

## ORIGINAL ARTICLES

# Knowledge of Chagas disease in a bolivian population living in Valencia, Spain

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## ABSTRACT

**Fundamentals:** Migration movements between countries have enabled the extension of Chagas disease to non-endemic countries such as Spain, where only recently there has been awareness of this emerging global disease and procedures have been put in place for its management. The objective of this study is to determine the level of knowledge of Chagas disease, its symptoms, means of transmission and places where seropositive residents in Valencia (Spain) may seek medical assistance.

**Methods:** Observational cross-sectional study of 96 Bolivian migrants living in Valencia (Spain). The sample was randomly selected and taking advantage of the bolivian elections in 2014. A specific epidemiological survey was conducted and screening blood tests were carried out using ELISA and confirmatory diagnosis by indirect immunofluorescence. After the bivariate analysis, logistic regression models were created to determine the variables that accounted for the lack of knowledge of the disease

**Results:** The prevalence of Chagas was 35.4%. However, 24% of the total sample and 26.1% of seropositive participants do not know about the disease and 70.8% of participants do not know about the symptoms of the disease. While 58.3% (41.1% of seropositive participants) ignore what the means of transmission in non-endemic countries are and 47.1% do not know where to seek medical attention. This ignorance is predominant in participants over 45 years of age and with lower levels of education.

**Conclusions:** There is an important lack of knowledge of the disease which, along with the issue of a high prevalence, elevates Chagas disease into being a potential public health problem which requires specific control and preventive measures.

**Key Words:** Chagas disease, American trypanosomiasis, Public health, Knowledge, Emigrants and immigrants, Bolivia

## 1. INTRODUCTION

Despite Chagas disease (ChD) or American trypanosomiasis being endemic in Latin America, migration flows<sup>[1]</sup> favor the detection of cases in areas previously free of the disease. Spain is the European country with the highest incidence of ChD<sup>[2,3]</sup> since it receives migrants from endemic countries such as Bolivia, the country with the highest prevalence of the disease.<sup>[4,5]</sup> According to data from the Spanish Statistics Institute, there are 9,947 Bolivians living in Valencia, or up

to a 10% of the migrant population.<sup>[6]</sup>

In endemic areas, the transmission of *Trypanosoma Cruzi* relies on the hematophagous vector *Triatoma Infestans*. In Spain, where the vector is absent, the only possible means of transmission are blood transfusions, organ donation, laboratory accidents and vertical transmission, particularly at child birth.<sup>[7,8]</sup> Whereas the two first means of transmission are controlled under Spain's hemodonation decree,<sup>[9]</sup> a national protocol for the control of vertical transmission is yet to be

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created.

Most people with positive serologic tests for ChD show no symptoms throughout their lives, but 30% will develop the disease between 10 and 20 years after infection. Observed symptoms include neurological disorders and, specially, myocardopathy with or without congestive heart failure (CHF) and development of digestive megaviscerae such as megacolon and megaesophagus.<sup>[10]</sup>

This clinical evolution along with a social context of migrants from endemic countries is complicated further by the limited availability of resources, job opportunities and poor knowledge of the seroprevalence of the disease (limited to blood donors and patients of maternity units). The complexity of the issue increases with biased information systems, the possession of a residence card and stigmatization of migrants with a lower socioeconomic status and the poor knowledge of the disease that both the medical class and general European population have.<sup>[11]</sup>

Just as in Latin America, ChD remains a forgotten disease in our midst, since the general public, the healthcare system and health professionals are not aware of the need to tackle it. As confirmed in “Chagas epidemiology in Europe: many calculations, little knowledge”,<sup>[12]</sup> ChD is still to be considered a public health issue.

