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Bibliometric Assessment of the Contributions of Literature on Chagas Disease in Latin America and the Caribbean†

Nathalia Delgado-Osorio[1], Felipe Vera-Polanía[1], Andrés F. López-Isaza[1], Dayron F. Martínez-Pulgarin[1], Jonathan Murillo-Abadia[1], Marcela Muñoz-Urbano[1], Jaime A. Cardona-Ospina[1], Ricardo Bello[2], Guillermo J. Lagos-Grisales[3], Soraya Villegas-Rojas[3] and Alfonso J. Rodríguez-Morales[3,4,5*]

[1]Public Health and Infection Research Incubator, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Risaralda, Colombia; [2]London School of Hygiene & Tropical Medicine, University of London, London, United Kingdom. Formerly, Universidad Central de Venezuela, Caracas, Venezuela; [3]Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Risaralda, Colombia; [4]Working Group on Zoonoses, International Society for Chemotherapy, Aberdeen, United Kingdom; [5]Committee on Zoonoses and Haemorrhagic Fevers, Asociación Colombiana de Infectología (ACIN), Bogotá, DC, Colombia; *†This study was previously presented in part at the 13th International Congress of Parasitology, Mexico City, Mexico, August 10-15, 2014 (Poster A1484)*

Rodriguez-Morales

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Abstract: Chagas disease, considered a parasitic neglected disease, is endemic in Latin America. Although, its mortality rate has decreased over time, it still represents a public health problem in the region. A bibliometric evaluation of the Latin American contributions on this disease was done. This study used SCI (1980-2013), MEDLINE/GOPUBMED (1802-2013), Scopus (1959-2013), SCIELO (2004-2013), and LILACS (1980-2013). Different study types have been characterized by years, origin city/country, journals and most productive authors, by country, cites and H-index. 2988 articles were retrieved from SCI (30.85% of total). Brazil was found to be the highest producer (31.22%), followed by Argentina (18.14%) and México (9.57%); the region received 47241 citations, 28.60% for Brazil (H-index=52), 18.26% of Argentina (H-index=43), 11.40% Bolivia (H-index=37). 4484 were retrieved from Scopus (30.20% of the total), 38.58% of which were from Brazil, 12.40% from Argentina and 8.90% from Mexico. From Medline, 6647 records were retrieved (45.58% Brazil). From SciELO, 917 articles (47.66% Brazil). From LILACS, 2165 articles (60.05% Brazil). Brazil has the highest output in the region. Despite advances in controlling Chagas disease, scientific production is low, particularly for regional bibliographic databases, which calls for more research on this disease.

Keywords: Bibliometrics, chagas disease, epidemiology, Latin America.

INTRODUCTION

Chagas Disease (CD) continues to be a major public health issue in South, Central, and North America, with 7.7 million persons infected in 18 countries. This parasitic infection is caused by the protozoan *Trypanosoma cruzi,* which is transmitted by blood-sucking insects and has several wild animals as reservoirs in rural areas of many countries in the region [1-3]. The burden of this disease is large worldwide, both in morbidity and mortality. According to the World Health Organization (WHO), 50,000 people die every year from this disease [4, 5]. In 2005, the Pan-American Health Organization (PAHO) showed that nearly 41,000 annual cases of vectorial transmission occur and approximately 108 million people were at risk of infection in endemic areas in Latin America and the Caribbean [6-8]. Furthermore, it is estimated that about 2 million women in childbearing age are

*Address correspondence to this author at the Committee on Zoonoses and Haemorrhagic Fevers, Asociación Colombiana de Infectología (ACIN), Bogotá, DC, Colombia; Tel:/Fax: 573008847448;
E-mail: arodriguezm@utp.edu.co

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infected and that 4-8% of them transmit the disease to their fetuses via vertical transmission and 15,000 children are born annually with congenital Chagas disease [9-11].

Chagas disease morbidity is still high and its mortality considerable. Deaths are caused either by infection itself or because of related conditions, sometimes being diagnosed *post-mortem* [12]. For these reasons this disease, which now shows new forms of transmission (e.g. orally), is a major public health problem for the region [13-16]. Additionally, for the region, the epidemiology of Chagas disease has recently shifted to disease migration, with higher incidence out of Latin America and the Caribbean [17, 18].

