Ecoepidemiology of Schistosomiasis mansoni in a rural area of Sergipe, Brazil

Ecoepidemiologia da Esquistossomose mansoni em área rural de Sergipe, Brasil

Ecoepidemiología de la Esquistosomosis mansoni en una zona rural de Sergipe, Brasil

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Abstract
Schistosomiasis mansoni is a severe water-borne parasitic disease which etiological agent is Schistosoma mansoni. Among the municipalities of Sergipe, Malhador, has one of the highest prevalence. The present research intends to describe the echoepidemiology of schistosomiasis mansoni in a rural community. A cross-sectional epidemiological study was carried out based on primary data resulting from malacological (light exposure technique) and coproscopic (Kato-Katz method) surveys A questionnaire was applied to evaluate the epidemiological variables of interest. In the descriptive data analysis, the software BioEstat (version 5.0) was used. The spatial analysis of the infection distribution in the studied locality was done through TerraView 4.2.0, using the kernel intensity estimator. The statistical analysis was performed through the Chi-Square Test and Multiple Logistic Regression. 95 people participated of the census survey. The prevalence was 45%. As for the parasite load, the mild infection prevailed (53.49%), followed by moderate (37.1%) and high (9.30%). Regarding the dichotomous epidemiological variables analyzed, the time of residence (OR = 11.5114), degree of contact with water (OR = 3.9383), knowledge about the disease (OR = 2.0148) and gender (OR = 1.5141) were highlighted. Nine breeding sites were detected and georeferenced. This study provided information that allows health services and public managers to plan, implement and evaluate the impact of measures to be taken to control the transmission of the disease.
Keywords: Schistosomiasis mansoni; Rural settlements; Sanitation; Geographic information system.

Resumo
A Esquistossomose mansoni é uma doença parasitária grave de veiculação hídrica cujo agente etiológico é o Schistosoma mansoni. Entre os municípios sergipanos, Malhador apresenta uma das maiores prevalências. A presente pesquisa pretende descrever a ecoepidemiologia da esquistossomose mansoni em uma comunidade rural. Realizou-se estudo epidemiológico transversal com base em dados primários de inquéritos malacológicos (técnica de exposição à luz) e coproscópicos (método Kato-Katz). Foi aplicado questionário para avaliação das variáveis epidemiológicas de interesse. Na análise descritiva dos dados, foi utilizado o software BioEstat (versão 5.0). A análise espacial da distribuição da infecção na localidade estudada foi feita através do TerraView 4.2.0, utilizando o estimador de intensidade de kernel. A análise estatística foi realizada por meio do Teste Qui-Quadrado e Regressão Logística Múltipla. 95 pessoas participaram da pesquisa do censo. A prevalência foi de 45%. Quanto à carga parasitária, prevaleceu a infecção leve (53,49%), seguida de moderada (37,1%) e alta (9,30%). Em relação às variáveis epidemiológicas dicotômicas analisadas, destacaram-se o tempo de residência (OR = 11,5114), o grau de contato com a água (OR = 3,9383), o conhecimento sobre a doença (OR = 2,0148) e o sexo (OR = 1,5141). Nove criadouros foram detectados e georreferenciados. Este estudo forneceu informações que permitem aos serviços de saúde e gestores públicos planejar, implementar e avaliar o impacto das medidas a serem tomadas para o controle da transmissão da doença.
Palavras-chave: Esquistossomose mansoni; Assentamentos rurais; Saneamento; Sistema de informações geográficas.

