



What are we talking about when we talk about education and Chagas? A systematic review of the issue



Mariana Sanmartino^{a,*}, Celeste Mateyca^a, Isabel Cecilia Pastorino^b

^a Grupo de Didáctica de las Ciencias, Instituto de Física de Líquidos y Sistemas Biológicos (IFLYSIB, CONICET-UNLP), La Plata, Provincia de Buenos Aires, Argentina

^b Departamento de Ciencias Naturales, Facultad de Ciencias Exactas, Físico-Químicas y Naturales, Universidad Nacional de Río Cuarto, Córdoba, Argentina

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ABSTRACT

More than 110 years has passed since the first publications on Chagas disease, and it still urges the necessity of understanding it as a complex socioenvironmental issue in which components of diverse nature converge and interact beyond the biomedical and epidemiological aspects. The current scenarios of the issue, both rural and Latin American as urban and global, demand that the education on Chagas disease include all possible contexts: where there are insect vectors and where there are not; inside and outside Latin America; in rural, periurban, and urban areas; in formal and non-formal educational environments. We consider essential the requirement of both an integral approach that overcomes the biomedical aspect to include the multidimensionality of the issue and a dialogical educational perspective that allows individuals and communities to analyze, decide, and lead contextualized prevention and promotion actions regarding their health. In this study, we surveyed, described, and critically analyzed studies approaching the link education-Chagas disease in scientific publications from the last 15 years. We aimed at contributing methodological-theoretical elements to (re)think the development of educational research and experiences that truly help facing this issue. From the electronic search of scientific literature in 6 databases, we found 426 articles, out of which we selected 25. We incorporated 10 articles from other sources to this initial corpus and performed both qualitative and quantitative analyses over the total number [35] to characterize the studied works in general, focusing on the conceptions on the Chagas disease issue and the underlying health education approaches.

1. Introduction

From a “classic” perspective, Chagas disease, also known as American trypanosomiasis, can be briefly described as a parasitic disease caused by the protozoan *Trypanosoma cruzi* and mainly transmitted by triatomine insects. However, more than 110 years has passed since the first publications of the Brazilian physician Carlos Chagas; it is essential to redefine the issue in agreement with the current scenarios [1]. Both its magnitude – between 6 and 8 million people infected with *T. cruzi* all over the world [2,3] – and the profile of its current distribution – urban and global besides rural and Latin American – demand to think Chagas as a complex socioenvironmental health issue in which components of diverse nature converge and interact. Considering this fact, alternately to the biomedical denomination of “Chagas disease”, throughout this article we will also refer to “Chagas” with a broader meaning, to include the psychological, legal, and socioeconomic issues that affect people infected by *T. cruzi* (most of whom will never develop the disease) and their relatives and societies.

Understanding that talking about Chagas is much more than talking about a disease, we consider that at least four interrelated dimensions – biomedical, epidemiological, sociocultural, and political – [4] are combined in its configuration. They can be summarized as follows:

- The biomedical dimension includes aspects ranging from the biology of the causal agent of disease and the insect vector to medical topics related with transmission routes, clinical manifestations, diagnosis, and treatment.
- The epidemiological dimension contemplates the elements that allow characterizing the situation of the issue at the population level: prevalence, incidence, distribution, and infestation indices, among others. It also considers the new geographical configurations of Chagas mainly associated with growing migratory movements and climate change at different scales.
- The sociocultural dimension refers to aspects related with the cosmovisions and cultural practices of the diverse social groups involved, environment management, the special features of rural and

* Corresponding author.

E-mail address: mariana.sanmartino@conicet.gov.ar (M. Sanmartino).

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urban contexts, representations, stereotypes, prejudices, and social appraisals (discrimination and stigmatization, among others).

- The political dimension includes the issues related with public management and decision making in the sanitary, educational, legislative, and economic spheres at local, regional, and global levels, as well as the decisions people take individually or collectively at the time of approaching the topic, which aspects are prioritized, and which ones are omitted.

The elements of these four dimensions are metaphorically combined in a *kaleidoscopic puzzle* in which the relationships established within and among the “pieces” promote that in a certain place of the world today the Chagas issue emerges with distinctive characteristics in comparison with other regions and historical moments [4]. Facing Chagas in the multiple and dissimilar scenarios in which it is currently manifested requires integral approaches that consider its multidimensionality, being necessary the contributions of different disciplines and the participation of diverse social actors [2,5–7].

In particular, in this call to broaden the view about the problem, it is necessary to rethink also the link between education and Chagas, which is the aim of this bibliographic review. It is worthy to highlight that education has been considered almost since the “discovery” of Chagas disease as one of the fundamental pillars to face the issue. Considering the need of going beyond the biomedical and epidemiological components, the component Information, Education, and Communication (IEC) has been formally included more recently in some Chagas Programs as a strategic, essential, and complementary axis for other related actions [8,9]. Moreover, in 2017 the WHO Chagas disease control program added a particular Technical Group on Information, Education, and Communication to the five previously existing Technical Groups [10]. From our perspective, education has a key role whenever it is understood from its dialogic and transforming character. We value the educational act as a promoter of changes of perspectives that favor dynamics of formation and information on behalf of the communities themselves in a process that transforms them in actors able to decide and become leading characters of health promotion actions and prevention of Chagas disease (as well as other issues). However, different studies state that the educational interventions on Chagas have been mainly developed in school environments from rural contexts, considering a fragmented viewpoint of the issue (centered on biomedical aspects) and disregarding the knowledge and experiences provided by the individuals involved as “recipients” of such interventions [11–13]. Paradoxically, the current scenarios demand that education on Chagas must be contemplated in all possible contexts: where there are insect vectors and where there are not; inside and outside Latin America; in rural, periurban, and urban areas; in formal (in all educational levels, including professional formation) and nonformal contexts (fairs, museums, social organizations, clubs, educational environments, waiting rooms, the media, etc.). Likewise, an integral approach is required to overcome the exclusively biomedical viewpoint and to enclose in its characterization the complex framework of biomedical, epidemiological, sociocultural, and political aspects that configure this issue in the particular context where every educational act is developed.

