
Chagas Disease in the Americas: A Review of the Current Public Health Situation and a Vision for the Future.

REPORT: CONCLUSIONS AND RECOMMENDATIONS

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Context and purpose of the meeting

Chagas disease is caused by infection with the flagellated protozoan *Trypanosoma cruzi* (*T. cruzi*), which circulates among insect vectors of the subfamily *Triatominae* (*Hemiptera: Reduviidae*) and some 120 species of mammals, including humans, reflecting its zoonotic nature and representing diverse and complex transmission cycles in sylvatic and domestic environments.

Domiciliary triatomines, efficient exploiters of ecotopes found primarily in and around substandard rural dwellings (and to a lesser extent, peri-urban and urban structures), are the main vectors for the transmission of *T. cruzi* infection in humans. They are responsible for concentrating the burden of disease in rural communities, whose socioenvironmental contexts foster and perpetuate its existence.

It is important to point out that the migration of rural populations to cities in recent years, even outside Latin America have 'urbanized' congenital and transfusion transmission, altering the epidemiology of the disease. The new epidemiological landscape also includes episodes of oral transmission, mainly in the Amazon basin, which have not yet been adequately characterized.

The geography of Chagas disease endemicity includes 21 countries ranging in latitude from 40° N (southern United States) to 45° S (southern Argentina and Chile). Despite the complexity of the epidemiological scenario and the enormous challenges entailed in collecting data on this subject, a substantial decline in the incidence and prevalence of the infection has been observed in recent decades. This progress is attributed mainly to improvements in the quality of life of populations, the progress made by national Chagas and/or vector control programs, the intensification of blood bank screening and detection activities, and medical care for managing morbidity and mortality in some countries.

Given the success in reducing the incidence of *T. cruzi* infection through the creation of sub-regional initiatives for Chagas control and the action taken by countries to control vector and transfusion transmission of the parasite, this is a good time to utilize these

platforms and introduce new objectives, considering the advances in the different fields of biomedicine.

In this context, the Pan American Health Organization (PAHO)—aware of its responsibility to adapt to the ever-changing economic and social situation in the countries as reflected by changes in the health structures and epidemiological profiles of diseases—recognizes that the dynamics of Chagas disease have changed since prevention and control activities were first implemented in the Americas in 1991.

Accordingly, PAHO recently held a meeting to examine all aspects of what has already been done, as well as the current and future challenges in the approach to Chagas disease, resulting in the adoption of a public health vision and establishing the service objective of finding alternative solutions to the current health problems associated with this endemic disease.

The purpose of the meeting was to create an entity that would bring together the various actors—including government representatives from endemic countries; civil society organizations working in endemic areas; affected people and/or representatives from communities at risk for the infection; national and international institutions actively engaged in fighting the endemic disease; academic and research institutions with knowledge, experience, and an understanding of the situation in the Americas; bilateral and multilateral institutions; and the private sector—to participate in a strategic review and discussion of all matters relevant to the surveillance, detection, diagnosis, treatment, prevention, control, and elimination of Chagas disease in the countries of the Americas.

The objectives, conclusions, and recommendations of that meeting are presented below.

General objective

Analyze the epidemiology of Chagas disease and formulate the major lines of future work to maintain the progress achieved and tackle the problems yet to be solved in the current situation, trends, and circumstances.

Specific objectives, conclusions, and recommendations

Session 1. Vector-borne transmission of Chagas disease.

1.1. Specific objective

Analyze current vector control, its progress, and the work pending; lay the foundation for strategies and methodologies that increase the coverage and quality of interventions.

1.2. Conclusions

- 1.2.1. In addition to positive socioeconomic changes and donor screening in blood banks, strategies for controlling the primary domiciliary vector—based on PAHO guidelines and in the context of South-South cooperation through sub-regional intergovernmental initiatives—have led to a significant reduction in Chagas endemicity levels, evidenced in the decline in prevalence and incidence, with the consequent inferred impact on financial costs and potential years of life lost.
- 1.2.2. Sub-regional initiatives, created as partnerships strategically managed by the countries themselves, have led to country empowerment, the sharing of experiences, the adoption of agreements, and the implementation and monitoring of interventions to meet their goals and objectives.
- 1.2.3. PAHO therefore acknowledges the efforts of the people from the health sector, academic and research institutions, social organizations, and cooperation agencies who work every day with a sustained commitment at the local level to give priority to promoting and maintaining the prevention, control/elimination, and treatment of Chagas disease.
- 1.2.4. Vector control has been effective in eliminating allochthonous domiciliary vector species in six countries and the state of São Paulo in Brazil, and in controlling them in all or part of the territory of 11 other countries, protecting 209 million people in an area 7 million km² and signifying the interruption of vector-borne transmission of *T. cruzi* in 17 countries in the Region.
- 1.2.5. Advances in the elimination/control of domiciliary vector-borne transmission of *T. cruzi* have led to changes in the transmission dynamic that are creating the conditions for the emergence of other entomological scenarios, such as peri-domiciliary or sylvatic cycles involving autochthonous species. These latter should be studied and characterized to learn about the risk they pose to the human population.
- 1.2.6. Recent studies on the variability of the parasite have shed new light on the different scenarios of the disease's transmission cycles and its pathogenesis in humans. Thus, the main purpose of molecular characterization of the multiple genotypes of *T. cruzi* is to determine their association with clinical disease, its pathogenesis and aspects of its epidemiology.

