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RESEARCH ARTICLE

Epidemiological and Clinical Data of *Trypanossoma Cruzia* in Nagapattinam District

[1]Sathish .K., [2]Muthu kumaran.B., [1]Niraimathi, S and [3]Govindarajan, M

1P.G and Research Department of Biochemistry, R.V.S College of Arts & Science, Karaikal- 609 609
2 Dept. of Science and Humanities, SCSVMV University, Enathur, kanchipuram, Tamilnadu, India.
3Department of Zoology, Annamalai University, Annamalai Nagar-608 002, Tamilnadu, India.

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ABSTRACT

The Chagas' disease is a protozoan infection caused by the parasite Trypanosoma cruzi and transmitted by the depositing of metacyclic tripomastigotes, eliminated in the feces and urine of the several species of triatomine bugs, during the hematophagism phase. A retrospective cohort study was performed between 2011 and 2012, on 54 patients with serum and parasitological diagnosis of CD. Epidemiological, clinical, nutritional, and biochemical data were collected, including gender, age, skin color, smoking, alcoholism, physical activity, weight, stature, body mass index, abdominal circumference, glycemia, and lipid profile. Were 46% male and 53% female; 96% were white skinned. Mean age was 49.6±6.36 years. The predominant form was indeterminate in 71%; smoking and drinking were recorded in 35% and 29%, respectively. Sedentariness predominated in 93% and 66% presented increased abdominal circumference. Most, 94%, were overweight or obese. The biochemical exams revealed hyperglycemia in 100% and dyslipidemia in 90%. These findings suggest that the Chagas population presents co-morbidities and risk factors for developing chronic non-transmissible diseases, including cardiovascular diseases, making CD evolution even worse.

INTRODUCTION

Acute or chronic Chagas disease (CD) is the result of infection by the protozoan *Trypanossoma cruzi*, with greater incidence in communities living under poor hygiene and sanitation conditions in the Americas (Neva 2003). In India, this is one of the most serious medico-social problems, evident from its high frequency and the large number of deaths, notably as a consequence of cardiac lesions (Carod-Artal et al., 2005). Most individuals with chronic CD have the indeterminate form, without any evident organic compromise. Other forms of the chronic phase are cardiac and digestive, the latter attacking the esophagus and colon (Neva 2003). Chagasic cardiomyopathy is associated in an independent manner with ischemia [4]. Other risk factors can be involved in the development of cardiovascular diseases, specifically hypertension, diabetes mellitus, obesity, and dyslipidemia, among others (Lamon-Fava et al., 1996. Cercato et al., 2000).

The Chagas' disease is a protozoan infection caused by the parasite Trypanosoma cruzi and transmitted by the depositing of metacyclic tripomastigotes, eliminated in the feces and urine of the several species of triatomine bugs, during the hematophagism phase (Cançado, 2005; Coura and Castro, 2002). It is an endemic Latin America parasitosis which affects 18 million individuals, with 300 thousand new cases every year (WHO, 2003) and persists for the lifetime of the human/mammalian host. This disease is characterized by an acute phase with detectable parasitemia and a long-lasting asymptomatic phase, generating megacolon, megaesophagus and chagasic heart disease (Santos et al., 2005; Teixeira et al., 2006). Treatment includes eradicating the parasite with Benznidazole, commercially known as Rochagan , a drug with specific anti-T. cruzi activity in vivo and in vitro, available in Brazil since the 1970's (Coura and Castro, 2002). The use of certain plants as phytotherapy has been a millennial practice in folk medicine. Its use has gained enormous popularity around the world, as modern medicine is beyond the reach of many people. The Artemisia vulgaris and Artemisia annua are examples of ancient plants in Chinese medicine that has shown to be very effective against Plasmodium falciparum and P. vivax, malaria parasites in humans (Meschinick. and Dobson, 2001). A. vulgaris is metabolized and eliminated rapidly from the human organism and induce a rapid reduction of these species of Plasmodium (Meschnick, 1998; Meschinick and Dobson, 2001). However, there are no reports in the scientific literature about its tripanosomicidal action (anti-T. cruzi). Another example of phytotherapy, widely used in Brazilian folk medicine, is the Aloe vera plant, known as "babosa". It is a tropical or sub-tropical plant from North