Finally, we claim that the education on Chagas (as any other educational practice) is crossed by different conceptions about its goals, the way in which knowledge is built, the type of knowledge to be taught, and the role and degree of the participants' protagonism, among other traits. From this perspective, we justify the performance of critical review studies to characterize and reflect on how the link education-Chagas is considered and posed in the diverse contexts where Chagas disease exists. Then, coming back to the questions that entitles this article *What are we talking about when we talk about education and Chagas?*, we will intend to contribute answers provided by the systematic survey, description, and critical analysis of studies on the link education-Chagas in scientific publications from the last 15 years.

2. Methodology

2.1. Search strategy

We performed an electronic search of scientific literature approaching Chagas issue from a certain aspect of the educational field. We took as a reference the work written by Ventura-Garcia et al. [14] who revised publications on Chagas performed with qualitative methodologies. We used the same databases those authors used, excepting the ones with no free access. We finally chose the following ones: Lilacs (Latin American and Caribbean Health Sciences Literature), ISOC (Institute of Information on Human and Social Sciences), SciELO (Scientific Electronic Library Online), ERIC (Education Resources Information Center), Pubmed/MEDLINE and Jstor (Journal Storage). The search was performed by the association of the descriptors “Chagas” or “Trypanosomiasis” and “education” in four languages (Spanish, Portuguese, English, and French) in title, abstract, and/or key words, according to the combination each search engine allowed. We decided to limit the search to the works published between 2004 and 2018, considering as a temporal starting point the bibliographic review on this subject performed by Sanmartino in 2003 [13].

Considering that they could be pertinent for our purpose, we complemented our search with other databases and open access local and regional scientific journals: Redined (Information Network on Education), Revista de Educación en Biología (Journal of Education in Biology) from ADBIA (Association of teachers of Biological Sciences in Argentina), Redalyc (Network of Scientific Journals of Latin America and the Caribbean, Spain, and Portugal), and BibTri (Bibliography of Triatomines).

2.2. Selection criteria

Fig. 1 shows a summary of the performed selection process, which is detailed below.

From the total number of works provided by the search in the six already mentioned databases, we excluded in a first stage:

- repeated works;
- works in which the descriptor “Chagas” corresponded to a proper name (e.g., an author's surname or the name of an institution);
- abstracts of thesis or conferences and technical reports. We only included the articles published in scientific journals, as they had been submitted to a considerable critical analysis from the scientific community;
- articles with no access to the full text.

In a second stage, we proceeded to the reading of this initial corpus consisting of 118 texts and discarded those that were not considered pertinent to the aims of this review on “education and Chagas disease”, that is, those approached from the biomedical (epidemiological, entomological, and clinical) or social approaches, which mentioned general educational issues that were not eventually developed.

From this second stage, we kept 25 works of interest and incorporated 10 articles from other sources (Redined, Revista de Educación en Biología, Redalyc and BibTri) to constitute the final corpus consisting of 35 texts (Fig. 1).

2.3. Analysis

Over the corpus of the selected 35 works and following the perspective proposed by Bardin [15] for Content Analysis (CA), we firstly performed a preanalysis that involved initial readings from which we started to define categories and axes. As a result of this first stage, we distinguished two types of articles: on the one hand, those that accounted for proposals, experiences, reflections, and/or investigations on education itself (Educational Works, hereinafter referred to as EW);

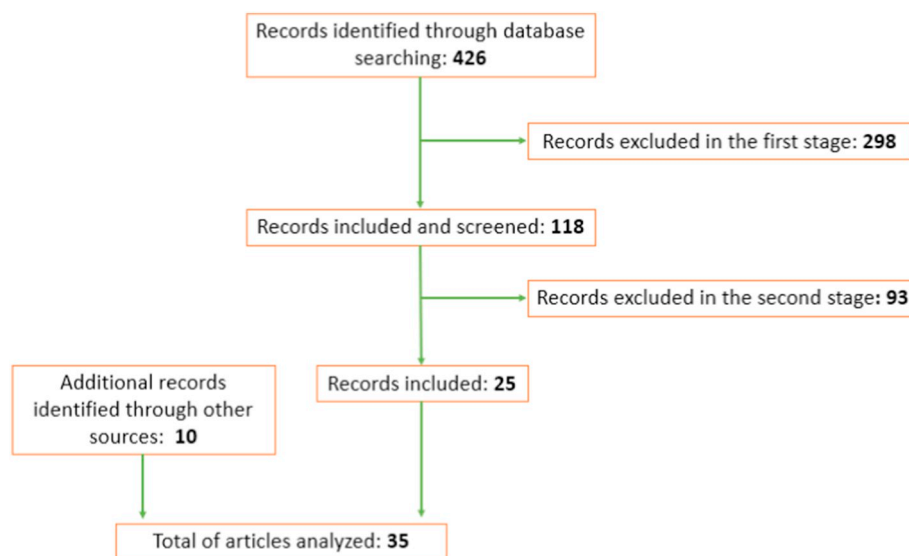


Fig. 1. Flow of search.

on the other hand, works on representations, knowledge, conceptions, perceptions, attitudes, and/or practices related to the Chagas disease (Knowledge Inquiry Works, hereinafter referred to as KW).

