Short Communication

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Schistosomiasis in Southern Brazil 17 years after the confirmation of the first autochthonous case

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ABSTRACT

Introduction: Schistosomiasis, a parasitic disease, is an important public health issue in Brazil, particularly Northern Brazil. Since the first recorded occurrence of *Biomphalaria glabrata* in the **S**tates of Santa Catarina and Rio Grande do Sul, it has spread to South Brazil. **Methods:** Using the Information System for Notifiable Diseases (SINAN), we assessed the disease spread in Southern Brazil. **Results:** In Rio Grande do Sul, nine localities had confirmed cases (n = 95, 2001-2013). **Conclusions**: We confirmed disease expansion to Southern Brazil. We demonstrated the effectiveness of SINAN to monitor notifiable diseases. Our results are useful to develop preventive actions for schistosomiasis control.

Keywords: Epidemiology. *Biomphalaria.* Helminth infections. Schistosomiasis.

Schistosomiasis is a chronic or acute parasitic disease caused by bloodworms of the genus *Schistosoma*. It is one of the most common parasitic diseases worldwide, with a significant socioeconomic impact[1]. This disease is prevalent in tropical and sub-tropical areas, mainly in poor and rural areas such as agricultural and fishing communities that lack access to safe drinking water and sanitation.

In the Americas, the only human schistosome is *Schistosoma mansoni*, which causes schistosomiasis mansoni. This disease is endemic in the countries and islands of Latin America, including the Caribbean islands[2], and it was probably introduced in Brazil from the slave traffic from Africa. Then, migration flow was responsible for the spread to the interior of the country[3]. Currently, schistosomiasis occurs endemically in nine states that are primarily in Northeast Brazil, while South Brazil is considered a low-transmission area[2].

The transmission of schistosomiasis occurs broadly across Brazil, affecting approximately 6 million people with its advanced forms, and approximately 25 million people live in areas where there is a risk of transmission[2]. Despite these estimates, the disease prevalence and morbidity have decreased in some states[2] due to government policies. Schistosomiasis control is based on historical data from the Schistosomiasis Control Program [*Programa de Controle da Esquistossomose* (PCE)] and its surveillance activities[3][4]. In high-endemic areas, registration of confirmed cases in the System of Schistosomiasis Control Program [*Sistema de Informação do Programa de Controle da Esquistossomose* (SIS-PCE)] is recommended by the PCE, whereas non-endemic localities register confirmed cases in the Information System for Notifiable Diseases [*Sistema Nacional de Agravos de Notificação* (SINAN)].

SINAN was created in 1993 and has been mandatory since 1998. It is composed of reported cases of the diseases available on the Brazilian list of notifiable diseases, according to Brazilian norms (Ministerial order number 2325, December 8, 2003). Although it is possible to have information overlap because the data entered in SINAN is the responsibility of the local health department, the use of an informative systematized network allows broad recognition of an event. Therefore, this network potentially includes the risks for exposure and can help to identify the epidemiological situation of an area[5].

However, despite the efforts of all health system agencies in Brazil, studies show that there is expansion of a new transmission focus. Since 1970, expansion of schistosomiasis toward Southern Brazil [States of Santa Catarina (SC) and Rio Grande do Sul (RS)][6][7] has been identified, with autochthonous cases recorded in these states[6][8]. This expansion might be caused by immigrants from endemic areas and the presence in Brazil of all of the natural intermediate hosts of *Schistosoma mansoni* (*Biomphalaria glabrata*, *Biomphalaria tenagophila*, and *Biomphalaria straminea*[4]). Since the introduction of the main *S. mansoni* host, *B. glabrata*, in 1997 near Rio dos Sinos in RS[9], the possibility of schistosomiasis establishment in the state has become a reality. Shortly after, *B. glabrata* snails infected with *S. mansoni* were detected,

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and an autochthonous case was confirmed in the same locality, representing the southernmost disease focus[10]. New disease cases and the distribution of *Biomphalaria* were then investigated in Esteio[4] [11] [12]. Given this new scenario, researchers and governmental institutions proposed health monitoring measures[9], such as copro-parasitological examination in populations at risk, treatment of patients infected with *S. mansoni*, a malacological survey in the metropolitan region, sanitary engineering measures, staff training for research, and mandatory reporting of cases of schistosomiasis.

Since 2001, the SINAN data system has been available online, and it is continuously updated. To examine the effectiveness of the health monitoring measures, we reviewed the notification of schistosomiasis cases in RS between 2001 and 2013. We obtained the year of the first symptoms and notification locality data from SINAN. According to the SINAN platform, the data from 2012-2013 are subject to revision[5].

RS has unique characteristics that are important for the epidemiological scenario. First, it has the southernmost record of schistosomiasis in South America; also, the three natural intermediate hosts of *S. mansoni* in Brazil occur in RS. Furthermore, because RS is in a low-transmission area for schistosomiasis, policies aimed at the monitoring and control of the disease are almost absent. This region is also very rich in rivers, facilitating the dispersal of the host species in Southern South America.

