Chagas Disease: The need for government recognition, intervention, and prevention on the coast of Oaxaca

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Introduction

The state of Oaxaca, located in southern Mexico, is one of the country’s most culturally and environmentally diverse states. Despite its rich culture and lush biodiversity, seventy percent of Oaxacans live in extreme poverty. This situation is especially prevalent in the coastal regions, where tropical diseases flourish. One of these tropical diseases is the parasitic Trypanosoma cruzi, commonly known as Chagas disease. Chagas first emerged in 1909 in Brazil and is considered among the top three most important parasitic diseases in Latin America. In countries such as Uruguay, Chile, and Brazil, where sufficient programs for treating Chagas have been developed, the disease is close to being eradicated. However, Chagas continues to have a detrimental impact along the Oaxacan coast due to the lack of funding for prevention programs. To solve this health concern, the government must recognize the disease’s severity and intervene via sufficient funding to create the required infrastructure for education, research, diagnosis, and treatment of Chagas.

Methods

For this paper we gathered information from the most recent data, conducted interviews, and used ethnographic observations of public health brigades that focus on Chagas disease in the communities of Bajos de Chila, particularly in the areas of San Pedro Mixtepec. Most sources came from the electronic library at the University of California, Davis, the database at the Ministry of Health in Oaxaca, and the Fourth Jurisdiction of Sanitation in the coastal region of Oaxaca. Interviews were conducted with professionals such as biologist Nancy Hernandez, Dr. Jorge Enrique Naranjo, and entomologist Refugio Paez, who shared their knowledge and expertise concerning the prevention, treatment and prevalence of Chagas. We also examined information to obtain budget data on Chagas treatment and prevention, and compared this with information on Paludismo (malaria) prevention programs.

Characteristics of Chagas and Diagnostic Difficulties

Mexico is a country of high climatic variety and great biodiversity, providing an opportunity for the development of etiological agents of all kinds. Trypanosoma cruzi (T. Cruzi), the parasitic agent for Chagas disease, is certainly no exception. Infecting over 10 million people in Latin America, Chagas has become an endemic disease, defined as a chronic disease within a community or population, with the highest impact in the state of Oaxaca, especially in the coastal regions. There are 30 different vector species for Chagas, with 10 species playing a major role in human infection. The genetic diversity in the vector species complicates diagnosis and treatment, making Chagas one of the most important parasitic diseases of our time.
Chagas remains a difficult disease to treat and control, in part because of the diagnostic difficulties. This has much to do with the characteristics of the disease itself. Chagas typically presents in one of two stages, with 1% of the cases falling in the acute stage and 29% falling in the chronic stage. 70% remain in an intermediate asymptomatic stage. The acute stage, characterized by a high level of parasites, is rarely diagnosed because its clinical manifestations are nonspecific or absent. It can last from 0 to 6 months. In this phase, sudden death occurs in 10% of 5-year-old children. The chronic stage, which presents with few or no visible parasites, can transform into cardiac and/or digestive problems. Nevertheless, nearly half of infected individuals are asymptomatic, making diagnosis extremely difficult.

Diagnosis of the infection in asymptomatic individuals is typically made through random blood tests administered during routine medical check-ups or blood bank visits. Due to their unreliability, however, blood tests cannot be used as diagnostic tools. As of now, doctors must look for one of two clues that can help them correctly diagnose Chagas: the first comes from the medical history of the patient, and includes any contact with *chinche* bugs during childhood, with relatives known to have Chagas disease, or with blood (typically as a result of transfusion) from endemic areas, which all point to a greater probability of a positive diagnosis. The second method is through laboratory tests. During the acute phase, parasitological tests are preferred, due to the higher number of parasites. For the more common chronic phase, serological tests should be performed instead.

Human infection occurs through contact of the skin or mucosa with contaminated feces or urine from *chinche* bugs infected with *T. cruzi*. This is more common in poor and rural areas where housing conditions favor close contact between infected bugs and human hosts. In most cases, if left untreated, infected individuals remain infected throughout their lives, but in some cases, the infection seems to disappear spontaneously without treatment. Healing is detected through serological tests. *T. cruzi* may be detected in the blood of at least 50% of seropositive individuals. Thus, it is not uncommon for *T. cruzi* to be transferred to an uninfected person by blood transfusion. Another means of acquiring infection is through the placenta, which occurs in 1.6–11.7% of newborns from *T. cruzi*-infected mothers.