Despite this epidemiological scenario, research on Chagas disease is still limited in quantity in comparison to its enormous importance in Latin America and the Caribbean as well as worldwide. It is important therefore to describe the magnitude, characteristics and impact of published research on Chagas disease in Latin America and the Caribbean. This study was conducted to develop a bibliometric assessment of the scientific literature contributions on Chagas disease by Latin America and the Caribbean.

MATERIAL AND METHODS

A bibliometric assessment of the scientific output related to CD in Latin America was conducted using 5 regional and international databases (3 in English, 2 in Spanish): Science Citation Index (1960-2012), Index Medicus/Medline/PubMed, analyzed with GoPubMed® (Enero 1809-Febrero 2012), Scopus of Elsevier (1959-2012), SciELO (Integrated) (2004-2012) and LILACS (1980-2013).

The search was conducted using the descriptors (DeCS, Descriptores en Ciencias de la Salud [Health Sciences Descriptors] or MeSH, Medical Subject Headings): “Chagas” AND “Latin America”, “Chagas” AND “Argentina”, “Chagas” AND “Colombia” and so with each Latin American country. All article types were included (original articles, reviews, case reports and editorials) and they were characterized by year, international cooperation (IC), city and institution of origin (CIO), publication journal (PJ), and most productive authors (MPA).

The data were analyzed on Excel 2007 for Windows 7. Continuous variables were summarized as means and standard deviations (+/- SD) and categorical variables were summarized as proportions.

RESULTS

Science Citation Index

A total of 2,988 articles about Chagas disease in Latin American countries were retrieved from this database. Out of these, 91.3% were original articles, being 52.7% published between 2008 and 2013 (mean: 262.3 articles/year).

The country with the largest production was Brazil, with the 31.2% of the publications in this database, followed by Argentina (18.21%), Mexico (9.6%), Bolivia (9.3%) and Colombia (6.1%) while the countries with lower article output were Cuba (0.2%), Belize (0.2%), Suriname (0.03%), Dominican Republic (0.03%), Haiti (0.03%) and Jamaica (0%).

The most productive authors were Solari A. with 28.2% of the publications in Chile; Guhl F. with 17.5% in Colombia; Gurtler R. E. with 16.8% in Argentina; Dumonteil E. with 12.2% in Mexico and Días J. C. P. with 4% in Brazil.

Latin American articles in this database received 47,241 cites, 28.6% were cited articles from Brazil, 18.3% from Argentina, 11.4% from Mexico, 4.3% from Colombia.

Scopus

In this database 4,484 articles were found, 38.6% were published between 2008 and 2013, with a mean of 288.2 articles per year Fig. (**1**).

Brazil contributed with 38.6% of articles, Argentina with 12.4%, Mexico with 8.9%, Bolivia with 6.6%, Chile with 6.6% and Colombia with 5%. Countries with lower number of published articles were Puerto Rico (0.1%), Jamaica (0.07%), Suriname (0.04%), Haiti (0.02%) and Dominican Republic (did not produce any publication).

The most productive authors were Gurtler R. E. with 16.2% of the publications in Argentina, Schenone H. with the 16% of the publications in Chile and Coura J.R. with the 2.7% in Brazil.

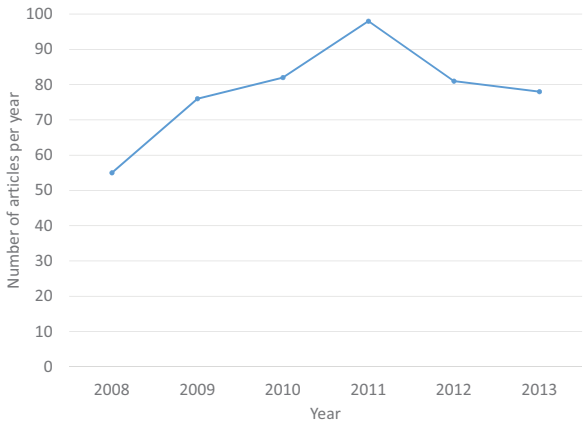

Fig. (1). Trends in annual publications related with Chagas Disease between 2008 and 2013 in Latin America, Scopus.

Institutions with the highest bibliographic production were Fundação Oswaldo Cruz, with the 22.3% of publications in Brazil; followed by Universidad de Buenos Aires with 18% in Argentina, and the Faculty of Medicine of Universidad de Chile with 27.9% of the publications in Chile. The institution with the largest number of publications in Colombia was the Universidad Industrial de Santander with the 18.2% of the scientific output in this country.