Africa and has been used over the years to treat various ailments and have been referred to as the "miracle" plant. It has been suggested that the extract of the plant promotes healing of diseases through the complex synergistic interaction of many substances, and some specially prepared A vera extracts possess some biological activities such as antiinflammation, anti-cancer, antidiabetes, macrophage activation, combat gastrointestinal infections and urinary infections, as an analgesic and more (Reynolds and Dweck, 1999). However, its effect anti-T. cruzi is not known until the moment. Studies are being developed to discover drugs that provoke the complete eradication of the Trypanosoma cruzi, not only through the elimination of tecidual forms (amastigotes) such as blood (tripomastigotes) and the 100% cure of cases in Brazil.

Pancreas is one of the organs affected in Chagas'Disease. Patients with this disease have plasma pancreatic glucagon and pancreatic polypeptide levels reduced (Long et al., 1985), lower insulin activity and morphometric and morphologic alterations of pancreatic ganglia and islets (Guariento et al.,1994). Experimental infections in hamsters caused pancreatitis, erratic blood glucose levels, and a tendency to hypo insulinemia (Dos Santos et al 2004). Above clinical and animal studies suggest that patients with Chagas' disease are more susceptible to develop hyperglycemia, and this would worsen the infection. In fact, patients with both conditions have been reported, and diabetes or hyperglycemia prevalence was higher in patients with the cardiac form of Chagas' disease (Dos Santos et al., 1999).

MATERIAL AND METHODS

Diagnosis of *T. cruzi* infection is challenging for a number of reasons. The initial infection is often not detected except in the rare cases of high infective doses and severe acute symptoms (Aguilar et al., 2007; Benchimol Barbosa, 2006; Shikanai-Yasuda et al., 1991), or when inflammation occurs at the site of parasite entry (Nicholls et al., 2007). Although parasites may be visible in the blood during the one- to two-month acute phase, they are difficult to detect thereafter. Amplification techniques (e.g., hemoculture, xenodiagnoses, and polymerase chain reaction (PCR) have been extensively evaluated as diagnostic tools with highly variable results (reviewed in Cooley et al., 2008). Most studies suggest that fewer than 50 percent of seropositive individuals have detectable parasites or parasite DNA, although numbers at both extremes of this average have been reported. In one of the more herculean attempts to assess the dependability of parasite detection in the chronic phase of *T. cruzi* infection, Cerisola et al. (1974) used xenodiagnosis (i.e., insect vectors as detectors of *T. cruzi)* to periodically sample 30 seropositive individuals as many as 21 times over several years, using 80 bugs per time point per subject. Only six subjects consistently had at least one infected bug at each sampling point but the remainder had one or more time points at which none of the 80 insects were positive. In the most extreme case, parasites were detected in only 2 of 18 sampling points (i.e., only 2 of 1,440 bugs fed on this individual were positive). This study firmly documents not only the low parasite levels in chronically infected subjects but also the between- and within-subjects variability in detecting those parasites. This type of sampling error carries over to other amplification methods as well—including PCR—making these techniques instructive when positive but uninformative when negative.