The knowledge of the disease prevents its propagation,<sup>[13]</sup> with education and communication being the key components in the prevention and control of ChD. Despite our knowledge of the means of transmission enabling a decrease in the incidence of the disease, sociologic studies have revealed a very limited knowledge of both the means of transmission and the disease itself.<sup>[14]</sup>

The poor knowledge of the disease is not limited to the general public, but includes healthcare professionals too. Only 6% of cases are diagnosed in Europe.<sup>[15]</sup> Early diagnosis is greatly relevant, since the effectiveness of the only available drug (Benzimidazole) depends on the phase of the disease and age of the patient,<sup>[16]</sup> with an 85% healing rate in acute phases and up to 90% in congenital infections during the first year of life. Some authors emphasize on the success of control strategies in primary care.<sup>[17]</sup>

The Carlos III Health Institute’s Agency for the Assessment of Health System Technologies’ report manifests the need to develop control strategies aiming to increase the detection of chronic infections in population at risk such as pregnant Latin American women, their newborns and close relatives of infected mothers.<sup>[18]</sup>

In this context, besides identifying carriers, we need to under-

stand their lifestyle and other epidemiological characteristics such as their attitude towards prevention and treatment of the disease in endemic areas and the impact on the general migrant population that is at risk of developing the disease in the years to come. These are pending objectives for preventive medicine and public health both in the Valencian Community and Europe as a whole.

The objective of this study is to determine the prevalence of ChD, the degree of knowledge of its symptoms, means of transmission, places where the population at risk may seek help and the disease itself amongst the Bolivian migrant population living in Valencia.

## 2. SAMPLE AND METHODS

An observational cross-sectional descriptive study was carried out in order to estimate the seroprevalence of carriers amongst the Bolivian migrant population living in Valencia and determine their knowledge of its symptoms, means of transmission and locations where the population at risk may seek medical assistance.

According to a census on January 2015, the population of Bolivian migrants living in Valencia amounts to 9,947. Of these, 96 people were randomly recruited taking advantage of the Bolivian elections on the 12th of October 2014 at the Polytechnic University of Valencia. Inclusion criteria for the study were being over 17 years of age, living in Valencia and being a Bolivian migrant. Subjects who refused to sign the informed consent form or were related to other participants in the study were excluded. So as to avoid a selection bias, participants were never informed about the relation of the study to ChD. Subjects who asked to participate after finding about the study were also excluded.

Appointments were made with participants on the 25th of October and 8th of November 2014 at the Universidad Católica de Valencia’s University Clinic where, after signing the informed consent and data protection forms, they were asked to complete a questionnaire to assess their knowledge of the disease (symptoms, complications, means of transmission and places where they could seek medical assistance). Blood tests were performed using immunochromatography (Stick Chagas Operon) and enzyme-linked immunosorbent assay (ELISA Novotec) with posterior confirmatory indirect immunochromatography testing.

Serological screening enabled the estimation of ChD seroprevalence. The relation between the sociodemographic variables and the knowledge of ChD was calculated using Odds Ratio (OR). Other independent variables were age, sex, level of education, department of birth in Bolivia and positive test for ChD. Knowledge of the symptoms, complications of

the disease, means of transmission and knowledge of places where medical assistance could be found were considered result variables. So as to adjust for the effect of the different studied variables on the knowledge of the disease, multivariate logistic regression analysis was performed. The level of statistical significance was established at  $p < .5$ . The statistical package used for the analysis was SPSS Statistics V2.0.

The study was approved by the Valencian Community's ethical committee of clinical studies involving health products (CAEC).

### 3. RESULTS

Seventy-five women and 21 men with a mean age of 39.5 (ranging between 18 and 61) were studied. Of these 36.5% had a primary education level, 47.9% had secondary edu-

cation and 15.6% had a university degree. 22.9% was unemployed and, among the active participants, 30.6% had house cleaning jobs and 21.9% cared for either children or elders. 71% of participants came from departments in Bolivia considered endemic for ChD (45 from Santa Cruz, 20 from Cochabamba and 4 from Chuquisaca).

Twenty-nine women and 5 men tested positive for ChD, with a global prevalence of 35.4%. Seroprevalence was higher among participants over 45 years of age ((51.5%;  $p = .017$ ) and those from endemic areas (46.5%;  $p = .000$ ). 100% of participants born in Chuquisaca, 50% in Cochabamba, 43.2% in Santa Cruz and 12.5% in La Paz tested positive for ChD. Seroprevalence was higher in women and participants with a lower level of education, however these differences were not significant (see Table 1).

