and epidemiological profile of users. **Methods:** A cross-sectional study of secondary data was conducted at a reference center for chronic cases of Chagas disease located in an endemic region of the state of Pernambuco from 2017 to 2018. Data were collected from nineteen users with reactive serology obtained by two methods of different principles or with different antigenic preparations. Sociodemographic, clinical, diagnostic and therapeutic variables were analyzed. Care flow and care offer were also analyzed. Descriptive analysis used mean, standard deviation and absolute frequency. **Results:** The mean age of the cases was 55 years with a standard deviation of ±14. Most users were women and lived in urban areas. All the users currently live or have lived in wattle and daub houses. Systemic arterial hypertension and stage B1 heart disease were the most prevalent comorbidities. The users had megaesophagus, predisposing factors for heart failure and family members with Chagas disease. Only one case was treated with benznidazole and the mean number of medications for comorbidities was 2.7±2.2 per user. **Conclusion:** The users were inserted in a context of socioenvironmental vulnerability because they lived in wattle and daub houses, presented a predominance of heart failure and worsening of clinical conditions due to the presence of comorbidities and tobacco use. In addition, the users face difficulties in making appointments and exams and accessing medications.

Descriptors: Chagas Disease; Chronic Disease; Health Profile; Epidemiological Monitoring; Health Care; Health Services Research.

RESUMO

Objetivo: *Descrever o serviço de referência de doença de Chagas e o perfil clínico e epidemiológico dos usuários.* ***Métodos:*** *Estudo transversal de dados secundários realizado no serviço de referência dos casos crônicos de doença de Chagas, localizado em uma região endêmica do estado de Pernambuco, no período de 2017 a 2018. Obtiveram-se dados provenientes de dezenove usuários com sorologia reagente por meio de dois métodos de princípios distintos ou com diferentes preparações antigênicas. Analisaram-se variáveis sociodemográficas, clínicas, diagnósticas e terapêuticas, além de fluxo de atendimento e oferta assistencial. A análise descritiva utilizou média, desvio padrão e frequência absoluta.* ***Resultados:*** *A média de idade dos casos é de 55 anos, com desvio padrão de ±14, sexo feminino, procedente da zona urbana. Todos os usuários residem ou residiram em casa de taipa. A hipertensão arterial sistêmica caracterizou-se como sendo a comorbidade prevalente, assim como o estágio B1 da forma cardíaca. Os usuários apresentaram megaesôfago, fatores predisponentes à insuficiência cardíaca e familiares com doença de Chagas. Apenas um caso fez tratamento com o benznidazol, com uma média de* 2,7±2,2 de m*edicações para as comorbidades por usuário.* ***Conclusão:*** *Os usuários estiveram inseridos em um contexto de vulnerabilidade socioambiental por residirem em casas de taipa, pela predominância do comprometimento cardíaco e agravamento das condições clínicas pela presença das comorbidades e uso de tabaco. Além disso, os usuários enfrentam dificuldade na marcação de consultas e exames, bem como no acesso a medicações.*

Descritores: *Doença de Chagas; Doença Crônica; Perfil de Saúde; Monitoramento Epidemiológico; Atenção à Saúde; Pesquisa*

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sobre Serviços de Saúde.

RESUMEN

Objetivo: *Describir el servicio de referencia de la enfermedad de Chagas y el perfil clínico y epidemiológico de los usuarios.* **Métodos:** *Estudio transversal de datos secundarios realizado en el servicio de referencia de los casos crónicos de la enfermedad de Chagas localizado en una región endémica del estado de Pernambuco en el periodo entre 2017 y 2018. Se obtuvieron los datos de diecinueve usuarios de serología reactiva a través de dos métodos de principios distintos o con distintas preparaciones antigénicas. Se analizaron las variables sociodemográficas, las clínicas, las diagnósticas y las terapéuticas además del flujo de la atención y la oferta de la asistencia. Para el análisis descriptivo se utilizó la media, la desviación típica y la frecuencia absoluta.* ***Resultados:*** *La media de edad de los casos es de 55 años con desviación típica de ±14, sexo femenino y de la zona urbana. Todos los usuarios viven o han vivido en casa de tapia. La hipertensión arterial sistémica se caracterizó como la comorbilidad más prevalente así como la fase B1 de la forma cardíaca. Los usuarios presentaron el mega esófago, los factores predisponentes para la insuficiencia cardíaca y familiares con enfermedad de Chagas. Solamente un caso ha realizado el tratamiento con el benznidazol, con una* media de 2,7±2,2 de m*edicaciones para las comorbilidades por usuario.* ***Conclusión:*** *Los usuarios se han inseridos en un contexto de vulnerabilidad socio ambiental por el hecho de vivir en casas de tapia, por el predominio del comprometimiento cardiaco y el empeoramiento de las condiciones clínicas por la presencia de las comorbilidades y el uso del tabaco. Además de eso, los usuarios afrontan la dificultad para la marcación de las consultas y pruebas así como para el acceso a las medicaciones.*