Before 2000, the 11 autochthonous cases reported in RS were limited to the City of Esteio[10] [11]. We identified 95 cases among nine cities reporting schistosomiasis between 2001 and 2013 (**Table 1**). Reported cases were in the three hydrographic regions of the state (**Figure 1**), and the highest prevalence was in the Guaiba hydrographic region, with the highest number of confirmed cases (75 cases) in this region in the City of Esteio. This is likely because this last locality has all of the conditions to maintain the trematode life cycle, such as susceptible populations of *B. glabrata*. Until now, this was the only species of *Biomphalaria* associated with schistosomiasis in RS, and it was only detected in Esteio[10] [11]. However, it is not known if there was another species of *Biomphalaria* acting as the host for *S. mansoni* in this state, highlighting the need for studies to identify and associate the causes for schistosomiasis cases. Nevertheless, new records were observed in this region, demonstrating a possible dispersion of some intermediate host along the Rio dos Sinos and Lago Guaiba.

The Guaiba hydrographic region, especially in the metropolitan area of Porto Alegre, is the most auspicious region for the emergence of an endemic focus of schistosomiasis in RS. This region is formed by north and central basins that drain to the Rio Guaiba and Rio Jacuí, which ultimately drain to the Laguna dos Patos. Factors facilitating the passive dispersal of limnic molluscs species, including the hosts of *S. mansoni*, are the short distances between the bodies of water, which facilitate communication through flooded areas, and the presence of artificial connections for irrigation and drainage. Furthermore, the aquatic fauna of Rio Guaiba pass through the coastal region, which has an extensive swamp area interspersed

TABLE 1 - Positive cases of schistosomiasis mansoni for Rio Grande do Sul, Brazil, as reported in the Information System for Notifiable Diseases (SINAN).

Hydrographic Regions	Localities (Latitude; Longitude)	Positive cases/year (n)											
		2001	2003	2005	2007	2008	2009	2010	2011	2012*	2013*	Total
Litoral	Candiota (31°33'29"S; 53°40'21"W)	-	-	-	-	-	-	-	1	-	-	1
Uruguay	Maximiliano de Almeida (27°37'56"S; 51°48'12"W)	-	-	-	-	-	-	-	-	1	-	1
Guaíba	Canoas (29°55'04"S; 51°11'01"W)	-	-	-	1	7	-	-	-	-	-	8
	Caxias do Sul (29°55'04"S; 51°11'01"W)	1	-	-	-	-	-	-	-	-	-	1
	Esteio (29°51'41"S; 51°10'45"W)	63	5	-	3	-	1	3	-	-	-	75
	Porto Alegre (30°01'59"S; 51°13'48"W)	3	-	2	-	-	-	-	-	-	-	5
	São Leopoldo (29°45'37"S; 51°08'50"W)	-	-	-	-	-	-	-	2	-	-	2
	Sapucaia do Sul (29°49'29"S; 51°08'54"W)	1	-	-	-	-	-	-	-	-	-	1
	Tramandaí (29°59'05"S; 50°08'01"W)	-	-	-	-	-	-	-	-	-	1	1
Total		68	5	2	4	7	1	3	3	1	1	95

SINAN: *Sistema Nacional de Agravos de Notificação.*; **S:** South; **W:** West. *Data were collected from the SINAN platform, subject to revision. (Cited 2014 January 15). Available at http://dtr2004.saude.gov.br/sinanweb/tabnet/dh?sinannet/esquisto/bases/esquistobrnet.def