Resumen

La Esquistosomosis mansoni es una enfermedad parasitaria grave transmitida por el agua cuyo agente etiológico es el Schistosoma mansoni. Entre los municipios de Sergipe, Malhador tiene uno de los de mayor prevalencia. La presente investigación pretende describir la ecoepidemiología de la esquistosomosis mansoni en una comunidad rural. Se realizó un estudio epidemiológico transversal a partir de los datos primarios resultantes de una encuesta malacológica (técnica de exposición a la luz) y coproscópica (método de Kato-Katz), aplicándose un cuestionario para evaluar las variables epidemiológicas de interés. En el análisis descriptivo de los datos se utilizó el software BioEstat (versión 5.0). El análisis espacial de la distribución de la infección en la localidad estudiada se realizó a través de TerraView 4.2.0, utilizando el estimador de intensidad de Kernel. El análisis estadístico se realizó mediante la prueba de Chi-Cuadrado y Regresión Logística Múltiple. 95 personas participaron de la encuesta. La prevalencia fue del 45%. En cuanto a la carga parasitaria, predominó la infección leve (53,49%), seguida de la moderada (37,1%) y alta (9,30%). En cuanto a las variables epidemiológicas dicotómicas analizadas, el tiempo de residencia (OR = 11,5114), el grado de contacto con el agua (OR = 3.9383), el conocimiento sobre la enfermedad (OR = 2.0148) y el sexo (OR = 1.5141) fueron destacados. Se detectaron y georreferenciaron nueve criaderos. Este estudio aporta información que permite a los servicios de salud y a los gestores públicos planificar, implementar y evaluar el impacto de las medidas a tomar para controlar la transmisión de la enfermedad.

Palabras clave: Esquistosomosis mansoni; Asentamientos rurales; Saneamiento; Sistema de información geográfica.

1. Introduction

Schistosomiasis mansoni (SM) is a parasitic endemic typical of the Americas, Asia and Africa. In South America, the Caribbean region, Venezuela and Brazil stand out. The World Health Organization (WHO) estimates that schistosomiasis affects 207 million people in 78 countries (WHO, 2017). In Brazil, the disease was described in 18 states and in the Federal District, the states of the Northeast, Southeast and Central West regions are the most affected.

According to the World Health Organization (WHO, 2017), SM is considered a neglected disease, it is found related to low-income populations as well as precarious socioeconomic and environmental conditions (WHO, 2010). The Brazilian Ministry of Health defines that neglected diseases are those that "not only prevail in conditions of poverty, but also contribute to the maintenance of inequality, since they represent a strong obstacle to the development of countries" (Ministry of Health, 2010). According to King (2010), there is a strong overlapping of extreme poverty and the prevalence of SM worldwide.

Knowledge of the spatial distribution of the disease and its impact on the population is very important for the treatment of people and to increase the measures of control and prevention of transmission, as there is a long-term relationship between disease and disability due to residual morbidity such as hepatic impairment, portal hypertension and neurological abnormalities (Araujo et al, 2010; Pordeus et al, 2008).

The use of maps gives the researcher an immediate and direct view of the distribution of an event in space. In addition, with the use of the Geographic Information System, eventual spatial associations between health events and different aspects of the natural and constructed environment can be more easily verified (Leal Neto et al, 2012; Barbosa et al, 2012).

Studies at the local level are necessary to understand the processes that result in diseases, and it is important to combine the knowledge generated by the research with the modern instruments of epidemiological analysis (Araujo et al, 2007).

In Sergipe, the disease is endemic in 51 of the 75 municipalities, the third highest prevalence in Brazil (Rollemberg et al, 2011; Santos et al., 2016). The municipality of Malhador, where the research was carried out, is located in the Agreste region of Sergipe; has an HDI-M of 0.587, considered low (Atlas of Human Development in Brazil, 2013), and presents one of the highest prevalence of schistosomiasis mansoni in Sergipe.

The objective of this research was to describe the epidemiological characteristics of schistosomiasis mansoni in a rural community in the municipality of Malhador, to understand the spatial distribution of the infection, as well as to construct risk maps that allow health services and public managers to plan, implement and evaluate the impact of measures to be taken to control the transmission of the disease.

2. Methodology

2.1 Study Area Description

The Municipality of Malhador is located in the central zone of the Sergipe territory, in the Agreste region of Itabaiana, distant 49 km from the state capital. The municipality has a territorial area of 100,941 km² and is located in the Sergipe river basin, which crosses the state from west to east and drains an area of 3.720 km² (Fig. 1).