Descriptores: *Enfermedad de Chagas; Enfermedad Crónica; Perfil de Salud; Monitoreo Epidemiológico; Atención a la Salud; Investigación sobre Servicios de Salud.*

INTRODUCTION

Human Chagas Disease (HCD), also known as American Trypanosomiasis[1], is a chronic disease that can be fatal as it progresses from acute clinical form (ACD) to cardiac and digestive forms[2]. Its causative agent is the protozoan *Trypanosoma cruzi* (*T.cruzi*), which is transmitted mainly through the feces of triatomine insects, popularly known as barbers[1].

About 6 to 7 million people worldwide are infected[1], and more than 5 million cases are concentrated in Latin America and an estimated 70 million people were at risk of infection in 2010[3]. In 2015, it is estimated that more than 80% of people worldwide with HCD did not have access to systematic diagnosis and treatment[3].

In Brazil, in 2006, an estimated 1.9 million people were infected and 21.8 million people were at risk in endemic areas[4]. An estimated 3.2 million people are projected to be infected in the country by 2020[2]. Between 1999 and 2007, Brazil reported 40% of deaths from Chagas Disease in Latin America. In the country, there has been a reduction in the mortality coefficient over these years, except in the Northeast region, which presented a growing trend of 38.5%[5].

From 1980 to 2007, the state of Pernambuco recorded 3,144 deaths in the Mortality Information System, a mortality coefficient of 1.53/100,000 inhabitants and a constant mortality trend. Between 1995 and 2008 in Brazil, 24,130 hospitalizations due to HCD were reported in the Hospital Information System. Of these hospitalizations, 3,555 were in the Northeast and 443 were in Pernambuco[6].

Given that context, this disease is listed among the 18 neglected tropical diseases (NTDs) established by the World Health Organization (WHO), which refer to the group of diseases caused by infectious and parasitic agents with high morbidity and mortality rates affecting predominantly the poorest and most vulnerable populations. Moreover, these diseases represent over 12% of the global disease burden[7-9].

NTDs represent an important public health problem and, because of that, the state of Pernambuco pioneered in creating the Integrated Plan of Actions to Tackle Neglected Diseases (*Plano Integrado de Ações para o Enfrentamento às Doenças Negligenciadas – the SANAR Program*) in the country in 2011. The program was developed to tackle eight NTDs, including Chagas Disease, through management, health surveillance, health care and health education actions[10], which enhance the precepts of health promotion for the fight against infectious diseases, thus minimizing the risks of the disease[11,12]. Within this context, the regional reference health care network for patients with HCD in the state of Pernambuco was created[13].

Strategies need to crosscut different social segments and include care practices integrated to the improvement of sanitary and housing conditions and the guarantee of access to health services and the environment, which are indispensable for the construction of quality of life[14].

HCD is a public health problem and the health region analyzed in this study is endemic. Therefore, it is important to obtain information on the follow-up of chronic cases of the disease, which may contribute to fill the existing gaps in chronic cases as only the acute form of the disease is compulsorily reported to the Notifiable Disease Information System (*Sistema de Informação Nacional de Agravos de Notificação – SINAN*) in the country[2]. Thus, the present study aimed to describe a reference center for Chagas Disease and the clinical and epidemiological profile of users.

METHODS

This is a quantitative and descriptive epidemiological cross-sectional study of secondary data from the Chagas Disease Control Program (*Programa de Controle da Doença de Chagas – PCDCh*) provided by the Pernambuco State Health Secretariat.