In a second step of CA, we performed what Bardin calls “usage of material”, that is, operations of encoding, decomposition, and enumeration [15]. These operations allowed us to firstly perform a general characterization considering the following categories and elements: number of articles found by database; language; type of journal; year of production and publication; kind of work (e.g. research, report of educational experience, didactic proposal, etc.); methodological approach applied in research (qualitative, quantitative, or mixed); place of production and origin of the proposal; place of origin of the journal in which it was published; actors involved (i.e. those who coordinated/performed the proposal and those to whom it was addressed to); educational context (formal, non-formal); and general context (rural/urban).

In a second step of this stage of “usage of material”, we deepen the analysis around the following questions: How was Chagas characterized in the theoretical foundations of the works? Which dimensions of the issue were considered in its developments and/or practices? Which dimensions were relegated? For this analysis, we considered the biomedical, epidemiological, sociocultural, and political dimensions, taking as a reference Amieva and Sanmartino's work [11].

Thirdly, we analyzed the EW group in particular to infer the models of Health Education (HE) in which the educational interventions on Chagas were framed, considering the characterization of three models performed by Fainsod and Busca [16]:

- The Normative model departs from a definition of health as absence of illness in which education is a tool to impose the biomedical scientific discourse to a population. Education –imparted only by teachers or specialists– is provided by transmission of information aiming that passive individuals adopt attitudes supposedly right and healthy.
- The Personalized model conceives health as the state of full wellness and physical, psychological, and social equilibrium. Although it proposes multiple approach dimensions, it supports a technocratic viewpoint of health in the hands of specialized people. Education in health is based on persuasion so that individuals change their actions toward healthier ones. Learners participate sharing their experiences to correct or divert them to healthy behavior.
- The Participative model uses the contributions of critical medicine and the pedagogy of the oppressed by Paulo Freire, among others, as

reference, broadening the previous viewpoints and proposing an education in critical, participative, and emancipating health. From this model, health is “the capacity of going out from a place of submission toward an authority that regulates their lives, almost omnipotent and arbitrary” [16]. Therefore, the role of education in health in agreement with this model is the problematization of social issues and power relationships with the intention of transforming reality. There is neither a reduced group of people able to teach nor passive individuals; instead, they are all individuals with valuable experiences and knowledge that are brought into play in every educational process.

The previous models coexist currently in health and educational institutions reflecting differentiated viewpoints as regard HE. The Normative and Personalized models are focused in a liberal paradigm whereas the Participative model is focused in a critical one [16].

To perform this analysis, we selected from the group of EW those publications that accounted for educational processes effectively implemented/developed (not just proposals) and proceeded to a detailed reading, identifying the elements that explain its purpose and methodology, through which it was possible to infer the underlying model/s of HE.

Continuing the analytical process and regarding the KW group, we looked for the answers to the following questions: Why do authors try to learn about the knowledge, representations, or conceptions about Chagas certain people or social actors have? How do they relate this search with “the educative issue”?

Finally, in the third step of CA, we performed inferences and interpretations to elaborate conclusions articulating our findings with the theoretical framework of reference.

3. Results and discussion

3.1. General characterization of the analyzed texts

We found 426 articles in the used databases, distributed as follows: 217/LILACS, 113/SciELO, 83/MEDLINE, 9/ISOC, 3/ERIC, and 1/JSTOR, and we added 10 articles from other sources, as we have already mentioned. In agreement with the above-mentioned criteria, we chose 35 articles for analysis [17–51] published in Spanish (57%), English (29%), and Portuguese (14%). Considering the profiles of the journals in which the articles had been published, we broadly found that they were publications on health issues (57%), education (40%),

and sociology (3%).

A first aspect to be highlighted from the results of the bibliographic search is the contrast between the high number of articles identified in the indexed literature that explicitly recognized the value of education to face the Chagas issue and the number of investigations and/or experiences that specifically linked education and Chagas published in the last 15 years. This fact is evidenced in the difference in the number of publications obtained as a result of the search and the number of publications that eventually resulted pertinent for analysis, which reflects the number of publications that were excluded in the second stage (93 out of 118 works) (Fig. 1). This result could be explained by considering that, although the acknowledgement of the importance of education to face the Chagas issue started with the beginning itself of the scientific works related with the topic, its approach is still far from being solid and systematic [13]. On the other hand, many of the experiences on education and Chagas are communicated in memoirs of seminars and conferences of associations, universities, and educational institutions, web pages, newsletters, and journals that are not accessed through indexed databases. These communications are part of the so-called “gray literature” that hinders their localization and retrieval because “there are no massive databases as in conventional literature from journals and books. Because it is not indexed in high-coverage databases, ‘gray literature’ has been related with a more difficult access to its documents on the Web” [52]. In agreement with Amieva and Sanmartino [11], we understand that “it is only possible to gather those [proposals] that were published generally by researchers from different areas, considering that most teachers do not publish their productions and results from the classroom.” As an example to visualize the number of productions that do not circulate by the current channels of highest academic dissemination of publications, we analyzed the findings for Argentina in the period that coincides with our search: Amieva and Sanmartino [11] reported that 60% out of the 25 works published between 2004 and 2016 corresponded to gray literature, whereas Bravo Almonacid [12] reported 12 works (including gray literature) between 2004 and 2012. In the current review, we found 12 articles for Argentina in the 15-year period of our search (which is clearly lower than the other authors' results).