**Table 1.** Distribution of seroprevalence according to sociodemographic variables

Variable	N° of Seropositives	Seroprevalence	Sig.
Gender			
Male	5	25.0%	$P = .274$
Female	29	38.2%	
Age (years)			
18-45	17	27.0%	$P = .017$
> 45	17	51.5%	
Level of Education			
Primary	15	42.9%	
Secondary	16	34.8%	$P = .299$
University	20	8.8%	
Endemic level in department of birth in Bolivia			
High	33	46.5%	$P = .000$
Low	1	4.0%	
Knows about ChD			
Yes	28	38.4%	$P = .283$
No	6	26.1%	
Knows about the means of transmission in non-endemic countries			
Yes	11	27.5%	$P = .170$
No	23	41.1%	
Knows where to seek medical assistance for ChD			
Yes	15	31.9%	$P = .436$
No	19	39.6%	

Twenty-four percent of the analyzed population and 21% of seropositive participants were unaware of ChD, with no statistical differences with seronegative participants. 58.3% of the total and 41.1% of seropositive participants were unaware of the means of transmission of ChD in non-endemic countries. 70.8% of the sample considered themselves unaware of the symptoms and complications of the disease. 73.5% of seropositive patients ignored what the symptoms of

ChD were. 64% of those who asserted that they knew about the symptoms of the disease were aware of the symptoms of cardiovascular nature. 47.1% of all participants and 39.6% of seropositive participants did not know where they might find medical assistance. Of those patients who asserted to know where medical assistance could be found, 54.6% preferred primary care, whereas a 6.5% preferred the Association of People Affected by Chagas Disease (Asapechavae).

**Table 2.** Independent variables of Bolivian migrants’ knowledge of Chagas disease

	Does not know about the disease		
	n (%)	P (JI-2)	Adjusted OR
Gender			
Male	5 (25.0%)	.902	0.74 (0.22-2.45)
Female	18 (23.7%)		1
Age (years)			
< 45	20 (31.7%)	.020*	5.53 (1.37-22.29)*
> 45	3 (9.1%)		1
Carrier of the disease			
No	17 (27.4%)		1
Yes	6 (17.6%)	.287	0.65 (0.19-2.20)
Level of studies			
Primary	10 (28.6%)	.259	4.36 (0.77-24.70)
Secondary	11 (23.9%)	.392	2.51 (0.46-13.81)
University	2 (13.3%)		1
Endemic level in department of birth in Bolivia			
High	17 (23.9%)	.995	0.98 (0.27-3.51)
Low	6 (24.0%)		1
	Does not know about the means of transmission of ChD in non-endemic countries		
	n (%)	P (JI-2)	Adjusted OR
Gender			
Male	9 (45.0%)	.178	0.43 (0.15-1.24)
Female	47 (61.8%)		1
Age (years)			
< 45	37 (58.7%)	.913	1.79 (0.66-4.87)
> 45	19 (57.6%)		1
Carrier of the Disease			
No	33 (53.2%)		1
Yes	23 (67.6%)	.173	1.94 (0.68-5.54)
Level of Studies			
Primary	23 (65.7%)	.040*	4.30 (1.09-16.88)*
Secondary	28 (60.9%)	.070	3.20 (0.86-11.87)
University	5 (33.3%)		1
Endemic level in department of birth in Bolivia			
High	41 (57.7%)	.844	0.72 (0.24-2.18)
Low	15 (60.0%)		1
	Does not know about the available resources to solve medical issues		
	n (%)	P (JI-2)	Adjusted OR
Gender			
Male	9 (47.4%)	.758	0.86 (0.30-2.48)
Female	39 (51.3%)		1
Age (years)			
< 45	30 (48.4%)	.568	1.03 (0.40-2.63)
> 45	18 (54.5%)		1
Carrier of the disease			
No	29 (47.5%)	.436	1
Yes	19 (55.9%)		1.68 (0.62-4.55)
Level of Studies			
Primary	19 (54.3%)	.179	2.12 (0.57-7.87)
Secondary	24(53.3%)	.185	1.82 (0.51-6.57)
University	5 (33.3%)		1
Endemic level in department of birth in Bolivia			
High	33 (47.1%)	.272	0.49 (0.16-1.44)
Low	15 (60.0%)		1

\*P < .5; aOR: adjusted for age, gender, level of studies and endemic level in place of birth.