The study was conducted at a reference health care facility in the III Health Region of the state of Pernambuco, which is located in the Mideast of Northeastern Brazil. The health care facility is located in the municipality of Palmares, which is the headquarters of the III Regional Health Management Office (*Gerência Regional de Saúde – GERES*) of the state's Mata Sul region (Figure 1)[15]. The III Health Region is composed of twenty-two municipalities[16], with a territorial extension of 4,747.2 km², an estimated population of 616,254 inhabitants in 2017 – 50.5% of which is female - and a human development index. 0.581 in 2010[17].

Figure 1 - Geographical location of the III Health Region of the state of Pernambuco, 2019.
Source**:** Geopolitical division of the state. Pernambuco, 2018[15]

The III Health Region was chosen for the present study because it was selected in the process of decentralization of the reference health care network for people with HCD (established in 2017) and for presenting persistence of considerable mortality rate and a high number of cases of chronic and severe manifestations[13].

The study population consisted of patients followed by the HCD reference service from 2017, year of implementation of the service[13], to the year of data collection (2018). Patients with reactive results were included in two different serological tests for HCD according to the II Brazilian Consensus on Chagas Disease, which defines the diagnosis of the chronic stage using serological criteria through screening for IgG anti-*T.cruzi* antibodies detected by two methods of different principles or with different antigenic preparations (recombinant and/or parasitic antigen)[2].

The serological results contained in the chronic case monitoring spreadsheet are extracted from the Laboratory Environment Manager (*Gerenciador de Ambiente Laboratorial – GAL*), a national computerized system for examination and testing of human, animal and environmental samples for Central Public Health Laboratories (*Laboratório Central de Saúde Pública – LACEN*)[18].

The service has 67 users registered in the chronic HCD case monitoring spreadsheet. Of these, 32 are registered in the GAL: 19 with HCD-reactive serology in two different serological tests and 13 with non-reactive serology. The other 35 users were not registered in the GAL. Thus, after applying the study inclusion criteria, the final study sample consisted of 19 users.

The following variables were analyzed: sociodemographic (sex, age, municipality of residence, origin and type of housing); clinical (personal/family history and comorbidities); diagnostic (serological result; complementary exams

such as chest x-ray, esophagus contrast x-ray, electrocardiogram (ECG), echocardiography (ECHO) and holter); Chagas disease classification according to the II Brazilian Consensus on Chagas Disease[2] and the I Latin American Guideline for the Diagnosis and Treatment of Chagas Heart Disease[19]; and the therapeutic variable (medications used by the patient).

The instrument for the diagnosis of HCD in the regionalized reference was used to analyze other variables, such as medications prescribed for comorbidities, care flow and care offer (drug dispensing, referral and counter-referral flow, offer of tests and pleaces where they are carried out, and barriers).

Descriptive analysis of the selected variables was performed using statistical measures (mean, standard deviation ± and absolute and relative frequency) and the results are described in graphs and tables.

The study complied with the ethical considerations proposed by the National Health Council Resolution No. 466 of December 12, 2012[20] and it was approved by a Research Ethics Committee (Approval No. 3.049.108).

RESULTS

The profile of chronic cases of HCD is characterized by a mean age of 55±14 years, with age ranging from 35 to 79 years and a female predominance of 68.42% (n=13). The users live in six municipalities out of the 22 of the III Health Region and are mainly concentrated in Palmares (36.84%; n=7), followed by Quipapá (31.58%; n=6). In all, 5.26% (n= 1) of the users lived in each of the following municipalities: Água Preta, Jaqueira, Joaquim Nabuco and Maraial. In addition, 5.26% (n=1) of the users lived in Ouricuri, a municipality belonging to the IX Health Region. The place of residence of other 5.26% (n=1) of the users was not informed. Currently, 63.16% (n=12) of the users live in urban areas and 21.05% (n=4) live in rural areas. There was no information on that variable for 15.79% (n=3) of the users. All the users lived or live in mud and stud houses (n=19).

With regard to family history, 10.53% (n=2) of the users had some family member with HCD. Systemic arterial hypertension (SAH) was the most prevalent comorbidity, followed by dyslipidemia, and 31.58% (n=6) of the users had two or more comorbidities.

