

Impact of Urbanization on Chagas Disease Transmission in León Brindis, Chiapas

Paz María Salazar Schettino^{1*}, Javier Vargas Villalpando¹, Dolores Guadalupe Vidal López²

¹Department of Microbiology and Parasitology, Universidad Nacional Autónoma de México, México

²Experimental Laboratory and Vivarium, Universidad de Ciencias y Artes de Chiapas, México

*Corresponding author: Paz María Salazar-Schettino, Department of Microbiology and Parasitology, Universidad Nacional Autónoma de México, México. Tel: +525556232381; Email: pazmar@unam.mx

Citation: Salazar-Schettino PM, Villalpando JV, Vidal-López DG (2017) Impact of Urbanization on Chagas Disease Transmission in León Brindis, Chiapas. J Trop Med Health; JTMH-103 DOI: 10.29011/JTMH-103. 000003

Received Date: 22 November, 2017; Accepted Date: 13 December, 2017; Published Date: 20 December, 2017

Communication

This report aims to compile and contrast data from two epidemiological research works on Chagas disease, both of them carried out in León Brindis, Chiapas, with 40 years apart. A first study, dating from 1976, consisted in the collection of clinical, electrocardiographic, microscopic, and serological data, as well as xenodiagnosis data. As an outstanding result, an infection prevalence of 16.3% was found in the 61 subjects, with the use of xenodiagnosis. In a second study, conducted in 2016, a serological screening followed by diagnosis confirmation was performed. From the 519 samples screened, 7 adults were confirmed as seropositive. The youngest individual with a confirmed diagnosis was 38 years-old. It is concluded that the cessation of the Chagas disease active transmission in this location may be due to changes in the natural environment, mainly the urbanization that prevents the easy access of vectors insects.

In 1976, the results of the first state-wide seroepidemiological survey for Chagas disease in Chiapas (1974-1975) allowed us to demonstrate a higher prevalence of *Trypanosoma cruzi* infection in the north and northeast areas of the state. After this, Ortega G. M. et al. Performed a preliminary clinical-epidemiological study in two villages of the region to determine whether such situation caused morbidity, its magnitude, and if it represented a public health problem. One of those villages was León Brindis.

León Brindis, a communal colony by then, with 400 inhabitants, had been established about 50 years earlier by Chol indigenous people. Located 14 km south of Palenque at an altitude of 200 mamsl, it has a warm, humid weather with year-round rains. Both towns were surrounded by the vestiges of dense, high evergreen forests and secondary flora (sunflowers). Housing was very similar in both villages: a roof made of palm leaves (guano), walls made of sticks or woods, and dirt floors ('jacal'-type house) (Figure 1)



Figure 1: Characteristic house of rural villages in Chiapas ('jacal').

The study sample consisted of 144 records randomly selected from asymptomatic villagers, aiming to identify, retrospectively, clinical characteristics suggestive of Chagas disease, taking blood samples for parasitoscopic smear, wet smear, and thick smear tests, along with immunologic tests such as direct and indirect hem agglutination and ELISA, which were performed at the Center for Disease Control and Prevention at Atlanta, GA.

Additionally, 61 xenodiagnosis tests were done using nymphs of the triatomine *Rhodnius prolixus*, the most prevalent indoor vector in the region. Simultaneously, electrocardiographic studies were performed on 10 subjects, along with an intradomiciliary search and capture of vector triatomines (*R. prolixus*) and 18 specimens of possible animal reservoirs (*Rattus rattus*). One of the 144 medical records taken featured the description of the Romaña's sign, in a case that additionally had a positive xenodiagnosis. One of the electrocardiographic studies performed showed alterations

compatible with Chagas disease. No trypomastigotes were observed in thick smear nor wet smear tests. Seropositivity rate to xenodiagnosis was surprisingly high: 16.3% in León Brindis. (Table 1) Infection rate by *T. cruzi*-like trypomastigotes in *R. prolixus* specimens from León Brindis was 9.5%. None of the 18 *R. rattus* specimens had positive imprint smear tests.

Based on the clinical-epidemiological findings of the study, it was established that the transmission intensity of the disease was largely due to the conditions of the houses in both villages and to the extended presence of vector triatomines. Furthermore, a future increase in transmission rates was predicted due to the accelerated colonization of the region. On account of these reasons, conducting deeper clinical-parasitological studies and/or epidemiologic studies was deemed necessary to clarify the extension and morbidity of the problem [1].

Forty years later, in 2016, a seroepidemiological and clinical research was carried out in subjects under the age of eighteen, from León Brindis, and aimed to detect children with chagasic cardiomyopathy, although some adult subjects were included afterwards. The study was planned as follows: blood samples were taken on filter paper from asymptomatic students in an elementary school, a secondary school, and a high school for Chagas disease serological screening; after that, seropositivity was confirmed by ELISA and immunofluorescence assay; finally, those patients with a confirmed diagnosis were subjected to clinical studies to characterize their morbidity status and the evaluation of treatment, however, no electrocardiographic or echocardiographic signs suggestive of chagasic cardiomyopathy were found in any of the children nor in the adult subjects [2]. Xenodiagnosis was not performed due to the current WHO recommendations, which advise avoiding it due to the risk of allergic reactions [3,4].