RESULT AND DISCUSSION

We carried out a cross-sectional study of the population, including data collected from February 2011 until February 2012, from 81 subjects (46 men and 35 women) aged 41.4 ± 5.6 years (range, 30–50 years), whose ECG, chest X-ray and 2-D echo were normal. Subjects were divided into 2 groups: a Chagas group (54 patients with the indeterminate phase of Chagas' disease) and a control group (27 normal subjects). All patients were referred from the Nagapattinam Government Hospitals. After patients were explained the goal of this investigation, all of them signed the informed consent. All patients with Chagas' disease, 25 men and 29 women, aged 41.7 ± 5.7 years (range 30–50 years), had a history of residence in an endemic zone and were asymptomatic. Exclusion criteria were: coronary artery disease, valvular, myocardial or pericardial disease, congenital heart disease, clinical evidence of heart failure or asymptomatic systolic dysfunction (ejection fraction < 50%), hypertension, diabetes mellitus, anemia, asthma, chronic obstructive pulmonary disease, thyroid dysfunction, renal failure, pregnancy, a history of alcohol intake or other disorders that could potentially cause cardiac disease. Main signs and symptoms were fever, weakness, facial edema, myalgia, arthralgia, and peripheral edema (Table 1).

Epidemiological and clinical data included gender, skin color, age, smoking, alcohol intake, and physical activity. Smokers were classified as such if they smoked daily, independent of quantity (Marcopito et al., 2005), and alcohol drinkers were women who consumed more than one and men more than two units per week (Costa et al., 2004). Individuals were considered sedentary when they did not partake in physical activity during leisure time for at least 30 minutes, on most days during the week (≥4), as per American Heart Association recommendations. Anthropometric data were weight, stature, and abdominal circumference. Body mass index was also calculated by dividing weight (kg) by stature (m) squared; in order to make a nutritional diagnosis based on World Health Organization (WHO) proposed values (Geneva, 1997).

Among the 54 individuals, 25 (46%) were male and 29 (53%) female; 96% were white skinned and 4% negro. Mean age was 49.6±6.36 years. Habitual smoking and drinking were reported in 35% and 29%, respectively; 93% were sedentary and 66% had abdominal circumferences considered to be high risk for cardiovascular diseases (CDV). Hyperglycemia was found in 100% (Table 2).

The predominant form of CD was indeterminate, followed by digestive, cardiac, and mixed, at 71.2, 12.1, 9.1, and 7.6%, respectively (Figure 1). The prevalent nutritional diagnoses were pre-obesity (31.8%), and various grades of obesity (62.1%), with eutrophy found in only 6.1% (Figure 2). In the lipid profile, dyslipidemia was found in 90% (Table 1), the most commonly-seen forms being mixed, hypercholesterolemia, and hypertriglyceridemia, in 36.4, 22.7, and 15.1%, respectively (Figure 3).

Table 1 Signs and symptoms in 54 patients with laboratory confirmed acute Chagas disease.

	Symptoms	No. of (%) patients (54)
1	Fever	100% (54)
2	Fatigue	100% (54)
3	Facial edema	100% (54)
4	Headache	98%(53)
5	Myalgia	94% (51)
6	Arthralgia	94% (51)
7	Peripheral edema	94% (51)
8	Shortness of breath	90% (49)
9	Tachycardia	90% (49)
10	Nausea/vomiting	90% (49)
11	Jaundice	70% (38)
12	Epigastric pain	70% (38)
13	Retroorbital pain	70% (38)

Table 2 Shows epidemiological, clinical and anthropometric data for 54 individuals

S.No	Variable	Individuals number	percentage
1	Gender (men)	25	46%
2	Gender (female)	29	53
3	Colour white	52	96
4	smoking	19	35
5	drinking	16	29
6	sedentriness	54	93
7	CA with high risk DVC	36	66
8	Hperglycemia	54	100
9	Dyslipedemia	49	90