According to the 2010 Population Census, the population of Malhador was 12,402 inhabitants, of which 6.416 people live in rural areas and 5.626 live in urban areas, and 70.3% of the population is in the age range between 0 and 39 years old (IBGE, 2014). The basis of its economy is agriculture.

The unit of analysis was Fazenda Tingui, located in Malhador, Sergipe. According to data from INCRA (2014), the camp consists of 226 families.

Figure 1: Location of the Tingui farm.
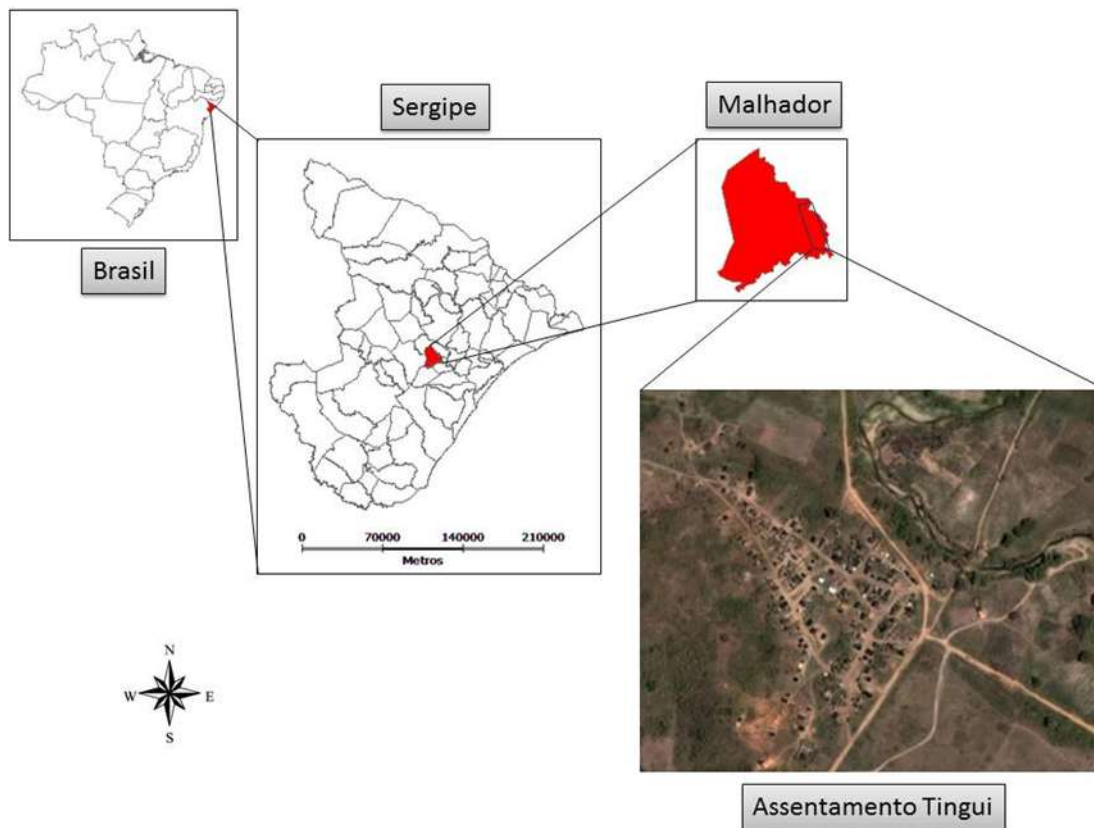
Source: Survey data.

2.2 Study Design

A cross - sectional quantitative epidemiological study was carried out over a 12-month period (Turato, 2005). The research project was approved by the Research Ethics Committee of the Federal University of Sergipe with the CAAE number: 37530014.3.0000.5546, according to Resolution No. 466 of December 12, 2012 of the National Health Council.