As for risk factors for heart failure (HF), 36.84% (n=7) of the users used or use tobacco and alcohol. Such data are described in Figure 2, where there may be more than one answer per user; therefore, the sum may exceed 100% of the cases.

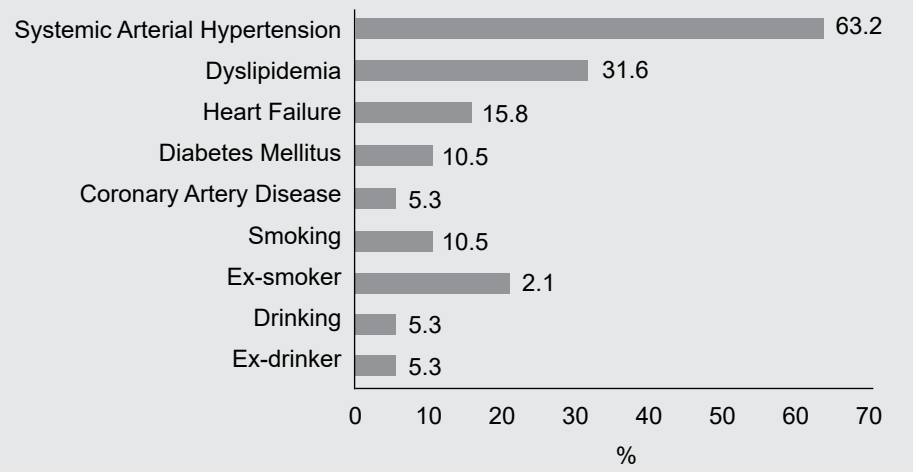

Figure 2 - Percentage of cases of Chagas disease in the reference service by comorbidities and risk factors for heart failure. Pernambuco, 2017-2018.
Source: PCDCh/SEVS/SES-PE, 2018

Regarding the complementary exams, the users did not present alterations in the chest x-ray and none of the patients underwent esophagus contrast x-ray. The users presented the following ECG alterations: use of pacemaker, right bundle branch block (RBBB) and left anterosuperior divisional block (LASDB). The users who presented LASDB also presented RBBB, as shown in Table I.

The echocardiogram (ECHO) revealed a mean of 59±12.5 left ventricular ejection fraction (LVEF). Alteration without nonsustained ventricular tachycardia (NSVT) was the most frequent finding in the holter, followed by NSVT and sustained ventricular tachycardia (SVT). The user with SVT also presented NSVT.

Table I - Findings on complementary exams (n and %) of cases of Chagas disease. Pernambuco, 2017-2018.

Exams and findings	n (%)
Chest x-ray	
Normal results	3 (15.79)
Total[a]	3 (15.79)
ECG[b]	
Sinus rythm	16 (84.21)
Pacemaker	1 (5.26)
RBBB	9 (47.37)
LASDB	3 (15.79)
Total[a]	17 (89.47)
ECHO	
LVEF (%)[c]	59±12.5
Total[a]	13 (68.42)
Holter[b]	
Alteration without NSVT	5 (26.32)
NSVT	2 (10.53)
SVT	1 (5.26)
Total[a]	7 (36.84)

a: total number of users who underwent the exam; b: there may be more than one response per user so the sum may exceed 100% (n=19) of the cases; c: mean ± standard deviation; RBBB: right bundle branch block; LASDB: left anteriorsuperior divisional block; ECHO: echocardiogram; LVEF: left ventricular ejection fraction; NSVT: nonsustained ventricular tachycardia; SVT: sustained ventricular tachycardia

Source: PCDCh /SEVS/SES-PE, 2018

As for the classification of HCD, the cardiac form was predominant in the chronic cases, followed by the undetermined, digestive and mixed forms, as shown in Figure 3. With regard to the manifestations of the digestive form, megaesophagus was present in 15.79% (n=3) of the users.