On the other hand, the analyzed works (published between 2004 and 2018) were produced between 1999 and 2017. Unlike what was found by Amieva and Sanmartino [11] regarding a growing trend of works produced in Argentina and published between 2000 and 2016, we observed that the surveyed number of publications on education and Chagas disease was relatively “stable” in the last 15 years (with a maximum of four works per year in some cases). From this observation and considering the period of more than 110 years since the “discovery” of Chagas disease (in scientific terms), we might characterize Chagas as a “Socially Acute Question” according to the definition provided by Legardez and Simonneaux [53,54]. Socially acute questions are understood as those “open questions in science and society that arouse debates and controversies and are characterized for creating doubts about the reference knowledge and the social implications” [53].

As regard the type of works, whereas the KW group completely consisted of research, the EW consisted of a similar number of investigations and other type of works, such as proposals, developed experiences, and reflections linked to education and Chagas (Table 1). In both groups of works, quantitative research predominated, followed by quantitative-qualitative research (mixed type), and, to a lesser extent, by qualitative research exclusively. In this sense, we agree with Ventura et al. [14] about the need of increasing qualitative research in the future because it allows understanding, among other aspects, how different social groups influenced by their ethnical origin, socio-economic state, general state, age, urban/rural context, etc., experiment different conditions that affect their experiences and behaviors related with Chagas disease. As the authors propose, “understanding how socio-cultural processes differentially affect these groups is key to designing and promoting appropriate interventions, adapted to

populations and contexts, and considering their specific needs” [14].

With respect to the geographical characterization of the analyzed texts, we wondered: In which countries were the experiences and/or investigations produced? Which were the origin countries of the proposals? To which countries belong the journals where the analyzed articles were published?

Fig. 2 shows the results that allow answering these questions. Only one out of the 35 analyzed articles was produced outside Latin America. It is a research performed from the implementation of a program for migrants in Spain that included educational activities and testing for Chagas disease [35]. It is important to note also the case of the USA, as 11% of the articles were published in journals from the USA and were proposed by authors working in that country, although none of them was developed there. These two results are outstanding considering the current reality of the distribution of Chagas disease, which estimates that there are between 68,000 and 123,000 people infected with *T. cruzi* in Europe –most of them in Spain– [55] and more than 300,000 cases in the USA [56]. Considering the magnitude of Chagas in these territories, and although they were not traditionally considered endemic regions, we highlight the urgent need of promoting there the contextualized development of educational strategies approaching the issue from an integral perspective.

The remaining articles were produced in Latin America. We found, in agreement with Ventura et al. [14] and Sanmartino [13], a strong presence of works proposed and/or developed in Argentina [17–19,24,26,27,38,41,42,49–51] and Brazil [20,22,25,28,36,43,46,48]. Among the diverse possible explanations, we could relate this fact to historical questions related with the environments of production of knowledge in the topic initiated by Carlos Chagas (in Brazil) and continued by Salvador Mazza (in Argentina), among other researchers who have contributed from 1909 until present. The fact that the research on Chagas disease started in both places and was established as a scientific and social problem at the beginning of the 20th century [57] could have settle the bases for a sounder and older tradition that reflects the number of works related with educational aspects of the complex network.

Other interesting questions arise from Fig. 2: Why certain proposals or projects are produced in one country but proposed in another one? [23,45]; Why certain experiences are proposed and published in one country but performed in another one? [23,39,44,45]. These questions and some other ones constitute particular clues that account for the need of broadening the searches and improve the analyses to obtain answers and conclusions that contribute to the field of interest of the present work.

As regard the actors involved, in general we identify two types according to their main role: people who think, program, and activate educational proposals and research (proposers) and people on whom research is developed or recipients of the educational proposals and strategies (recipients). To be able to characterize better who the proposers are and who the recipients are, we will account for the particular contexts of each one (the proposers' institutions and the recipients' educational context).

The proposers of the analyzed works were mostly (80%) researchers and/or university teachers –mainly from the biomedical area– whereas in 17% of the works “other actors” occupied this role, such as referents from a Provincial Program on Chagas disease in Argentina [49] or from a secretary of health in Colombia [47], students participating in an exchange work [31], kindergarten teachers [17], members of a multi-disciplinary health team [35], and members of Doctors Without Borders [45]. When considering their institutions of origin, we observed that in most of the works proposers came from universities and research centers, whereas in only 20% of the works we identified other institutions, such as state and municipal secretaries of health [43,47], a provincial Program on Chagas disease [49], Higher Education Institutes on Teacher Training [17], the building company of a hydroelectric plant [43], the Tropical Medicine Unit of a hospital in Spain [35], and the international organization Doctors Without Borders [45]. Thus, we observed

Table 1
Corpus of selected works.