- 1.2.7. Mention should be made of country efforts to improve unhealthy, precarious rural or peri-urban housing as a Chagas vector control measure, enhancing the overall quality of life of their populations.
- 1.2.8. Entomological surveillance with quality and coverage criteria still needs improvement in the countries of the Region.

1.3. Recommendations

- 1.3.1. Improve knowledge about the vector-borne transmission of *T. cruzi* to humans in all environments and circumstances, characterizing the spectrum of possibilities and evaluating the real epidemiological importance of each scenario to develop new strategies and methodologies for integrated triatomine control.
- 1.3.2. Encourage the countries to achieve/maintain the interruption of domiciliary, vector-borne transmission of *T. cruzi* throughout their territory, following the recommendations of PAHO.
- 1.3.3. Develop and strengthen operational research to increase the effectiveness of entomological surveillance and interventions to combat vectors in areas where transmission through autochthonous vectors or vectors from the sylvatic cycle of *T. cruzi* is a risk, prioritizing the lines of action and issues to be addressed in the short and medium term. In particular, it is recommended that new tools be investigated and developed for preventing or reducing the presence of autochthonous triatomines in dwellings or their contact with humans in the enzootic environment of Chagas.
- 1.3.4. Establish laboratories and a sufficient quantity of capable human resources to support entomological surveillance and the implementation and evaluation of the vector control required in endemic countries.
- 1.3.5. Improve knowledge about insecticide resistance in triatomines and its mapping and management with the support of centers and networks specializing in this area.
- 1.3.6. Provide continuity and expand the intersectoral and interinstitutional associations and partnerships that have led to the progress achieved to date.

2. Session 2. Transfusion transmission of Chagas disease.

2.1. Specific objective

Review the current situation regarding transfusion transmission of *T. cruzi*, cementing and reaffirming achievements and planning improvements that will lead to the sustainability of coverage and an improvement in the quality of activities.

2.2. Conclusions

- 2.2.1. Universal Chagas screening in blood banks in the 21 endemic countries of the Region has been an effective strategy for controlling transfusion transmission.
- 2.2.2. This demands the continuity, sustainability, coverage, and quality of screenings in the public sector, social security system, private sector, and other areas.
- 2.2.3. Mention should be made of the solidarity and support provided by the São Paulo Blood Center (*Hemocentro*) in the dissemination of good practices and quality control of Chagas screening in blood banks.

2.3. Recommendations

- 2.3.1. Agree on the goals and targets necessary for achieving and obtaining national certification of the “interruption of transfusion-transmitted *T. cruzi*.” This should be part of the technical manual for elimination that describes how to accomplish this.
- 2.3.2. The technical manual that will be prepared should include the necessary information on the organization, functions, operation, supervision, and evaluation of the comprehensive prevention of transfusion transmission.
- 2.3.3. It is imperative to adjust and coordinate the algorithms for the care of blood donors who test positive during screening. This includes confirming the diagnosis, referring them through clear and established flow charts to capable clinical personnel, and beginning their management and eventual treatment.
- 2.3.4. Reinforce good practices and the internal and external quality control mechanisms for serological testing when screening blood donors for Chagas disease. This should extend to the screening of organ donors and transplant recipients.
- 2.3.5. Promote voluntary altruistic blood donation as the ideal safety mechanism in donation.
- 2.3.6. Consider the possibility of false positives and negatives in the techniques used in screening blood donors in order to implement safe, practical solutions for improving quality control.

- 2.3.7. Include the PAHO blood unit in the work to screen blood donors for Chagas and improve the quality of the screening.

3. Session 3. Care for Chagas disease.

3.1. Specific objective

Develop approaches for sustained, effective, efficient, timely, adequate, and affordable comprehensive medical care geared to universal coverage for people infected with *T. cruzi*.

3.2. Conclusions

- 3.2.1. Due to a variety of factors and causes, some 6-8 million people infected with *T. cruzi* have limited opportunities to access the health services and resulting comprehensive care (detection, diagnosis, treatment, rehabilitation, and monitoring) for Chagas disease.
- 3.2.2. The diagnosis and treatment of children and adolescents infected with *T. cruzi* is the most effective medical intervention for curing Chagas disease in its early stages.
- 3.2.3. There is evidence of therapeutic indications with a positive impact on the etiological treatment of adults with chronic *T. cruzi* infection in specific situations – for example, women of reproductive age.