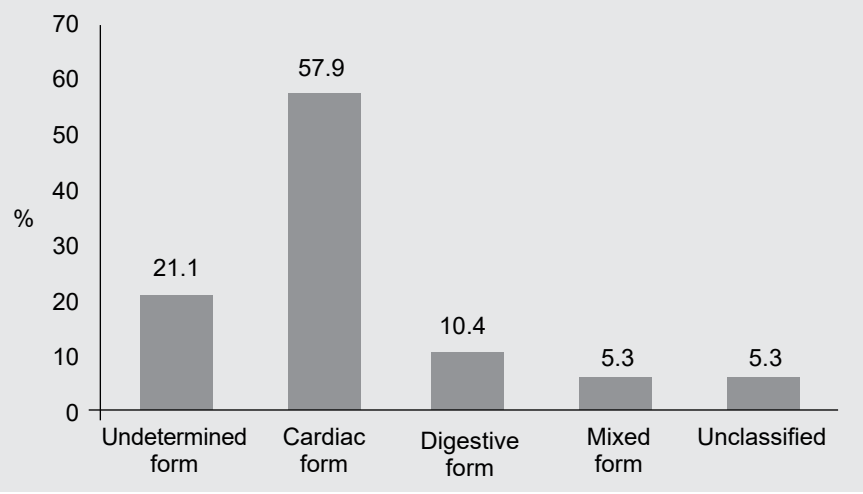

Figure 3 - Percentage of cases of Chagas disease by clinical forms of the disease. Pernambuco, 2017-2018.
Source: PCDCh/SEVS/SES-PE, 2018

Stage B1, which refers to users without ventricular dysfunction, was the most prevalent, followed by asymptomatic users or users without previous symptoms of HF (A), users with ventricular dysfunction with previous or current symptoms of HF (C) and users with ventricular dysfunction without signs and symptoms of HF (B2), as shown in Figure 4.

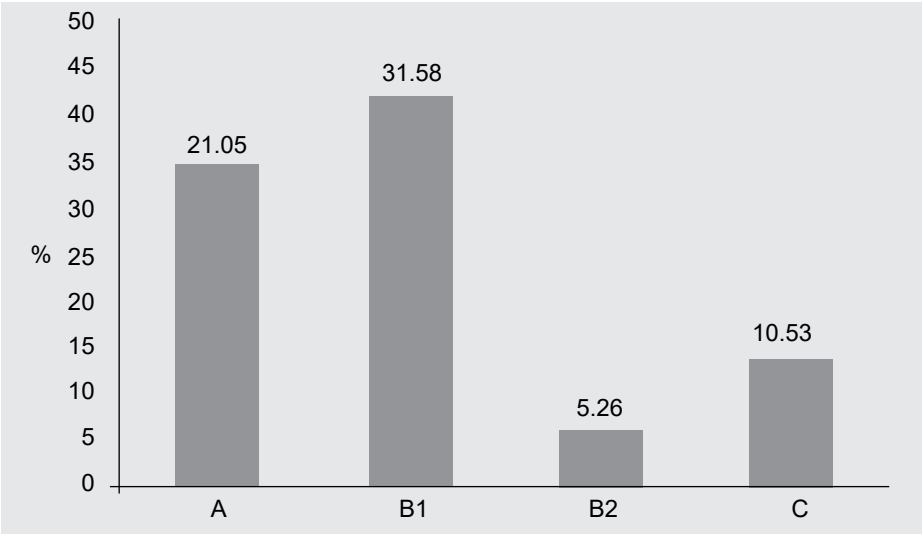

Figure 4 - Percentage of cases of Chagas disease by clinical stages of the cardiac form. Pernambuco, 2017-2018. Source: PCDCh/SEVS/SES-PE, 2018

With regard to the chronic cases of HCD, 5.26% (n=1) of the patients received etiological treatment with benznidazole. As for the treatment of comorbidities, 26.32% (n=5) of the patients use two medications. The mean number of medications used per patient ranged from 0 to 9 medications (2.7±2.2). There is a variety of 24 medications and the most commonly used are angiotensin-converting enzyme (ACE) inhibitors (68.42%; n=13), followed by diuretics (42.10%; n=8), calcium channel blockers (26.32%; n=5) and B-blockers (26.32%; n=5). The most commonly used medications are losartan (42.10%; n=8), followed by hydrochlorothiazide (31.58%; n=6) and carvedilol (21.05%; n=4).