Groups	Type	Methodology	Works
Educational works (EW)	12 investigations	5 quantitative	Cunha et al., 2014 [20] Bonfante et al., 2004 [29] Grijalva et al., 2011 [31] Yun et al., 2009 [45] Genero et al., 2018 [49]
		3 mixed	Crocco, 2015 [19] De Urioste-Stone et al., 2015 [21] Pimenta et al., 2008 [36]
		4 qualitative	Giraldez, 2007 [27] Gomide et al., 2005 [28] Navarro et al., 2011 [35] Polanco-Rodríguez et al., 2017 [37]
	4 proposals of didactic resources and strategies	-	Freitas Bianchi et al., 2018 [25] Giraldez et al., 2012 [26] Revel Chion et al., 2017 [38] Crocco et al., 2010 [51]
	5 experience records	-	Amelotti et al., 2016 [17] Ferrero et al., 2015 [24] León et al., 2015 [33] Sanmartino et al., 2012 [41] Serpa Filho y Okochi, 2010 [43]
	2 theoretical reflections	-	Amieva, 2012 [18] Cardoso et al., 2009 [46]
Works of wisdom exploration (WW)	12 investigations	7 quantitative	Donovan et al., 2014 [23] González & Ponte, 2013 [30] Hurtado et al., 2014 [32] Montaño Bohórquez et al., 2018 [34] Cantillo-Barraza et al., 2012 [40] Yevstigneyeva et al., 2014 [44] Castañeda et al., 2017 [47]
		4 mixed	Diaz et al., 2016 [22] Rosecrans et al., 2014 [39] Colosio et al., 2008 [48] Crocco et al., 2013 [50]
		1 qualitative	Sanmartino, 2006 [42]

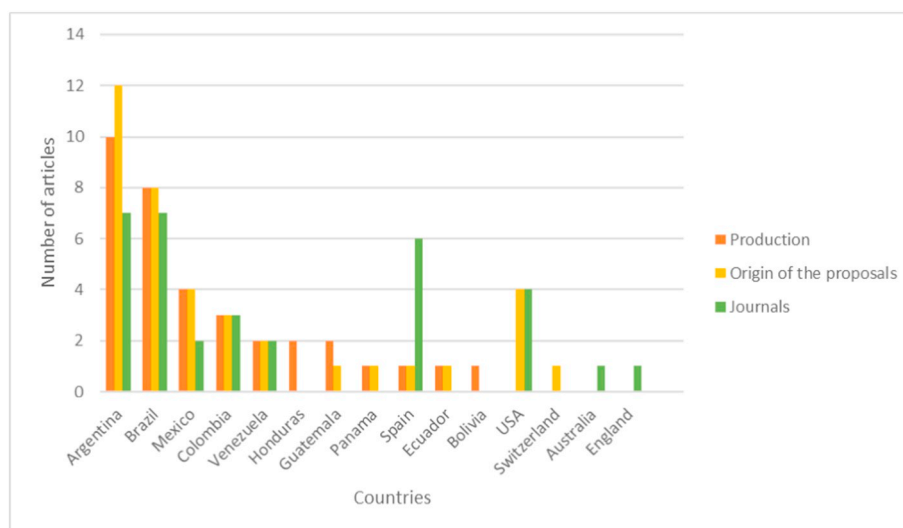


Fig. 2. Number of articles per country of production, origin of work, and publication.

that all of the proposals we found for our analysis had an “institutional” origin. In none of them, there were other types of proposers, such as members of communities, members of civil society organizations, or school teachers. These results agree with what Amieva and Sanmartino [11] observed in their study on educational experiences on Chagas disease in Argentina; they reported that most of the analyzed proposals were developed in primary schools by researchers from the area of natural sciences.

As regard the population that participated in research developments

and the recipients of educational proposals and strategies, we found that 57.5% of the individuals were part of the education community (teachers in service, prospective teachers, students from initial, primary and secondary levels, headmasters, cooks, students’ families), 25.5% belonged to the so-called “community” (people living in rural areas and migrants, among others), and the remaining 17% consisted of health teams (technicians, nursing students, sanitary agents, vector control personnel). In relation with the educational contexts in which the works were performed, we observed that researchers worked with and for

three types of educational spaces:

- spaces of formal education in 43% of the cases: schools – mainly primary level ones – [17,20,24,28,33,37,38,40,44,51], instances of university degree formation [30,34] and teacher training [26–29];
- spaces of technical-professional education of diverse members of health teams in 16% of the cases [25,27,36,43,45,48]
- nonformal educational contexts, mainly in the recipients' houses [21,22,28,30–32,35,39,42,45,47,49], but also in the medical consultation [23], a museum [41], and the Internet [19] in 41% of the analyzed texts.

From these results, we understand that the link education-Chagas is being considered beyond the school context, as previously stated. We take as an encouraging sign the diversification of educational spaces to approach the issue and support its multiplication in the coming years.

Finally, we observed in the articles in which it was possible to identify the implementation context that 76% of them were developed in rural and semirural areas whereas the remaining 24% was performed in urban contexts. It must be highlighted the urgent need of incorporating urban scenarios – inside and outside Latin America – to the range of spaces that also require educational research and implementation of didactic resources and strategies related with the Chagas issue; this is currently a predominantly urban topic because it is estimated that at least two thirds of the infected people live in cities [58]. The new distribution profile of the issue, not only Latin American and rural but also urban and global, compels us to strengthen the efforts to carry out contextualized, integral, and inclusive proposals [59].