Latin America received 39,758 citations during the evaluated period in this database, 52.9% were for articles from Brazil, 21.4% for articles from Argentina, 12.7% from Bolivia, 12.6% from Mexico. The articles from Colombia had 6.8% of the citations. The median H index for every country was 15; the highest was for Argentina with 46 followed by Bolivia with 38, Brazil with 33, and Chile and Venezuela with 32.

Index Medicus/Medline/PubMed

A total of 6,647 articles were found, 34.9% were published between 2008 and 2013, with a mean of 386.5 articles per year. The number of publications increased considerably over the years, with the major output observed in 2011 Fig. (**2**). As in Scopus, the country with the largest number of publications was Brazil (45.6%), followed by Argentina (18.5%), Mexico (6.5%) and Chile (5.5%). Colombia had the 3.9% of the publications. The countries with the lowest output were Puerto Rico and Jamaica with 0.05%, and Haiti and Suriname with 0.01%. Figure **3** shows the cities of the Institutions that published articles related with Chagas disease in Latin America in this database.

The proportion of original articles published was 97.7%. The MPA were Dias, J. C. with the 2.6% of publications in Brazil, Schenone H. with 18.7% in Chile and Gürtler, R. E. - Segura, E. L. with 5.3% in Argentina. The author with the greatest number of contributions in Colombia was Guhl F. with 8.6% of the publications in this country. These

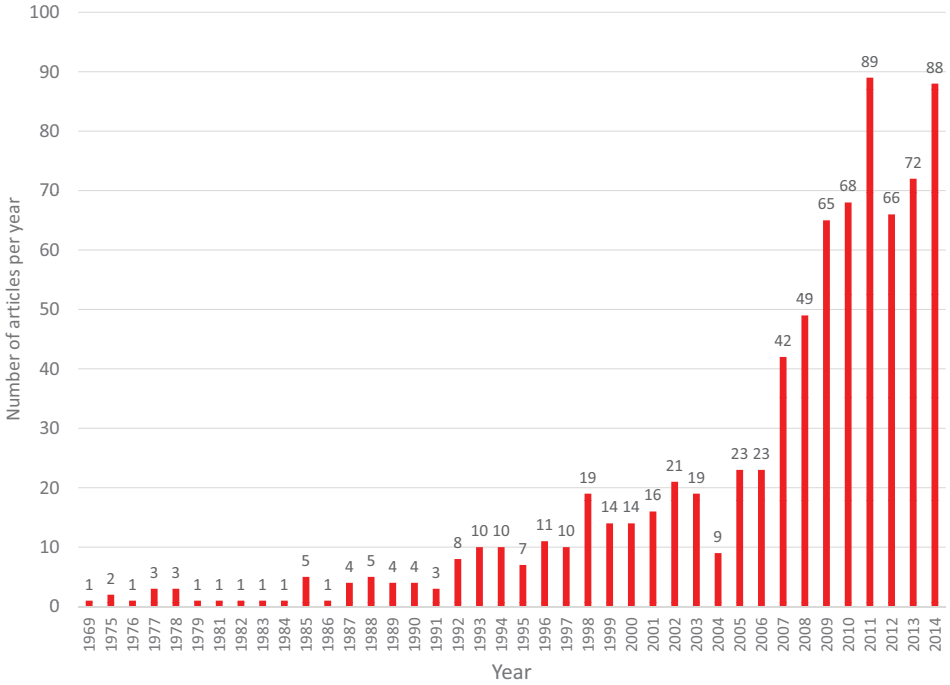

Fig. (2). Trends in annual publications related with Chagas Disease in Latin America, Medline, 1970-2013.

Fig. (3). Cities of the Institutions that published works related with Chagas Disease in Latin America, Medline.

authors and others that are not mentioned have collaborated with others as showed in Fig. (**4**).

SciELO

917 articles were found, 35.5% of which were published between 2008 and 2013, on average 54.3 articles were published annually and 93.3% of these were original articles. 47.7% of published articles were from Brazil, 8.7% from Argentina, 6.7% from Venezuela, 6.7% from Colombia and 6% from Mexico.