The reference service for these patients is located at *Espaço Saúde* in the municipality of Palmares, Pernambuco. The *Espaço Saúde* covers several medical specialties, but the reference service for CD counts on only one physician specializing in cardiology and with expertise in the disease.

In the case of a patient with gastrointestinal signs and symptoms and/or alterations in the imaging exams, the cardiologist informally contacts a physician from the Restoration Hospital (*Hospital da Restauração*) located in the municipality of Recife and refers the patient since there are no gastroenterologists in the reference service to provide care in case of digestive forms of the disease.

The consultations are scheduled according to the regulations adopted by each municipality. The Municipal Health Secretariat does not recommend serving patients who seek care spontaneously because it requires an Outpatient Procedure Authorization (*Autorização de Procedimento Ambulatorial – APAC*). However, even without the APAC, the physician does not deny care when patients with chronic HCD spontaneously seek the service.

When exams/procedures need to be requested, the physician of the Family Health Care Center (*Unidade de Saúde da Família – USF*) must complete an APAC and then send it to the regulation officer who will proceed with the appointment.

Blood collection is performed in the municipalities where the patients live and at the Palmares Testing and Counseling Center for users of the III Health Region. The collected blood is sent to the III GERES located in Palmares and then to LACEN in Recife for analysis and registration in the GAL. The results are released within 15 days on average. However, patients end up not taking blood test due to the time and money need to go to the center.

The analyses showed that the reference service does not fill out the USF counter-referral form and does not receive the counter-referral from the reference hospital. The reference service has difficulty in referring users for hospitalization since it is scheduled by the municipal regulation office.

The reference service does not offer the essential tests during follow-up of chronic patients. The ECG is performed at the Palmares Regional Hospital (on pre-established quotas and days) and the holter, ECO and blood count/

biochemical testing are performed in the municipalities of residence. The regional regulation office has established chronic cases as priorities to facilitate access to cardiology tests and care in the reference service.

If the medications prescribed are lacking (in the reference service or USF) during follow-up, patients need to buy them directly from drugstores. Amiodarone, simvastatin, carvedilol, furosemide, enalapril, hydrochlorothiazide, potassium losartan, digoxin and amlodipine are commonly prescribed in the service on a daily basis, but only captopril and furosemide are available in the reference service.

DISCUSSION

The strengthening of the Health Care Network for people with Chagas disease by monitoring the morbidity and mortality profile is one of the goals of epidemiological surveillance for this disease in Brazil[21]. In Pernambuco, surveillance has historically focused on entomology and has expanded to chronic cases with the decentralization of regional reference services and the monitoring of clinical and epidemiological profile[13].

With regard to the profile of the chronic cases analyzed in the present study, the mean age was found in older age groups, but it varies across studies conducted in Paraná[22], Bahia[23], Ceará[24] and Rio Grande do Norte[25]. There was a predominance of cases among women, which is in accordance with other studies[22-24]; however, in Natal (RN) and Ceará they accounted for half of the cases[25,26]. As for the housing area, most cases occurred in urban areas, which is in line with a study conducted in a referral outpatient clinic in Salvador, Bahia[23]. However, in Ceará, 83.5% of the cases occurred in rural areas[26].

The precariousness of housing is one of the conditioning factors and determinants of the vectorial transmission of the disease[27], which allows to infer an association between living in a mud and stud house and the transmission of the disease because all the chronic cases live or have lived in mud and stud houses. This reality is in accordance with the chronic cases found in the outpatient clinic in Salvador[23].

Given that, intersectoral management is deemed paramount to act upon the social determination of the disease and on the continuous effort to tackle social injustices[14]. A study conducted in a hospital in São Paulo[28] and another study conducted in Salvador[23] found that most users have relatives with HCD, which differs from the present study. Therefore, it is necessary to emphasize the need for actively tracing relatives.

The recording of sociodemographic data in the present study had some limitations. For instance, it did not include information on race, education, income and occupation, which could add to the knowledge of the profile. In addition, the incompleteness of information hindered the analysis of some variables, such as place of birth, marital status and weight – such information was missing in 10, 13 and 18 users, respectively. It should be noted that there was no information on some variables, such as blood donation, receipt of blood transfusion and possible form of contamination.