**Environmental and Social Factors**

The predominant vector of Chagas throughout the state of Oaxaca is the triatominae bug species *T. mazzotti*. Compared with other tiratominae species, *T. mazzotti* results in more *T. cruzi* infections. Thus, high transmission risk areas are defined by the presence of this vector species. *T. mazzotti* is found in altitudes ranging from 15-750 meters and temperature ranges between 22->26°C. Along coastal villages such as Puerto Escondido, which lies at 40 meters above sea level and has very warm temperatures, the living conditions are ideal for *T. mazzotti* to thrive. Studies throughout Mexico have concluded that as many as 1,874,320 individuals are at risk for Chagas, based on temperature and altitude alone. However, when socioeconomic status is included as a potential risk factor, the population at risk rises to 2,148,100. For many poor communities the
intersection of climate and poverty creates an ideal environment for *T. mazzotti* to thrive, therefore increasing the risk of infection within the community.

Among communities of low socioeconomic status, where housing conditions are often composed of dirt floors, adobe and brick walls, and cardboard and lamina tile ceilings, there are positive correlations with the presence of *chinches*.\(^{11}\) *Chinches* live in two states, the wild and the domestic. In the wild state they are present in burrows, often in the habitats of opossums, armadillos, and raccoons. *Chinches* are able to enter the domestic arena when a domestic animal such as a dog roams in or around wild life burrows. The domestic animal is infected when the bug bites it and is then carried into the home. Once inside the home, the insects hide in ceiling nooks, cracks and crevices in the walls. People become infected when bitten or consuming food that has been contaminated by the insect’s feces. The *chinche* is well adapted to survive in domestic environments. In the southern regions of Mexico, 91.3% of specimens captured were within homes; of these, 28.94% were in the young nymph stage, indicating the presence of many reproducing adults within the domestic setting.\(^{11}\)

Among the low socioeconomic status populations there also exists an overall low educational level. Due to the lack in general education, communities fail to recognize changes in their physical and mental well-being that require medical attention.\(^{12}\) Therefore they are less likely to seek medical aid. In the case of Chagas-infected individuals, many are unaware of the severity of a chinche bite, let alone that the chinche transmits the disease. Chagas disease is highly preventable through community health education, but the lack of governmental support for Chagas health education is a major factor that allows the continued spread of Chagas throughout communities. It must be noted that a community’s vulnerability is due not solely to a low level of health-related knowledge, but also to risk factors that are difficult to control and that make it easier to contract the disease.

The lack of quality health care plays a major role in the prevalence of the disease within low socioeconomic status populations. In the coastal municipalities of Oaxaca, the poorest individuals have access to a health care facility; however, the facility itself is lacking necessary resources to adequately treat patients. Despite clinical and experimental evidence of its impact on the community, Chagas disease receives very little attention and little funding for disease education and prevention. Consequently, many doctors within the health care system are unaware of how to properly treat the disease. Oftentimes doctors fail to distinguish a *chinche* bite from a mosquito bite and do not test for the parasite. For example, at a *Centro de Salud*, we saw a woman patient who was clearly worried as she looked at a bug bite that had turned red. The doctor looked at her, and said, “Oh it’s a *chinche*, you should be careful of those things. It looks like you need to clean your home”, and quickly ended the consultation. Unfortunately, the woman was never told that the *chinche* could have been infected with the parasite and the doctor never asked her to bring in samples from her home to test for the parasite. Someone infected under such circumstances, at the very least, would face a delay in treatment that could prove detrimental for her health, as it would allow the parasite to reproduce before treatment.
Lack of Prevention

Studies conducted in countries affected by the outbreak of Chagas disease, including parts of Mexico, show that despite the lack of accurate nationwide information, available data from more limited areas show the importance of Chagas disease as a cause of death.\textsuperscript{13} Despite this evidence in the coastal zones of Oaxaca, Chagas has not received enough attention from the Ministry of Health to fund programs for the prevention of this disease. In the coastal regions, there are vector program campaigns that aim at eradicating tropical diseases present in that area. Although the government has allocated funds for the prevention of prevalent tropical diseases in Oaxaca, Chagas disease prevention programs are among those that receive the fewest resources.\textsuperscript{14} The Ministry of Health (MOH) currently provides zero pesos for Chagas prevention programs along the coast of Oaxaca. Current funding for Chagas brigades is taken from funds allocated for *Paludismo* brigades and other prevention programs. Consequently, there is a lack of support for preventative care measures for Chagas disease. One of the most pressing reasons is that the Ministry of Health considers it to be a non-lethal chronic. However, once Chagas has evolved it can become lethal.\textsuperscript{14} Since the onset of symptoms for Chagas is delayed, there is no imminent health care threat in its early stages. Unlike other tropical diseases, such as *Paludismo* and Dengue, the MOH does not acknowledge the importance of Chagas prevention in the coastal region of Oaxaca. The lack of funding for Chagas prevention programs limits the services available for the control and future eradication of this disease.