3.2. Viewpoints on Chagas issue present in the texts

We looked for answers to the questions we posed initially about the underlying conception of Chagas in the analyzed texts both in “theory” (i.e. in the conceptualization about the issue mainly presented in the Introduction as well as in the Conclusions) and in “practice” (i.e. the aspects of the issue approached in the field work, in the analyzed and/or developed educational experiences, in the proposed didactic resources, in the explored knowledge). We performed a detailed reading of the works to identify the dimensions (biomedical, epidemiological, political, and sociocultural) present in both areas (Fig. 3).

Although we could generally observe a multidimensional mark both in theory (Fig. 3A) and in practice (Fig. 3B), we detected a noticeable difference between both parts of the works as regard the biomedical dimension, which was considerably more relevant in “practice”. This means that the diversity of aspects considered at the time of describing the issue in the publications were not considered in the same way at the

time of thinking educational strategies or carrying out research. This discordance is in agreement with what was described by Garelli et al. [60] in the analysis of educational material on dengue. There is also a partial agreement with the findings presented by Amieva and Sanmartino [11] and Bravo Almonacid [12]; these authors found that most of the educational experiences surveyed in both cases face the issue from approaches markedly “biomedical and epidemiological, centered on the illness-spreading insect and the illness detection and prevention in rural areas” [11]. Unlike the authors' findings, in our case the epidemiologic dimension was the least considered in practice.

Special mention should be made of our findings about the socio-cultural dimension. Although it was present with almost the similar weight in both theory and practice of the analyzed works, its references were limited to a classical and reductionist viewpoint of the link individual habits-risk factors. These aspects of the sociocultural dimension agree with the proposal of the Personalized approach in HE [16] that, as it will be seen in the following section, predominates in the analyzed articles.

On the other hand, we noted a marked difference as regard what was said in each dimension. The references to “biomedical” accounted for diverse aspects and considered particularized and detailed elements to a greater or lesser extent, whereas the other dimensions were defined generally in a superficial way with little detail.

We understand that these facts favor the multiplication of partial views of the issue that do not consider essential aspects of the current reality such as the important distribution of people affected with Chagas disease in several countries outside Latin America [58] among others. At the same time, they disregard the viewpoint of the multiplicity of actors involved (in both rural and urban areas) from a slightly critical approach of the sociocultural aspects that reproduces stereotypes and prejudices as regard the affected people and the contexts where they live, contributing to the individual blame because of their life conditions.

Finally, we focused on the political dimension. There were only a few cases in which it was approached with a certain level of complexity, from critical postures, and relating actively the knowledge provided by the actors being part of the education situation. It is worthy to highlight two articles that consider Chagas from an integral approach, in which the political dimension became relevant. On the one hand, in the research developed by Gomide et al. [28] from Brazil, the whole education community (teachers, headmasters, students, cooks, etc.) was considered to survey the problems related to the Chagas issue (among other health and environmental issues) proper of the schools involved in the research to plan solutions collectively in participative workshops. The emerging projects to improve the different situations were presented to government officials. On the other hand, in an experience

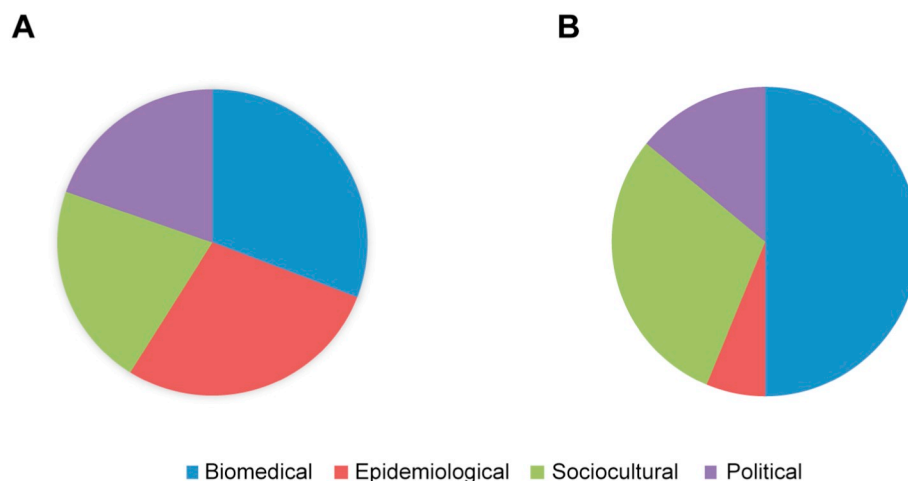


Fig. 3. Dimensions of Chagas considered in the analyzed works: in the theoretical foundations (A) and in practice (B).

presented by Sanmartino et al. [41], talks and workshops from an innovative approach in which multiple voices and languages were part of the dialogue were performed in a museum. Both publications accounted for the political and emancipating role of education and incorporated a great diversity of actors to make them dialogue about their knowledge and experiences about Chagas disease. We consider that these two experiences might be useful to inspire further educative works on this issue.