The possibility of chronic degenerative comorbidities is higher due to the prevalence of the disease in the most advanced age groups and due to vector transmission in the past, mostly. Diabetes mellitus, SAH and other heart diseases[29,30] were the most prevalent comorbidities among service users, which is in line with a study conducted in Bahia[23], were there was a predominance of SAH and the presence of risk factors for HF, such smoking.

It is essential to plan and perform health promotion and disease prevention activities to intervene on the chronic conditions and lifestyle of patients with chronic HCD using an interdisciplinary approach and providing guidance on self-care since care focused on a curative model centered on the physician does not fulfill the importance of a multiprofessional team as it is fragmented and ineffective for health promotion. Given that, there is a need for local managers to discuss the National Health Promotion Policy together with society[31].

All suspected cases of HCD, both acute and chronic, should be etiologically diagnosed. However, 35 users served at the reference service analyzed did not have their serological results registered in the GAL, thus increasing the risk of developing complications[13].

Neglected diseases constitute a worrying reality in view of the needs of the neediest populations, such as less coverage of preventive actions, poor quality and access to the health services network, and the poor access to essential treatments[8]. In the present study, the users experience problems related to access to clinical care and examinations and availability of medications.

The municipality should offer the complementary exams and when it is not possible to do so the state should allow the offer and provide technical support for the treatment of suspected and confirmed cases through specialized consultations (cardiologist, gastroenterologist, radiologist, clinician, neurologist, among others) and clinical hospitalization

for users with cardiac decompensation[13]. Even so, most of the users in the present study do not have access to these tests, which makes clinical classification impossible and impairs the continuity of care.

As for the complementary exams performed, the RBBB alterations in the ECG followed by LASDB alterations were prevalent in both the present study and in others[25,26] and the mean LVEF of the users of this service (59±12.5) is close to the one found in a study conducted in Salvador (54±15)[23].

Regarding the clinical forms, the most prevalent forms in this study (cardiac, followed by undetermined and digestive) disagreed with data from the Chagas Consensus and the WHO, who found that half of the cases are asymptomatic[21], followed by 30% of cardiac disorders and 10% of digestive disorders[1]. The findings are also different from those reported in another study in which there was a predominance of undetermined forms[25]. However, other studies also found the cardiac form as being the most prevalent, followed by the undetermined form[22,23,26,28].

The most prevalent symptomatic clinical form of HCD is chronic Chagas heart disease (CCHD)[2], which is in line with the findings of the present study. Some of the users analyzed in this study are at risk of sudden death due to cardiac arrhythmias or progressive HF caused by the destruction of the cardiac muscle and nervous system[1]. They are also at increased odds of being readmitted due to CCHD[32] and HF symptoms are more prevalent in the cardiac form of the disease[19]. With regard to the stages of the cardiac form, stage A, followed by stage B1, was the most prevalent stage in a study conducted in Natal[25]. In contrast, most of the users in the present study presented stage B1, followed by stage A.

According to a study carried out in Paraná[22], the organs most affected by the digestive form of HCD are the esophagus and the large intestine, thus leading to megaesophagus and megacolon, respectively[2]. However, there was no megacolon in the present study. There was one case of grade III megaesophagus in Rio Grande do Norte[25].

The disarticulation of the network, the absence of the electrocardiograph in the service and the regulation office's poor organization of access to examinations resulted in failure to classify users with the digestive clinical form of the disease since no user received esophagus contrast x-ray. In addition, there are users without the classification of stages (A, B1, B2, C or D) of the cardiac form due to failure to perform tests such as ECG and ECHO, thus making it impossible to identify ventricular dysfunction[19].

The municipality should offer etiological treatment and follow-up of laboratory confirmed cases of acute or chronic HCD[13], but it was observed that only one patient received specific antiparasitic treatment.

Thus, there is a need for sensitization of Primary Health Care (*Atenção Primária à Saúde - APS*) professionals to identify symptoms and for a critical and epidemiological glance at an endemic region to increase the detection of suspected cases for faster diagnosis – even if they are already in the chronic stage – and treatment initiation since treatment is indicated for patients with reactivated infection[1], children aged 12 years or less in the chronic stage, adolescents aged 13 to 18 years, and adults with recent chronic infection (<12 years). The treatment is also recommended on a case-by-case basis for the undetermined form and for patients with mild heart disease[2].