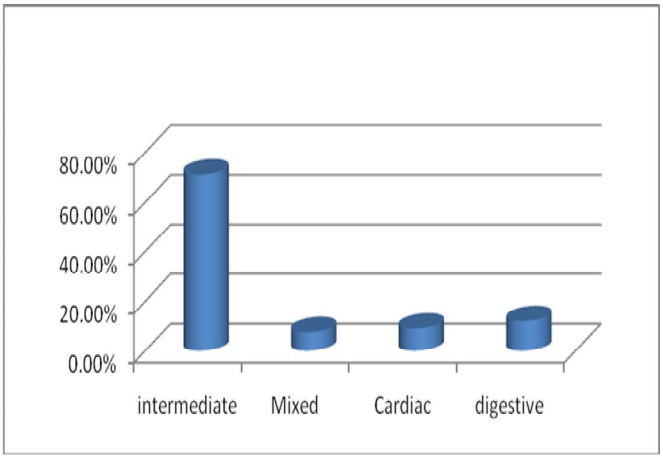

Figure 1 From the Chagas disease in 54 individuals

Different authors have reported that diabetics have an increased susceptibility to a variety of infectious agents (Plouffe et al., 1978, , Casey and Sturm 1982). Hyperglycemia has been previously observed to increase the morbidity and mortality of murine T. cruzi infection. Diabetes and hyperglycemia were also reported to be more prevalent in chagasic human patients with the cardiac form of the disease, than in control ones. But, according to the analysis of the bibliography,

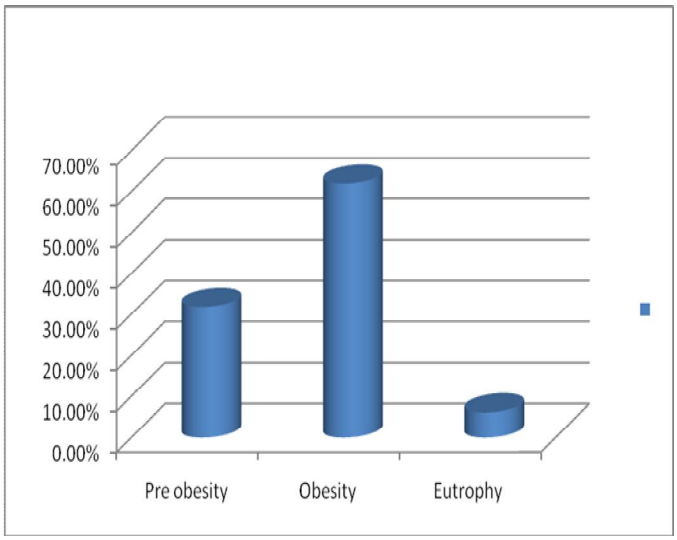

Figure 2 Nutritional profile of Chagas disease in 54 individuals

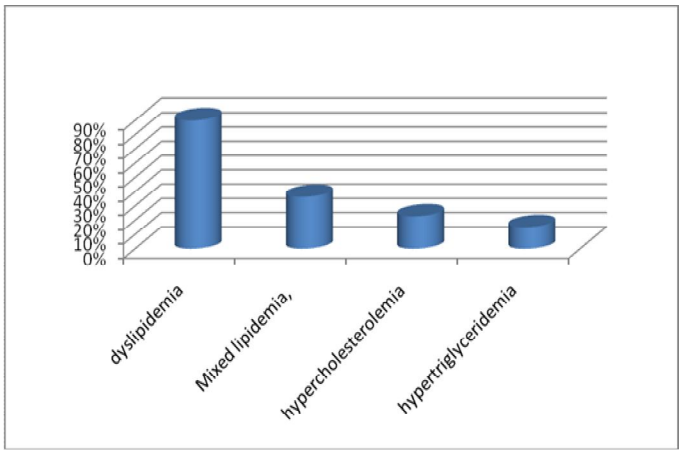

Figure 3 Types of dyslipidemia in 54 individuals

there is not any study analyzing an association between pregnant women affected with both Chagas' disease and diabetes with congenital transmission or with the effect on the new born. Furthermore, there is no marker for placental or fetus infection in Chagas' disease. Due the effect of the Chagas parasite on some proteins located at the lipid raft of chorionic villi trophoblast (Priotto 2009), as well as in trophoblast lipids (Fabro and Calzolari 1990), we aimed to analyze the possible modification of the main glucose transporter located at the syncytiotrophoblast, the GLUT1 protein, produced by placental T. cruzi infection.