Initially, a field study was carried out to recognize the area, as well as the main existing water collections. In order to identify the human positive cases for Schistosoma mansoni in the study site, a coproscopic inquiry, using the Kato-Katz method (Katz et al., 1972), where the prevalence of infection was verified, percentage of people who had eggs in the feces[feces] in the parasitological examination; and the intensity of the infection, geometric mean number of eggs per gram of

feces (eggs/g) among positive. The intensity was categorized by S. mansoni infection rates: light parasite load (eggs/g <99), moderate (100 - 399 eggs/g) and high (400 ≥ eggs/g) (Barbosa C.S. and Barbosa F.S., 1998). The examinations were carried out in partnership with the Schistosomiasis Control Program of the municipality of Malhador. After the survey was completed, the results of the parasitological examinations were delivered to the population, and treatment was offered to all individuals positive for schistosomiasis through the Municipal Health Department of Malhador.

The description of the social, health and behavioral variables of the residents of the locality was obtained from the application and analysis of a questionnaire, which was answered by the individuals who performed the parasitological examination.

To determine the degree of contact with natural waters, weights were attributed to the motifs and their frequency, according to attributes validated by Lima and Costa et al. (1991). Thus, the degree of contact (DC) was calculated using the following formula: $DC = \Sigma (m \times f)$; where m is the weight of the contact motif and f is the weight of the contact frequency. Contacts that added 2 to 99 points were considered Grade I (less intense) and those contacts that added 100 points or more, were considered Grade II (more intense).

The identification of the breeding sites of Biomphalaria in the water collections of the region of analysis was carried out from field studies, in which each of the water collections was inspected to identify the existence of molluscs. From the sites where molluscs of the genus Biomphalaria were found, several samples were collected and later analyzed in the Laboratory of Parasitology of the Federal University of Sergipe. Samples were collected using metal shells and tweezers, placed in plastic containers and taken to the laboratory on the same day, where they were prepared for further analysis.

The residence of the Schistosoma mansoni positive individuals, as well as the breeding grounds where molluscs of the genus Biomphalaria were found, were georeferenced by means of a Ground Positioning System (GPS) for later construction of spatial distribution maps of the disease and breeding sites.

The GPS data were transferred to the computer via the GPS TrackMaker Pro software (Version 13.9). The maps were constructed and analyzed using the TerraView 4.2.0 software.

The results were obtained in the form of thematic maps (Câmara et al., 1996). The cartographic base of the Tingui Farm, provided by the National Institute of Colonization and Agrarian Reform (INCRA), cartographic base of the municipality of Malhador, provided by IBGE, Google Maps image, and the georeferenced data were used in the generation of the maps.

The spatial data collected were analyzed using the exploratory interpolation technique, Kernel estimation. Through flatting, or statistical smoothing, this technique generates a density surface for the visual detection of hot spots, understood as a concentration of events that indicates somehow the agglomeration in a spatial distribution. The distribution of points was transformed into a continuous surface of risk for the occurrence of cases of schistosomiasis in the studied locality. This procedure allowed to filter the variability of the data set, without, however, changing its local characteristics (Bailey; Gatrell 1995; Barcellos et al., 2006) and generated a continuous surface from point data (Cromley & Mclafferty, 2002).

The descriptive analysis of the data was performed by pairing the variables selected from the database using the BioEstat 5.0 software.

In order to verify the strength of association between the dependent and independent variables, the Chi-Square Equality Test and the Multiple Logistic Regression were used. The level of significance was set at 5% ($p < 0.05$).

3. Results

3.1 Coproscopic survey and socio-demographic data

In the census survey, 95 people participated, all of them living in the Tingui rural community, in the town of Malhador-SE, with ages varying from 2 to 85 years (mean 34.48 and standard deviation 2.13), and the highest frequency found

was between the ages of 2 and 19 years (31.58%), followed by 27 people (28.42%) between 38 and 55 years, 19 people (20%), between 56 and 73 years, 18 people (18, 95%), between 20 and 37 years, and one person (1.05%) between 74 and 91 years old (Table 1).