The adjustment through logistic regression models allows us to identify the main determinants in the participants' knowledge of the disease. In this regard, being under 45 years of age meant a fivefold increase in risk of not knowing about ChD. Having a primary level of education was associated with a fourfold increase in risk, whereas secondary level of education doubled the risk of ignoring the means of transmission in non-endemic countries. Identifying the factors that explain the ignorance with respect to where medical assistance may be sought proved to be more complicated (see Table 2).

#### 4. DISCUSSION

Despite this study being limited by the difficulty of obtaining a representative sample of the Bolivian migrant population, it is worth noting the results it provides in terms of prevalence and level of knowledge of the disease. The last published review on ChD in Europe on February 2015 reveals a prevalence of 18.1% among the Bolivian population, inferior to this study's 35.4%. This higher prevalence could be explained by the fact that Spain is the European country with the highest number of Bolivian migrants, possibly due to the language advantage. In fact, the prevalence found in this study is similar to the 34% observed in a study carried out in Barcelona between 2004 and 2008; which concludes warning about the possible infectious public health threat ChD could pose for the European Union, and goes on to advise European countries to develop protocols to track migrants from endemic areas.

Although ChD has been object of study since the 1990s in non-endemic<sup>[21]</sup> areas such as Spain there is still a lot to learn both in non-endemic areas as well as endemic areas.<sup>[22]</sup> This ignorance is not exclusively limited to the poorest sectors of the population in endemic rural areas, but would also apply to other sectors such as health professionals in non-endemic<sup>[23]</sup> and endemic areas.<sup>[24]</sup>

This study shines the spotlight on a level of awareness of the disease (76%) very similar to the 78.3% previously found in pregnant migrant women in Valencia.<sup>[21]</sup> However, despite three quarters of the participants admit to knowing about the disease, they still ignore some of its main aspects, such as the clinical presentations, means of transmission in non-endemic countries and where to access medical assistance.

In 2007, the Tropical Medicine Unit at the Ramón y Cajal Hospital in Madrid<sup>[25]</sup> observed that 18%-36% of Latino

Americans had no knowledge of ChD, and up to half ignored the existence of vertical transmission. The Spanish ministry of health's report "Chagas Disease in Latino American Residents in Spain 2009<sup>[26]</sup>" estimates the appearance of between 5,897 and 29,409 cases of ChD related myocardioathy between 2009 and 2024. However, despite most participants (64%) correctly indicating cardiovascular problems as the main symptom of the disease there is still little knowledge of the general symptoms (70.8%). Vertical transmission is the most important type of transmission in non-endemic areas such as Spain. Despite this, only one participant indicated vertical transmission as a possible means of transmission in a non-endemic area. Other means of transmission are still ignored. Of the total studied sample, only 29.4% asserts to know the means of transmission in non-endemic areas and, of these, 73.7% believed the vincucha to be a possible vector of the disease despite this vector not being present in Spain. Finally, only a 44.1% asserted to know where they could find medical assistance, with primary care as their first option.

The limited knowledge of ChD observed in this study poses a problem for public health services, particularly if we consider the ignorance on the disease demonstrated by health professionals in Spain. A study performed in Almeria in 2013<sup>[21]</sup> among health professionals who treat Latin American patients daily showed that from 116 professionals (doctors and nurses) only a 54.3% knew the manifestations of ChD; almost 50% ignored what the treatment was and the repercussions that the disease might have in children.

As cited in a recent study,<sup>[27]</sup> Spain is, outside of America, the country with the most potential cases of ChD in the world. The main problem is that carrier patients ignore that they are infected and, therefore, will not take the adequate preventive measures. In this sense, we agree that ChD is a "silent and silenced disease"; silent because patients often ignore their situation and won't seek medical assistance, and silenced because governments aren't taking responsibility for the diagnosis and treatment of the affected population.<sup>[28]</sup> Equally we coincide that there is a necessity to develop educational programs to spread information so that people know about the disease, its means of transmission in non-endemic countries, its symptoms and were to go so as to be screened for the infection, thus preventing new cases of the disease and promoting early diagnosis.

#### CONFLICTS OF INTEREST DISCLOSURE

Authors declare that they have no competing interests.

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