This is especially alarming in light of a one year pilot prevention program against Chagas that showed positive results. The purpose of the program was to educate the community about the disease and provide different methods of prevention. Despite these successful results, the MOH did not consider these findings significant enough to fund and establish a permanent prevention program. Data show that in the coastal regions of Oaxaca the number of cases of individuals infected with Chagas disease quadrupled from 1990 to 1996. Conversely, in the year 2006, when the prevention program was in effect, the number of cases reported dropped from 26 to 8 cases, a direct consequence of the pilot prevention program.\textsuperscript{4} In addition, limited funding for Chagas is further reflected in the lack of professionals working for Chagas prevention and education.

Another problem is the lack of doctors’ awareness of the disease. Currently, there are only two active professionals in charge of the project against Chagas. They are responsible for all 55 municipalities of the coast, which account for approximately 500,000 individuals at risk of acquiring the disease. According to our interview with biologist Nancy Hernandez, it is extremely important to establish a laboratory, on site, and clinical research to eradicate Chagas. This research enables one to evaluate the magnitude of the disease and more importantly, to formulate alternate solutions. Currently there is no scientific research being conducted to target the environmental, ecological, and epidemiological factors related to the spread of Chagas disease along the coast of Oaxaca.\textsuperscript{16} The only research currently underway is conducted by Dr. Naranjo, who focuses on clinical research of Chagas. Unfortunately, Dr. Naranjo does not receive funding from the MOH to develop his studies, and so he pays for his own research. This reflects the fact that the level of investment for research in Mexico is insufficient even for basic
healthcare services.¹⁸ Mexico spends only 6% of its GDP on healthcare, in contrast to countries such as the U.S., which spends 11% on health care.¹² Most of the clinical research on Chagas has taken place in Brazil and Chile, where governments have allocated funds to find solutions against Chagas.¹⁴

**Medical Treatment Options**

With no established, efficient prevention program against Chagas, the population of Oaxaca, among other areas in Mexico, is at risk. Lack of prevention leads to increased incidence of the disease, and patients either go untreated or have to seek medical assistance and costly treatment. Studies show that “treatment costs of each individual with acute Chagas disease were US$591.80, with asymptomatic infection US$174.49, mild cardiopathy US$493.16 and severe cardiopathy US$1597.83. These costs do not include consultation, care, and supportive treatment for chronic Chagas patients, which amounted to a further US$1,000/year per patient.”⁸

Despite the fact that Chagas treatment is free for all Mexican citizens, the process of treatment and delivery is costly for the patients’ health. Given the best scenario, individuals that are bitten by a *chinche* can go to the nearest health center to screen for Chagas disease. However, the patient must wait one to two months before they can be tested for the presence of the parasite in their blood. If the results are positive, they are sent to the Committee of Health and Sanitation Services in Mexico City for treatment approval. If this case is approved, the patient’s name is added to the treatment waitlist. Finally, once the medicine is purchased, it is distributed to the patients according to their place on the waitlist. Unfortunately, this process can take from 5 to 9 months before the patients finally receive their treatment.⁴

As a result, individuals infected with Chagas are more prone to lengthy treatment and more serious complications. One example is the testimony of Doña Margarita, a woman who lives in a very low income rural area of Quequextle and has had Chagas for five years. She explained that she did not receive medication for nine months after the onset of the disease. She still has the disease and has developed side effects that, according to her doctor, were caused by delayed treatment. Had she received treatment sooner, the likelihood of recovery without side effects would have been greater. One of the main reasons that there is a delay in Chagas treatment is that Mexico does not fabricate the drugs Nifurtimox and Benznidazol, which are the only medications used to control and treat the disease during the acute stage.⁶ Therefore, medications must be imported from Brazil, increasing expenditures and causing delays in treatment.

**Solutions and Recommendations**

More support, in the form of a permanent budget dedicated to preventing and treating Chagas, is needed from the MOH. If funding was established for Chagas, it could be used to create an infrastructure that could help prevent the disease and include education to the community, the providing of trained professionals with expertise in Chagas, and biochemical and physical preventive measures.
Prevention, particularly for tropical diseases, relies heavily on community involvement, which provides an indicator of the success of any prevention program. During the late 1990s Quequextle and other neighboring communities had a relatively high number of cases for *Paludismo* (malaria). Through the introduction of the government program, EHCAS (Elimination of the Habitat and Creation of Mosquitoes) the number of cases of *Paludismo* was cut by 75% within a span of ten years. The program was funded by the MOH, and coordinated by vector programs run by highly trained health educators. These educators were able to maintain relationships with community leaders. This in turn empowered communities to work together in order to eliminate mosquito habitats. The decrease of transmission of *Paludismo* was made possible because of the efficient number of trained health educators and financial support from the government. If efforts like this are made to fund future Chagas prevention programs, similar results might be expected.