Regarding gender, 50 individuals (52.63%) were males, while 45 individuals (47.37%) were female. Among the 95 participants, 59 were farmers (62.11%), 28 students (29.47%), five housewives (5.26%) and three people performed other types of activity (3.16%). As far as education is concerned, the majority of the population studied had incomplete elementary education, making a total of 76 people (80%), 13 people said they had not studied (13.68%) and declared themselves with complete elementary education, elementary school and high school, two, one and three people (2.11%, 1.05% and 3.16%), respectively. The majority of the study population, 81 people (86.32%), had lived in the place for more than a year, and 13 people (13.68%) lived for less than one year (Table 1).

Regarding the use of the toilet, 49 people (51.58%) reported having and using a toilet, inside or outside the home, 28 people (29.47%), said to deposit their waste "in the bush", while 11 people (11.58%) did it "in the hole" (the "hole" is usually located in the backyard), and seven people (7.37%) did not give any information about it.

Of the 28 people who reported depositing their waste "in the bush" (according to the interviewees, the expression "in the bush" is to designate any external area, plantations and riverbank), 17 of them had a positive result in the coproscopic examination for Schistosomiasis mansoni.

Table 1: Distribution of the studied population according to age, gender, occupation, schooling and length of residence.

Epidemiological Variables	X$_i$	Absolute Frequency (n=95)	Relative Frequency (%) (n=95)
Age group			
02.0 |— 20.0	11.0	30	31.58
20.0 |— 38.0	29.0	18	18.95
38.0 |— 56.0	47.0	27	28.42
56.0 |— 74.0	65.0	19	20.00
74.0 |— 92.0	83.0	1	1.05
Gender			
Male	-	50	52.63
Female	-	45	47.37
Occupation			
Farmer	-	59	62.11
Student	-	28	29.47
Housewife	-	5	5.26
Others	-	3	3.16
Education			
No study	-	13	13.68
Incomplete elementary school	-	76	80.00
Complete primary education	-	2	2.11
Incomplete high school	-	1	1.05
Complete high school	-	3	3.16
Living Time			
Less than 1 year	-	13	13.68
Greater than 1 year	-	82	86.32

Source: Authors.

The verified prevalence for schistosomiasis mansoni in the analyzed population was 45%, that is, 43 of the 95 participants had different degrees of infection intensity. People with positive tests were classified according to the parasite load, evaluated by the calculation of eggs per gram of feces. It was observed that in general prevailed light infection (53.49%), followed by moderate (37.1%) and high (9.30%). In relation to the intensity of the infection by age group, moderate and light intensity prevailed among people aged 2 to 19 years, while light intensity was more prevalent among the first three age groups, ranging from 2 to 55 years (Table 2).

The degree of contact with water can be considered light (grade I) or intense (grade II). In the analyzed population, 49 people (51.58%) had a light degree, and 46 people (48.42%) presented an intense degree. In relation to water contact and positivity for Schistosoma mansoni, it was found that of the 43 infected individuals, 29 of them (67.44%) had an intense degree, while 14 people (32.56%) had a light degree.

The community does not have piped water supply, and makes use of water coming from artesian well, the river and the dam.

Table 2: Intensity of Schistosoma mansoni infection by age group.

Intensity of Infection	Age Group (%)				
	2.0|—20.0	20.0|—38.0	38.0|—56.0	56.0|—74.0	TOTAL
Light (< 100)	18.60	16.28	13.95	4.65	53.49
Moderate(100 to 399)	20.93	0.00	13.95	2.33	37.21
High (>399)	6.98	2.33	0.00	0.00	9.30
TOTAL	46.51	18.60	27.91	6.98	100.00

Source: Authors.

3.2 Study of factors associated with the occurrence of Schistosoma mansoni infection

95 questionnaires were applied in the households of the residents who participated in the research. The health, behavioral and social profile of the individuals was delineated, of which 43 were positive and 52 negative for the infection.