3.3. Recommendations

- 3.3.1. Achieve universal access to comprehensive care for all people infected with *T. cruzi*, whatever their age and the stage of their disease, eliminating the misconception that Chagas disease is an untreatable illness.
- 3.3.2. Therefore, intensify strategies to identify people with Chagas disease in all countries and territories in the Americas.
- 3.3.3. All countries, at all levels of care, should improve and update the necessary capacities of parasitological and/or immunological laboratories for diagnosing Chagas disease, in keeping with their level of complexity within the corresponding national health system.

- 3.3.4. Aligning with PAHO's new diagnostic and treatment guidelines for Chagas disease, access to etiological treatment should be guaranteed for any patient with a completed diagnosis of Chagas and no formal contraindications that meet one or more of the following criteria,
- acute stage of Chagas disease
 - pediatric age
 - recent chronic infection
 - woman of reproductive age
 - pathological immunodepression or immunosuppression
 - accidental inoculation with *T. cruzi*
- 3.3.4. Any patient infected with *T. cruzi* can potentially benefit from etiological treatment of the infection, but in the case of patients with chronic infection, its administration should be indicated by agreement between the treating physician and the patient after an accurate and thorough evaluation of the situation and a determination of the risks and benefits.
- 3.3.5. It is necessary to ensure the availability of drugs for the etiological treatment of Chagas disease in all their presentations (for adult and pediatric use), providing free and universal access.
- 3.3.6. Provide comprehensive care for cases, emphasizing a family-based approach. Care should include counseling, guidance, and monitoring. Treatment for Chagas disease is not simply etiological but requires physio-pathological and symptomatic treatment and the early detection of potential complications, depending on the characteristics of each case.
- 3.3.7. There is an urgent need for new drugs capable of curing trypanosome infection and improving conditions, the outlook for cure, and the management of the disease at the personal and societal levels. Additionally, drugs to reverse heart damage are also needed and the use of new therapeutic regimens and strategies for existing drugs should be explored.
- 3.3.8. Regarding the diagnostic tests, there is an urgent need for specific, newly quantifiable and sensitive techniques for diagnosing trypanosome infection and evaluating the efficacy of the drugs. Thus, research in this field should be given the highest priority in order to improve the outlook for diagnosis, even considering rapid tests.
- 3.3.9. Ongoing training, both formal and informal, should be provided to health workers (physicians, nurses, technicians, aides, etc.) to keep their knowledge about Chagas

disease relevant and enable them to properly do their work in prevention, control, and care.

4. Session 4. Congenital transmission of Chagas disease.

4.1. Specific objective

Adopt a comprehensive approach to the diagnosis and treatment of congenital Chagas disease as a public health problem; and its integrated management from the standpoint of maternal and child health through the Framework for Elimination of Mother-to-Child Transmission of HIV, Syphilis, Hepatitis B, and Chagas (EMTCT-Plus).

4.2. Conclusions

- 4.2.1. For many countries that have had success in controlling vector-borne and transfusion transmission of Chagas disease, vertical transmission (from mother to fetus) may currently be the primary mode of *T. cruzi* transmission.
- 4.2.2. By the same token, this form of transmission may also be occurring in urban areas where there is no vector-borne transmission but, instead, the migration of infected populations from endemic areas.
- 4.2.3. Vertically transmitted Chagas cases that receive accurate and timely diagnosis and treatment are cured with a positive impact on morbidity, mortality, and the economic burden of the disease.

4.3. Recommendations

- 4.3.1. For complete and accurate diagnosis and treatment of congenital Chagas, it is essential and strategic to include it in the PAHO platform for the elimination of mother-to-child transmission of Chagas disease, known by the acronym EMTCT Plus, which works in a comprehensive manner to simultaneously eliminate other, more visible vertically transmitted diseases that receive more attention: HIV/AIDS, hepatitis B, and congenital syphilis. The goal is the interruption of transmission and the prevention of new cases.
- 4.3.2. The intervention necessary for the prevention, diagnosis, and treatment of congenital Chagas disease requires services for girls and women in the adolescent and pre-pregnancy stage; during pregnancy itself; in the perinatal period for newborns; and

in the maternal and child postnatal period. To this end, it is important to create algorithms for case referral.