Integrating educational measures in high-risk communities most affected by Chagas is crucial. According to Dr. Naranjo, education programs should be directed towards school children, particularly in kindergarten. As part of the program, they would learn how to identify a *chinche*, its distinctive bite mark, and the steps needed once bitten. Young children are particularly at risk for developing Chagas since the onset of symptoms in children is not as distinct as those in adults, making diagnosis more difficult. From 2007 to 2008 15% of confirmed Chagas cases were from children five years and younger. The education of young children would immediately curtail new Chagas cases and cut down on the number of future infections.

In addition to education, there should also be prevention programs for the purpose of changing the environment that allows *chinches* to thrive. According to Dr. Naranjo and biologist Nancy Hernandez, there are numerous ways to prevent the presence of *chinches* in and around the home. They include throwing away old material such as wood and adobe, where *chinches* often hide. The use of *pabellones* (bed nets) is highly recommended to keep chinches from biting their host at night or while asleep. Another recommendation is to improve current living conditions by adding mud plaster to walls and constructing a simple ceiling that keeps *chinches* from inhabiting the home. Other methods include biochemical repellants such as mushrooms (*beuvaria bassiana vulemin*). The fungus grows inside the insect and eventually kills it. Recent experiments have indicated that this mushroom, used to repel locusts, can also be used to repel chinches. More studies need to be made in order to confirm effectiveness for future public use. It is evident that none of these options can occur without the adequate funding for Chagas. If funding was available, vector control programs could be charged with educating people on how to modify their homes, keeping a daily survey of homes that follow these requirements, and providing community funds for home reconstructions.

Currently there is no established protocol or education for medical professionals concerning Chagas disease. The education of qualified personnel is of extreme importance, not only to help educate the community but to help empower these individuals to take the necessary steps to prevent *chinche* bites. Protocols would inform the patient of Chagas disease and advise them to capture the *chinche* in order to be tested for the parasite. The patient would also be advised on ways to prevent *chinche* infestation within their homes.
If there was established funding, a full functioning laboratory could be established to track the population trends of *chinches* along the coast. The laboratory could also identify specific species that carry the parasite, as well as provide a quick diagnosis of the parasite. Biologist Nancy Hernandez recommends that for every municipality there should be ten trained professionals including chemists, biologists, entomologists, health educators, and doctors. Chemists are needed in order to help make an analysis of the parasite. This analysis can be used as a tool to give more support for a proper diagnosis. More importantly chemists are needed for basic scientific research on potential infectious parasites related to Chagas. Biologists and entomologists are needed in order to test the *chinche* bug for the parasite and make taxonomic identification of the species most likely to carry the parasite. Doctors are needed to train other doctors on how to properly treat and diagnose Chagas disease as well as provide clinical studies. Clinical studies would include studying the incidence and severity of the disease as well as the effects of various Chagas medications.

If there were more funding from the MOH, research could be done to study the prevalence of Chagas diseases and determine geographically which communities have a higher risk of contracting the Chagas disease. These studies would help provide more extensive and long term prevention programs in the areas most affected. Moreover, there needs to be an efficient method for the MOH to quickly distribute medications. With an efficient method of medication distribution, Chagas can be eliminated sooner rather than later. The prevalence of Chagas can be diminished if the proper attention to this endemic disease is given by both the government and the community.

**Conclusion**

It is evident that the Mexican government spends more on Chagas disease treatment than on prevention. A reallocation of government funds towards prevention programs could significantly lower the number of cases, and would be more cost effective in the long run. Unfortunately, the lack of government recognition of the severity of the disease has prevented the funding of these prevention programs. Such prevention programs would educate the community, fund home reconstructions, and help develop laboratory and clinical studies. Current efforts at the control of Chagas disease are developing. A strategic allocation of resources could help decrease the impact of the disease, relieving suffering along the coast of Oaxaca.

**Notes**

1. Authors' names are listed alphabetically. All authors contributed equally to the research and writing of the paper.
2. INEGI Census. 2006.

6. Ibid.


10. Ibid.


References


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