LILACS

The search showed a total of 2,165 articles from Latin American countries with 4% published between 2008 and 2013. The countries with the highest number of publications were Brazil (60%), Argentina (11.5%), Venezuela (6.3%), Colombia (5.6%) and Chile (3.6%) and the countries with the lowest output were El Salvador and Jamaica with 0.05% and Haiti, Dominican Republic, Puerto Rico, Suriname, Guyana, French Guiana, Belize and Trinidad and Tobago, for which no articles were indexed in this database.

The percentage of published original articles was 8.5%. The most productive authors were Torrico F. with 40% of publications from Bolivia, Rojas-de Arias A. with 47.4% of the publications from Paraguay and Calzada J. E. with 88.8% of the publications from Panama.

The institutions with the largest number of contributions were the Institute of Research in Health Sciences of the Universidad Nacional de Asunción, Paraguay with the 57.9% of the publications on this country; the Regional Direction of Health in Arequipa, Peru with the 25% and the Universidad San Carlos de Guatemala, Guatemala city with the 58.3% for that country.

DISCUSSION

Several international bibliometric analyses of the scientific literature have been performed for different disciplines of medicine and/or different diseases [19, 20]. Costa Lima *et al.* had reported a bibliometric analysis of Brazilian scientific output for a list of parasitic diseases, including Chagas disease [21]. More recently, analyses have been published on scientific production in parasitology [22], Leishmaniasis [23] and even for Chagas disease, but limited to Medline (1940-2009) [24]. This last cited study seems to be divided in two publications [25].

Apart from these studies, no other bibliometric assessments on Chagas disease research have been published. Since Medline does not allow for citation assessments (this is not registered in this database), the inclusion of Science Citation Index and Scopus in this study is highly valuable to assess the citation impact of Chagas disease research in the region and each of its countries.

The burden of Chagas disease in Latin America and the Caribbean is still high. Moreover, it is currently extending beyond the borders of the region (by migration but also with autochthonous cases in previously non-endemic regions) [26-28], and this fact should be matched by the quantity and quality of the scientific writing about this issue.

This study shows that Brazil, one important country in terms of prevalence and incidence of this disease, was also the main country in terms of scientific output.