- 4.3.3. Universal serological screening for every pregnant woman during prenatal check-ups is recommended as a diagnostic procedure, and establishment of treatment procedures for verified cases of infected newborns.
- 4.3.4. For the newborns of mothers seropositive for *T. cruzi*, it is essential to perform an immediate perinatal parasitological study which, if positive, will warrant etiological treatment and, if negative, will call for serological monitoring beginning at 8 months to determine the absence or presence of infection.
- 4.3.5. Prior to pregnancy or once exclusive breastfeeding has ended, mothers seropositive for *T. cruzi* should receive etiological treatment to reduce their parasite load and eliminate the possibility of future vertical transmission.
- 4.3.6. Cross-cutting interventions should be conducted to investigate and detect Chagas disease in the entire family of an infected newborn and/or child of a mother who is seropositive for Chagas. Furthermore, all steps should be taken to protect the newborn's home from infestation with triatomine vectors.

5. Session 5. The complex challenge of Chagas disease: patients, community, civil society organizations, and international cooperation agencies.

5.1. Specific objective

Review the situation and opportunities for improving coordination among government agencies, civil society organizations, international cooperation agencies, patient associations, and PAHO itself, identifying the strengths and weaknesses of the current scenarios.

5.2. Conclusions:

- 5.2.1. There is growing recognition of the multidimensional nature of Chagas disease, whose characterization involves the study of a complex web of sociocultural, political, biological, environmental, and health factors. Within this framework, in Chagas, as in other vector-borne diseases, biological factors interact with the

socioeconomic, cultural and environmental dynamics of the locations in which the cases occur.

- 5.2.2. It is essential to maintain and increase the support from national, international, bilateral, and multilateral technical cooperation agencies, both public and private, to guarantee the sustainability of the progress achieved and improve the quality and coverage of interventions in the existing endemic areas.

5.3. Recommendations

- 5.3.1. The comprehensive integrated approach to Chagas disease that its multidimensional nature requires should be grounded in community-oriented concepts with an intersectoral focus. To this end, government institutions, civil society organizations, international cooperation agencies, and patient associations should work together to explore new connections that will increase opportunities for synergy and collaboration for better prevention, management, and control of this disease.

6. Session 6. Surveillance and access to information on Chagas disease.

6.1. Specific objective

Review current surveillance and access to information on Chagas disease in the Americas and propose feasible alternatives and action to improve the quality, frequency, and representativeness of data and epidemiological information that support decision-making in health regarding the management of this disease.

6.2. Conclusions

- 6.1.1. Given the diversity of factors in the natural and social history of Chagas disease, the management of health promotion, prevention, control, and treatment interventions, as well as the monitoring of control/elimination targets, calls for strengthening public health surveillance and information systems with a multidimensional approach by transmission scenario.
- 6.1.2. It is therefore necessary to design comprehensive new indicators that are clear, quantifiable, and harmonize sufficiently with the monitoring of the Sustainable Development Goals (SDG) and the Plan of Action for the Elimination of Neglected Infectious Diseases and Post-elimination Actions 2016-2022. These indicators

should be constructed jointly with the countries to facilitate technical and political decision-making to meet the targets set with clear and objective monitoring of the progress made.

- 6.1.3. It is likewise essential to have more robust data on Chagas disease and integrated analysis of the data, duly incorporating it in the countries' information and/or statistical systems.
- 6.1.4. Mathematical models are a robust tool for inferring the quantification of Chagas disease and the strength of its transmission. Modelling also makes it possible to estimate distribution, progression, and the respective burden of disease, and even the potential impact of some interventions used for its control and elimination. However, mathematical models are no substitute for the national information or statistical services, whose data and information are the basic inputs for decision-making to fight this disease.

6.2. Recommendations

- 6.2.1. Given the ecological, geographic, and demographic heterogeneity of Chagas disease, the creation of more and better instruments and tools is recommended for proper characterization of its risk and transmission scenarios.
- 6.2.2. It is recommended that national morbidity and mortality surveillance systems include compulsory notification of acute and chronic cases of Chagas disease that incorporates at least the variables of age and sex.
- 6.2.3. It is imperative to adopt a methodology for measuring the burden of disease, taking the asymmetrical capacities of country surveillance systems into account.
- 6.2.4. Given the preliminary evidence of the benefits of mathematical models in data analysis, it is recommended that pilot studies for validation and analysis be conducted in Chile, Paraguay, and Brazil, duly accompanied by external evaluation. Adaptation of the methodology should involve country participation and it should be geared for use at the local level.
- 6.2.5. Given the multidimensional approach required for complete and useful surveillance of Chagas disease, the diversity of potential sources of information should be considered. It is also important to generate capacity for the necessary and sufficient integrated analysis of these sources, pursuant to the requirements of each program (and each country), duly harmonized with the health surveillance systems.

- 6.2.6. Considering the multidimensional approach required for the surveillance of Chagas disease, it is therefore recommended that a working group be formed to: review the timeliness, sources, and quality of the information; standardize definitions; determine the requirements; and propose an efficient and viable model for surveillance and integrated data analysis for Chagas disease.

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