3.3. Models of health education in the educational interventions on Chagas disease

As previously mentioned, the analyzed works within the EW group included, besides investigations, a heterogeneous set of works: reports of experiences developed in different contexts, didactic resource/strategy proposals to approach Chagas issue, and theoretical reflections on the link education-Chagas (Table 1). In this group, 15 out of the 25 works corresponded to investigations or report of developed experiences in which it was possible to infer the underlying HE model – Normative, Personalized, or Participative – [16].

As it can be seen in Fig. 4, in some works we could infer clearly the HE model in which the educational intervention was framed within, whereas in other cases we found traits belonging to more than one model. For example, Bonfante et al. [29] stated in their work that they aimed at “transmitting the basic knowledge about the disease, its risks, and above all preventive measures” (purpose of the Normative model), and they proposed workshops using videos, expositions, dramatizations, billboards, and didactic games to “look for motivating and persuading the receivers” (methodology of the Personalized approach).

The Personalized model (alone or combined with other HE approaches) was the most present one in the analyzed works, which is in agreement with Fainsod and Busca [16], who stated that this model is currently the hegemonic one. From this perspective, behaviors and lifestyles are assigned a key role as they are considered essential elements for the prevention of Chagas disease. The axis is moved from the information toward the individuals who receive it. The transmission of information is not any longer an end in itself (as in the Normative model) to become an instrument that looks for habit formation. Therefore, the ultimate goal is the modification of the individuals' behaviors to guide them toward the adoption of healthy behaviors. This is clearly expressed by Amelotti et al. [17]: “Using playful practices, we intend to provide an innovative approach for the appropriation of behavior patterns that favor health promotion.”

As in the Normative model, in the Personalized one “health concerns professionals, specialists, or technicians that study populations, have the necessary knowledge, and program plans and activities” [16]. In this sense, it is worthy to note that, as previously mentioned, most of the found works were proposed by researchers or teachers from

biomedicine-oriented areas and research centers. This fact could explain partly the predominance of the biomedical dimension of the Chagas issue over the other ones in its “practices” (Fig. 3B).

In the EWs, framed within the Personalized model, the knowledge and experiences about Chagas provided by the recipient individuals or groups –central elements of the sociocultural dimension– are considered “obstacles” or “errors” to be corrected. That is, the individuals' knowledge is considered a source of “fake” knowledge to be revised and removed to acquire the “true” knowledge and adopt the right habits and customs. The recipients' participation was reduced to prevent risk factors through the adoption of prevention measures mainly individualistic: entomological surveillance and vector control in homes and surroundings, among other “classical” measures. These findings support what Enria et al. [61] stated: “the acknowledgement of the population's knowledge translated through their social representations, traditions, conceptions of health and life, and the importance of producing an encounter with the contributions of the professional knowledge are expected situations claimed by all the sanitary actors and expressed under the statement ‘community participation’ that still occurs in an inefficient and fragmented way.”

The predominance of a Personalized model of HE – coexisting in some cases with the Normative model, both liberal – as a framework of educational interventions in Chagas found in the present review is in agreement with the results of other studies. Amieva and Sanmartino [11] analyzed education experiences on Chagas implemented in school environments and identified in most of them approaches in which specialists are the ones who introduce the topics at school and work with teachers to accomplish the modification of behaviors through the acquisition of basic notions about the disease and its prevention. On the other hand, Bravo Almonacid [12] analyzed the link education-Chagas in academic texts and found that education practices are evaluated according to observable behavioral results and they are conceived as successful ones when students can reproduce the information provided and they can enunciate how they will modify their daily practices to prevent Chagas disease.

Finally, although we found a few works framed within an approach of Participative HE with respect to the ones identified by the previously mentioned authors, we understand that the educational interventions on Chagas that will truly contribute to face the issue must be posed from this model. These interventions must be contextualized and sustained along the time, understood as negotiation spaces that need the acknowledgement of the local context to be put into practice and with the “real” participation of the involved community in its design and implementation, posing a true dialogue between the community knowledge and the scientific knowledge. The proposal is to generate, according to Enria et al. [61], “an environment that allows the encounter of knowledge and promotes the elaboration of accepted intervention designs within a negotiation that enables the transformation of social practices with epidemiologic implications.”

3.4. About the knowledge inquiry works (KW)

The link between educational aspects and the Chagas issue was present in the objectives of most of the works in the KW group. For example, 26% of the works posed inquiry developed as a departure point for future interventions or research on education from the obtained conclusions [30,32,34,39,40,42,47,48,50]. However, only one is an educational work itself performed from the results of an inquiry about the knowledge of a population [42]. Other objectives dealt with the optimization of prevention strategies of Chagas disease from the improvement of activities of vector control conducted by the local secretaries of health [30,32,39,47] and/or the strengthening of community participation mainly in actions of entomological control [23,30,40]. In some other cases, the relationship with education was provided by the particular contexts in which the inquiry of knowledge occurred, because 11% of these works was performed with members of

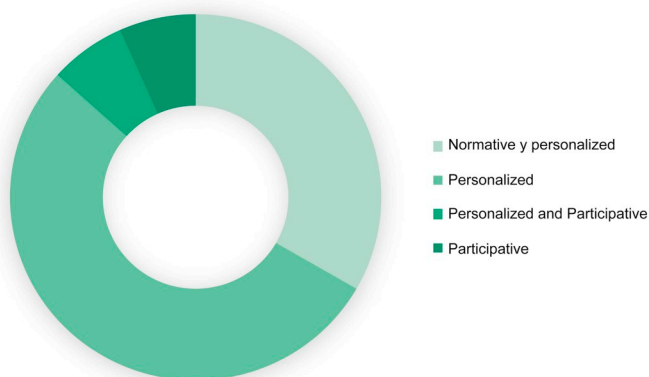


Fig. 4. Health Education Models identified in the educative works.

an education community, such as nursing university students, primary school students, and primary school teachers [30,34,44,50].