Treatment may be necessary for cardiac or digestive manifestations[1]. The mean number of medications per user in this study (2.7±2.2) was similar to that found in a pharmaceutical service in the state of Ceará (3.12±2.44)[26]. The three types of drugs most commonly used by users of this service are also in line with the study conducted in Ceará[26], but the order of prevalence differed, with diuretics being the most used, followed by ACE inhibitors and blockers.

Regionalization allows the decentralized provision of health actions and makes the states and municipalities accountable for health care, thereby allowing a more localized action. In order to provide users with universal access to these services, it is necessary to guide and order the flows of actions and health services[33] and to ensure interaction between these services and their interdependence in different flows based on a horizontal relationship[34].

The reference service has faced the challenge of effectively establishing the referral and counter-referral flow. This reality requires planning the organization of work processes since health surveillance is redefined as a model of care with the integration of health practices and technologies and innovations in health[35].

Other problems, such as the disarticulated work process and the incomplete health team, in addition to referral and counter-referral difficulties such as patients spontaneously seeking care without being referred from the APS centers[36], are portrayed in the reference service by the absence of a gastroenterologist, the ineffective municipal regulation of medical appointments and the non-referral to the USFs.

In the present study, referral of patients with severe clinical conditions to more specialized health services by primary care teams or even hospitalization is not in accordance with the II Brazilian Consensus on Chagas Disease, which defines the order of actions that should be taken for an integrated management with APS through counter-referral[2].

Some of the major barriers to the treatment of cases of HCD in Colombia include delayed diagnosis, loss of documents, lack of diagnosis and treatment in APS, shortage of equipment and supplies in health centers, and the

distance between rural dwellers and specialized health services[37]. The reference service analyzed in the present study also experiences these barriers, except for the professional's lack of experience and training in HCD, as the reference physician is trained.

The poor access to health services of higher complexity, as observed in the service analyzed in the present study, is one of the factors that contribute to the fragmentation of health care[34], which occurs in an unequal and excluding way with problems in the components of accessibility[36], availability (receiving the necessary care), convenience (the form of scheduling) and acceptability of the service by users[38].

In the present study, the articulation of the reference service with the APS teams and the board of directors, the regulation of the municipalities of the III Health Region and the GERES, the municipal and regional surveillance, and the state HF and HCD outpatient clinic of the reference hospital are fragile. This articulation between the services of the health care network is essential to deliver care to solve problems in a quality, timely, fast and singular manner and it is aimed at the comprehensiveness of care[38]. In addition, it is necessary to address problems related to service communication and access operability[39].

The universalization of access to health services has not been fully materialized due to the precariousness of care delivery[40] and disorganization of services. This scenario has a negative impact on the costs for public services, with more complex treatments and costs for users, thus causing individuals to walk a long therapeutic itinerary in search of health care, which leads to delayed responses to demands, worsening of clinical conditions, and, consequently, increased risk of morbidity and mortality[36].

The service faces several obstacles, such as the lack of electrocardiographs, computers without internet access, lack of medication for comorbidities and lack of complementary exams. Given that, public policies should be aimed at the organization of this network through material resources, equipment, trained human resources[36], commitment from managers at different levels, instruments and mechanisms of operationalization in the governance process (acquisition of inputs, complex regulators and service contracts), confrontation of political and structural issues[38], civil society involvement – including people with HCD – and the creation of a patient-centered management model[37].

CONCLUSION

The users of the reference service are inserted in a context of social and environmental vulnerability because they live in mud and stud houses and there is a predominance of cardiac impairment and worsening of clinical conditions due to the presence of comorbidities and tobacco use. In addition, they face difficulty in making appointments and accessing exams and medications.

CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTIONS

Rafael Mota Mendonça and **Aymée Medeiros da Rocha** contributed to the study design and conception; the acquisition, analysis and interpretation of data and the writing and/or revision of the manuscript; **Maria Sandra Andrade** contributed to the acquisition, analysis and interpretation of data and the writing and/or revision of the manuscript; **Aline Beatriz dos Santos Silva** contributed to the acquisition, analysis and interpretation of data.

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