CONCLUSIONS

Our study findings implicated in an outbreak of acute Chagas disease. Oral transmission of this disease in the Amazon region has been reported since the 1960s. has long been the principal suspected food vehicle, but characteristics of outbreaks, small groups with universal exposure and high attack rates, have precluded epidemiologic implication of this

food. There are no reports of timely collection of açaí for laboratory testing in an outbreak. In this outbreak, vectorborne, transfusional, transplant-associated, and transplacental transmission were excluded. Incubation periods of cohort case-patients were compatible with those of previous reports.

Chagas disease has a heterogeneous presentation, with wide variation in clinical course and prognosis. Treated as a chronic pathology, patients are susceptible to developing co-morbidities, such as cardiovascular diseases, obesity, diabetes mellitus, which can directly or indirectly interfere in disease evolution, accentuating its seriousness. To this end, university hospitals must provide differentiated treatment to CD patients to prevent complications and reduce costs(Bozelli et al., 2006). There were no significant differences between genders; CD affected both men and women, and as found in other studies, CD is prevalent in rural areas, it is associated with low socioeconomic levels, and it can attack both genders (Conforto and Sung 2003).

We found that CD predominated in the adult-age group, which agrees with most reports; they indicate that it is a late-manifesting chronic disease (Ronan et al., 2000; Souza and Guariento 1998; Gontijo *et al.,* 1996) . White-colored skin, the most numerous group, reflects the origin of those included in this study, who were mainly from the rural interior of São Paulo State, where Italian immigrant colonization predominated. Most cases that we studied originated from a blood bank, in which indeterminate CD predominated, which reflected the normal distribution of chronic forms of this disease (Bozelli *et al.,* 2006; Guariento 1998; Gontijo *et al.,* 1996) . The principal co-morbidities and risk factors for developing DVC identified in these individuals were hyperglycemia, obesity, smoking, sedentariness, high abdominal circumference values, and dyslipidemia. Although elevated glycemia has been reported in around 32% of the Chagas population that includes all clinical forms of the chronic phase (Santos *et al.,* 1999), we observed hyperglycemia in only 100% of the individuals. Other risk factors for chronic diseases are regular drinking and smoking, which were documented in 35% and 29% of our patients respectively. These frequencies are within the range reported for the Brazilian population, for which the frequency of smoking and drinking are between 2.9 and 45.4%, and 20 and 30% of the country's population, respectively (Bloch et al.,2006).

Sedentariness was found in 93%, within the range reported in a recent review article. Physical inactivity can contribute to the development of clinical-nutritional alterations and consequently aggravate CD evolution, as it can provoke cardiovascular alterations. Another factor that can contribute to these alterations is increased abdominal circumference, which was found in 66% of the individuals, which is higher than reported in a study by(Marcopito et al., 2005) for a population from the São Paulo municipal area, in which the prevalence was 19.7%. Combined excess weight and obesity in our study population was 94%, higher than in the Indian population which is currently around 51%; this is extremely worrying and requires special attention. Another important aspect that was evaluated was dyslipidemia, which was found in 74% of the individuals, with mixed dyslipidemia predominating. Carod-Artal et al., 2005 observed cardiac dyslipidemia in 19.15% of CD individuals. We observed lipidic alterations in 67% of individuals with the cardiac form of CD, in 75% of those with the indeterminate form, in 88% of those with the digestive form, and in 60% of those with the mixed form.

There was a high prevalence of co-morbidities and risk factors for developing non-transmittable chronic diseases in these individuals with CD. We conclude that it is important to make an early evaluation of associated chronic pathologies and inadequate lifestyles, aiming towards specialized orientation and follow-up, with the objective of preventing and treating these alterations, as they can worsen Chagas disease, especially the cardiac form. New studies are needed to improve our understanding of the importance of these metabolic alterations and lifestyle impacts, with the aim of defining methods for treatment of this population.

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