Of the total number of infected individuals, 25 were male and 18 female. As for length of residence, 42 individuals have lived in the locality for more than one year and only one individual for less than a year. Regarding education, the majority of the population (38 of the 43 infected individuals) had some degree of schooling, while 5 individuals declared they were not literate (Table 3).

Regarding the knowledge about the disease, 37 individuals reported not having knowledge, and only six people reported having some knowledge related to the disease. The degree of contact with water was considered intense in 29 of the infected individuals (Table 3).

Table 3 shows the percentage values of positivity for Schistosoma mansoni infection according to dichotomous epidemiological variables analyzed by the X² test and by the Multiple Logistic Regression test.

Table 3: Distribution of positivity for Schistosoma mansoni according to the associated risk factors.

Epidemiological Variables		Positive		Negative		*Odds Ratio*	CI 95%	*p**	x^2(p)
		Freq.	%	Freq.	%				
Gender	Male	25	50,00	25	50,00	1,5141	0,59-3,88	0,3871	0,1552
	Female	18	40,00	27	60,00				
Length of residence	< 1 year	1	7,69	12	92,31	11,5114	1,31-100,38	0,0270	0,0001
	>1 year	42	51,22	40	48,78				
Education	Illiterate	5	38,46	8	61,54	0,6417	0,17-2,43	0,5136	0,2595
	Literate	38	46,34	44	53,66				
Knowledge about the disease	No	37	49,33	38	50,67	2,0148	0,61-6,62	0,2484	0,0052
	Yes	6	30,00	14	70,00				
Degree of contact with water	Grade I	14	28,57	35	71,43	3,9383	1,55-10,04	0,0041	0,0007
	Grade II	29	63,04	17	36,96				

Source: Authors.

Values of p* for analysis by Multiple Logistic Regression; CI 95% - 95% confidence interval; x^2 - p-value according to the analyzes by the Chi-square of equality.

The variables length of residence ($OR = 11.5114$), degree of contact with water ($OR = 3.9383$), knowledge about the disease ($OR = 2.0148$) and gender ($OR = 1.5141$), stand out. The educational variable ($OR = 0.6417$) did not show a significant influence on the presence of the disease.

3.3 Malacological survey

Four malacological collections were carried out in the analysis. Nine breeding sites were georeferenced and a total of 218 snails were collected and analyzed, of which 212 were Biomphalaria and six were Melanoides tuberculatus. The number of snails collected in each of the breeding sites identified in the localities was variable. The light exposure analysis technique was used over the 45 day period and no infected snail was found.

3.4 Spatial distribution pattern of Schistosomiasis Mansoni and Biomphalaria breeding sites in the community

Figure 2 shows the results of the Kernel analysis of positive human cases for Schistosomiasis mansoni, distributed throughout the area of the village of the Tingui rural community, with a greater spatial concentration in the eastern region, closer to the Dangra river.