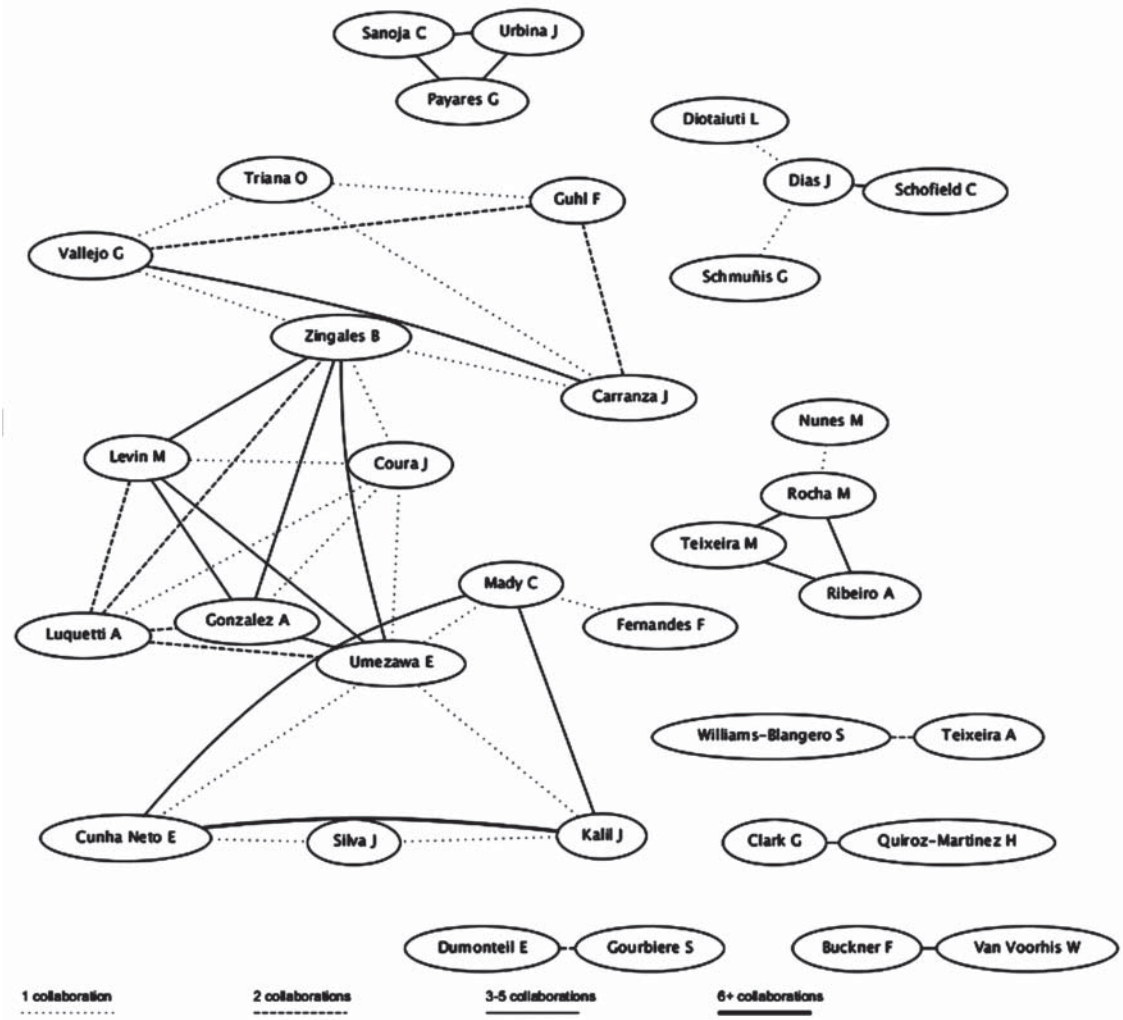

Fig. (4). Cooperation of the authors that have published the largest amount of articles related with Chagas Disease in Latin America in Medline.

Countries like Brazil, Argentina and Mexico were the main contributors from Latin America to the worldwide literature in CD with percentages of 31.2%; 18.1% and 9.6% respectively in SCI. Similar results were found in Scopus. Additionally, this trend is maintained in other knowledge topics as has been reported previously [19, 20, 22].

Furthermore, Latin American countries received 47,241 citations in SCI with high scientific impact in Chagas disease. Of these, 28.6% were from Brazil, 18.3% from Argentina and 11.4% from Mexico. Findings from Scopus were similar (39,758 cites), with Brazilian papers as the most cited (52.4%). The high output in these countries is possibly related to broader economic and political contexts involving higher investment in research. This influence has been shown by other studies with the variation observed after controlling for disease burden, socioeconomic and population indicators [24]. In contrast, countries with the lowest output were Belize, Suriname, Dominican Republic, Haiti and Jamaica, with percentages below 0.03% of the total output in Latin America. This may also be related to low or null prevalence of disease in these countries.

The results from this study are similar to those reported by recent papers, analyzing scientific production indexed in Medline between 1940 and 2009 [24, 25], in which Brazil, Argentina and Mexico were the countries with highest scientific production, and Belize, Suriname and Jamaica were the countries with the lowest output. The contribution of Colombia to the scientific output on Chagas disease in Latin America is highlighted with 6.1% of the published articles in SCI, 5% in Scopus and 3.9% in Medline, placing it among the six countries with the largest number of published articles in the region. Original articles were the

main type of published article, representing the 91.3%, 97.7%, 93.3% in SCI, Medline and SciELO respectively.

A considerable proportion of the articles produced in Latin America were published between 2008 and 2013: 52.7%, 49.9%, 34.9%, and 35.5% of the articles in SCI, Scopus, Medline and SciELO, respectively. In contrast, only 4.2% of the articles in LILACS were published during this period.

Scientific activity is not only limited to scholarly publications. However, a country's scientific output is mostly based on the publication of scientific articles in journals indexed in relevant databases such as SCI, Scopus, Medline, SciELO, among others. Unfortunately, comparing these databases is complicated.

This study is limited by the lack of uniformity of variables between databases, such as the H Index that is found only in SCI and Scopus. However, this research is one of the first bibliometric approaches in Latin America assessing these databases for Chagas disease.

CURRENT & FUTURE DEVELOPMENTS

Current findings allow to determine the current situation and direction of research on Chagas disease in Latin America and the Caribbean. Furthermore, the large burden that this disease exerts on the region calls for increased research. This is needed to deepen understanding on the disease that will lead to better designs in interventions to prevent and treat Chagas. Continuing bibliometric assessments in this area and others is recommended in order to monitor progress and advances, as well as estimate needs and set priorities for research activity in the region for Chagas disease.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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