A deeper analysis of these questions goes beyond the scope of this work, although we consider of great interest the possibility of inquiring about the aspects barely outlined in this systematic review of studies on the approach of representations, knowledge, conceptions, perceptions, attitudes, and/or practices (according to the theoretical framework of each work), considering not only the link or educational interest but also a more general and integral approach. In this sense, we should remind that it would be necessary to broaden the search criteria beyond “education” to be able to find the diversity of research performed on such aspects from the perspective of the social sciences in general. As previously mentioned, it is essential to consider sociocultural aspects for a better comprehension of the issue. In particular, the knowledge and experiences of the diverse actors involved are “elements” of inescapable value. We agree with Enria et al. [61] about the importance of the “encounter of knowledge” as a strategy to transform a Health Educator from a mere reproducer of scientific statements generated in a supposedly truth rigor into a Professional with the conceptual tools to assess the situation, elaborate a strategy, negotiate with the community, redirect the community and his/her own practices, and evaluate the consequences.

3.5. General observations

Considering our results and the need of contributing to the development of further work on the educational aspects of the issue we are dealing with, it is essential to highlight, as we stated at the beginning, that the current scenarios demand an education on Chagas that behaves as an essential and key tool to defy stigmas and barriers in all possible contexts. Likewise, an integral approach is required to consider in its characterization the complex framework of biomedical, epidemiological, sociocultural, political and other possible aspects configuring this issue in the particular context in which each educational practice is developed.

Finally, understanding Chagas as a *socially relevant topic* in which technoscience and its products intervene in different ways, we agree with Massarini and Schnek [62] on the need of comprehending that “its approach requires an integrative, multidisciplinary, and multicultural pedagogic strategy that incorporates nonscientific knowledge, political debates, ethical, emotional, artistic and aesthetic aspects, etc. Thus, scientific knowledge can find its place and meanings, show its scope and limitations, and prompt controversy and critical thinking.” In this sense, we appeal to the inclusion within pedagogical frameworks in which people “feel like subjects of their thinking, discussing their thinking, their own vision of the world manifested, implicitly or explicitly, in their own suggestions and their partners' ones” [63]. We agree with Díaz [64] on the need of thinking investigations and proposals about education on Chagas from a pedagogy in a “decolonial way” that is necessarily emancipatory based on two key ideas. On the one hand, it must “place, re-signify, and relate experiences, individuals, and knowledge taking part in the specific pedagogical proposals to promote formative spaces that contribute to the critical transformation of the social reality”. On the other hand, it must consider “the constant openness to the generation of new educational practices that form the historic conscience and permeate the current school scenarios (and any other educational context), creating spaces where a critical eye is constituted in an epistemic angle able to produce new meanings about itself and the constituted reality”. Once more, we echo Enria et al. [61]; like these authors, we consider that this “irreproachable longing needs the corresponding conceptual tools and a philosophic position that moves from dual thinking to see in the others' resistances a noble challenge, a condition of humanity – and because of that, an enriching condition – and not always a rivalry that must be solved by the subordination or disappearance of one of the opponents.”

4. Conclusions

The performed analysis allows us to obtain an overview of certain aspects of the current publications related with the possible educational approaches of the Chagas issue. However, we are aware of the important constraint posed by the exclusion of both the databases that were beyond our scope for different reasons and the gray literature. In this sense, we consider that an exhaustive review will require a more detailed work with the latter because, is where there are more works contributing to the field “education-Chagas” in circulation.

From the corpus of analyzed works and considering some aspects that are worthy to summarize, we observed that:

- There seem to be more works that “refer” the importance of education to address the Chagas issue than works that really approach educational aspects in depth (either from the contributions of a theoretical construction or from the put into practice of experiences and resources).
- The field in question is still incipient, even in most of the countries affected by Chagas disease in which it is acknowledged (to a greater or lesser extent) as a relevant issue.
- The development of qualitative approximations is not substantive yet; these approximations would allow a deeper comprehension of the involved phenomena.
- The members of the educational communities are mostly recipients instead of proposers of experiences and investigations.
- Although certain multidimensionality can be read in the way of understanding Chagas on the bases of these works, practice demonstrates the supremacy of the biomedical viewpoint and the reduction of sociocultural aspects to stereotyped and individualistic notions.
- The approaches on HE are focused on the Normative or Personalized viewpoints; it still seems distant the horizon of participative proposals that implicitly promote social transformation.
- Most of the works aimed at objectives mostly strictly “preventive” without deepening about the transforming power of education (e.g. by supporting a critical eye or the promotion of rights).

Considering these premises, in agreement with the obtained results, and with a proactive and optimist look, we expect that this review contribute theoretical-methodological elements to (re)think the development of educational investigations and experiences to truly face the Chagas issue from a broad and dialogic concept of the educational act.

Transparency document

The [Transparency document](#) associated with this article can be found, in the online version.

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