A total of 519 blood samples were collected for serological screening in León Brindis; among them 361 samples were taken from individuals under 18 years-old, and none of them was confirmed as seropositive. On the other hand, adult inhabitants of the village requested to enter the screening and confirmation studies, and to be integrally studied and given treatment if necessary. Among the 158 adults studied, 7 were confirmed as seropositive and received treatment. It is noteworthy, however, that the youngest of these adult seropositive patients was 38 years-old, which lead us to believe that no active transmission of the disease had taken place in the locality in all these years (Salazar P. and Vidal D., unpublished data). (Table 1)

	Ortega GM, et al. 1976	Salazar P, et al. 2016
Study group features		
Geographic area	León Brindis, Chiapas. México.	León Brindis, Chiapas. México

Studied subjects >18 years old	Not specified	158	
Studied subjects <18 years old	Not specified	361	
Clinical status	Asymptomatic	Asymptomatic	
Total	61	519	
Diagnosis			
Method	Xenodiagnosis	Serology	
		>18 years	<18 years
Positive individuals	9	7	0
Percentage of positivity	16.3%	4.43%	0%
Total Prevalence	16.3%	1.35%	

Table 1: Summary of the highlight results within the studies contrasted.

It can be concluded that the epidemiological picture of Chagas disease in the northern region of Chiapas, and specifically in León Brindis, has changed over the previous 40 years. To date, this village is officially regarded as rural; however, the changes produced in the infrastructure of the dwellings since the year 1976 should make us reconsider this classification, because in practice and with respect to other communities recently studied, León Brindis is semi-rural or semi-urban nowadays (Figure 2).

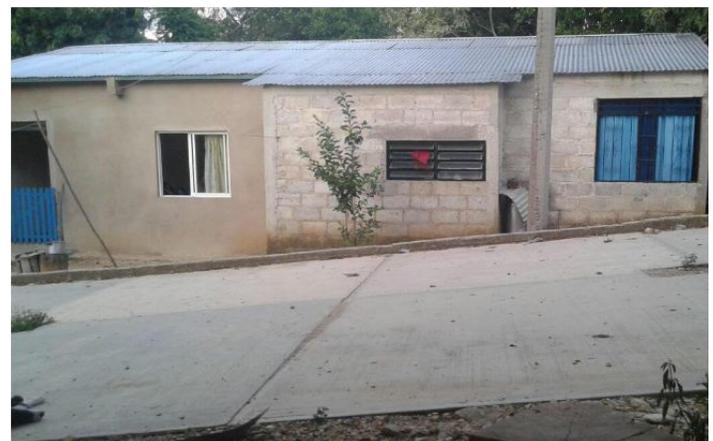


Figure 2: Type of housing currently used in León Brindis.

Currently, León Brindis is mainly surrounded by meadows and scanty high forest remnants; nevertheless, weather is still warm and humid, with rains all year round. It has 1320 inhabitants; 80% of the houses are made of concrete, and all of them have cement floor today, and, additionally, 97.99% have electricity, tap water, and 91.57% has a toilet. Nowadays it is not possible to find

triatomines neither in the houses nor in peridomiliary areas. Being this the determining factor in Chagas disease geographic perpetuation and dissemination, we believe that the total eradication of the disease in this village may be due to the improvement of floors and walls in order to make them solid and continuous, to eliminate the cracks where the triatomines nest and to urbanization of the surroundings [5].

Financial support: This work was supported by DGAPA-PAPIIT N° IN211613 and DGAPA-PAPIIT N° IN227816

Acknowledgments: We thank Elia Torres Gutiérrez for her collaboration with sample processing.

References

1. Ortega GM, Beltrán HF, Zavala VJ (1976) Enfermedad de Chagas en Chiapas: Estudios clinicoepidemiológicos. Sal Públ Méx 18: 837-841.
2. Salazar-Schettino PM, Cabrera-Bravo M, Vazquez-Antona C, Zenteno E, Alba-Alvarado M, et al. (2016) Chagas Disease in Mexico: Report of 14 Cases of Chagasic Cardiomyopathy in Children. *Tohoku J Exp Med* 240: 243-249.
3. Mott KE, França JT, Barrett TV, Hoff R, Oliveira TSD et al. (1980) Cutaneous allergic reactions to *Triatoma infestans* after xenodiagnosis. *Mem Inst Oswaldo Cruz* 75: 3-4.
4. World Health Organization (WHO) (2015) Chagas disease in Latin America: an epidemiological update based on 2010 estimates. *Weekly Epidemiological Record* 90: 33-44.
5. Puntoni V, Igiene TD, Tumminelli Editore. Roma, 1964