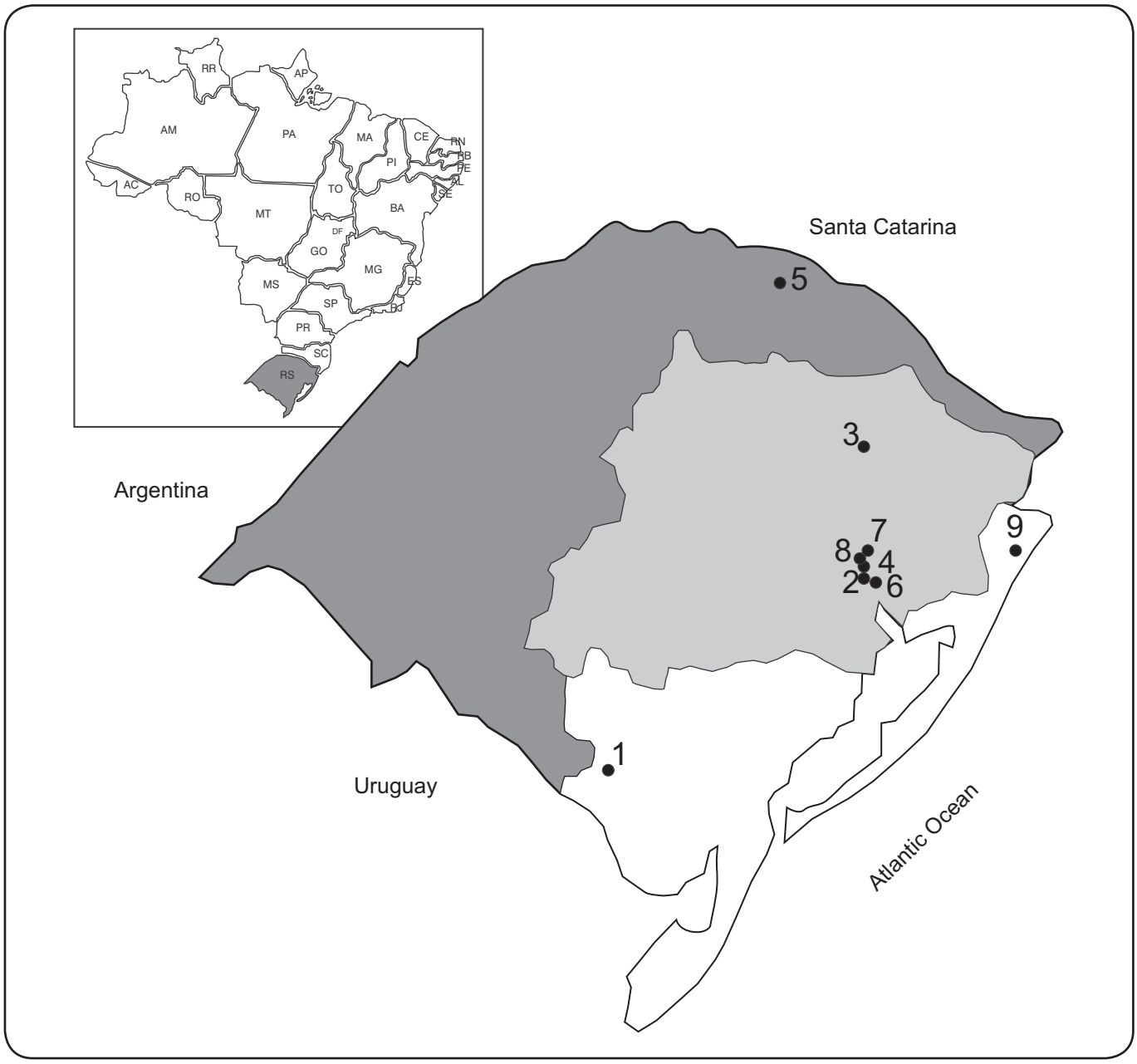

FIGURE 1 - Localities of Rio Grande do Sul showing recorded notifications of schistosomiasis in the Information System for Notifiable Diseases (SINAN) database per hydrographic region. White: Litoral hydrographic region. Light gray: Guaiba hydrographic region. Dark gray: Uruguay hydrographic region. The following localities are indicated: 1. Candiota; 2. Canoas; 3. Caxias do Sul; 4. Esteio; 5. Maximiliano de Almeida; 6. Porto Alegre; 7. São Leopoldo; 8. Sapucaia do Sul; 9. Tramandaí. SINAN*: Sistema Nacional de Agravos de Notificação.*

by large rice fields with irrigation systems[13]. This agricultural practice has proven to be one of the sources of infection with and dispersal of schistosomiasis as well as of its intermediate hosts[14]. However, the transmission of schistosomiasis is more complex than just the interaction among humans, snails, and parasites, and involves demographic, environmental, political, socioeconomic, and cultural issues[1].

The SINAN database allowed us to identify new cases of schistosomiasis and disease outbreaks. These new cases occurred in the Cities of Candiota, Caxias do Sul, Maximiliano de Almeida, and Tramandaí **(Figure 1)**. Despite the occurrence of single cases, which were not likely autochthonous, in each locality, the identification of schistosomiasis cases far from the original focus (Esteio) are particularly interesting because there is no record of *B. glabrata* in these locations. Considering that the maintenance of *S. mansoni* is mainly by *B. tenagophila* in the state of SC[8] [15] and this species in RS has proven to be resistant to *S. mansoni*[12], the schistosomiasis cases in Northern RS would have occurred through the introduction of susceptible *B. tenagophila* populations from SC. However, this hypothesis has yet to be tested.

The most Southern case registered in RS was in Candiota, which is 400km from Esteio. This city is located relatively near the border of Brazil with Uruguay and Argentina. Considering the intense flow of people and dispersion of susceptible snail populations in South Brazil, this case report is alarming and deserves attention because it potentially contributes to the creation of a new focus of schistosomiasis.

The SINAN is a good source of information for many notifiable diseases, mainly for non-endemic areas. It helped to identify the 2001 outbreak in Esteio, with a decline in cases thereafter. We posit that this decrease was due to the effectiveness of public policies in RS that led to the control of *B. glabrata* and/or of the trematode *S. mansoni*. At the same time, our results show that it is extremely important to promote epidemiological studies in areas with the potential to develop the disease.

This study observed that the SINAN database is a useful tool and should be explored further for the investigation and monitoring for several diseases, as for schistosomiasis. Furthermore, the SINAN has the potential to contribute to the development of strategies to prevent the distribution of notifiable diseases throughout Southern Brazil.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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