Related to the distribution and concentration of Biomphalaria breeding sites, the Kernel analysis shows two more hot spots, one west of the community village, near a stream; and another area to the east, in the acerola plantations in which a large part of the population works (Figure 3).
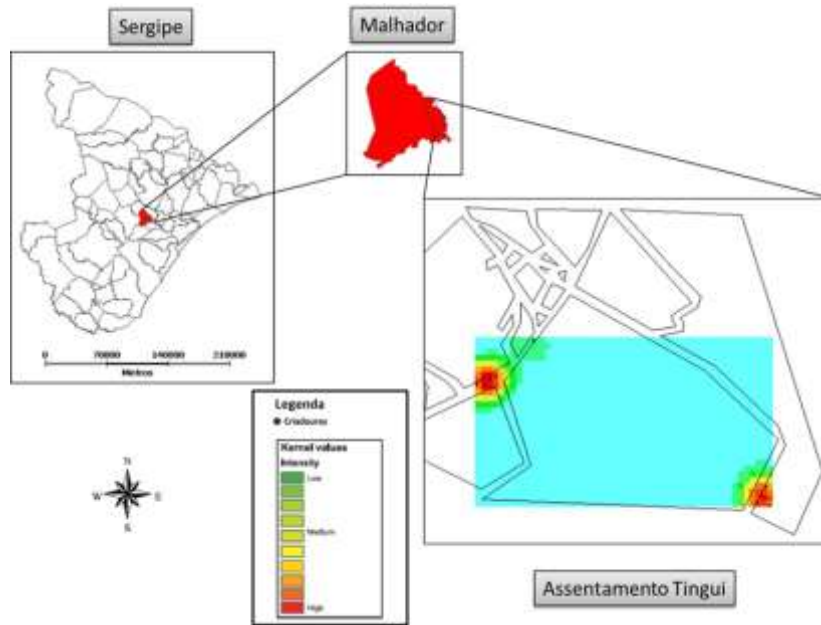
Figure 2: Kernel Intensity Analysis: Human positive cases of SM.
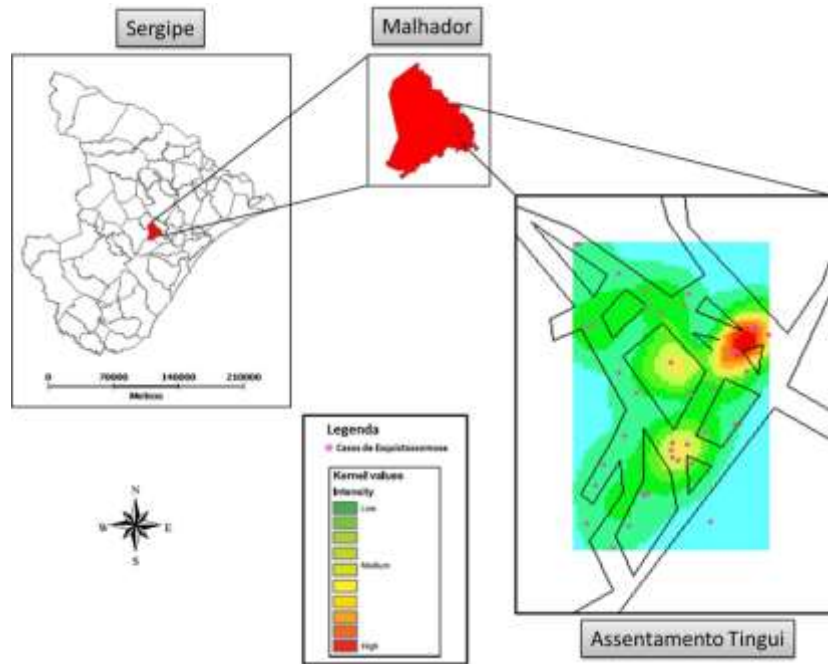
Source: Authors.

Figure 3: Kernel Intensity Analysis: Biomphalaria breeding sites.

Source: Authors.

4. Discussion

Several ecoepidemiological factors are related to the occurrence of Schistosomiasis mansoni in the Tingui rural community, including environmental, sanitary, educational and social conditions.

The epidemiological study presents a certain complexity, due to the necessity of analyzing not only the positivity variables for schistosomiasis, both in definitive hosts (human) and in intermediate hosts (snails), as well as environmental, health, educational and socioeconomic variables that make part of the dynamics of the disease. Understanding the relationship of the factors that influence the maintenance of the cycle is extremely important, as well as knowing the actions of epidemiological surveillance carried out by the SCP

The municipality of Malhador presents endemic locations of SM, and the objectives of surveillance and control in the endemic area are: to prevent the appearance of severe forms of Schistosomiasis; to reduce prevalence by location and to avoid the spread of the endemic disease through coproscopy, carrier treatment, malacology, environmental sanitation actions and health education (Health Surveillance Secretariat, 2014). The discontinuity of the actions carried out by the SCP in the region confirms, locally, the conceptualization of Schistosomiasis mansoni as a neglected disease.

The coproscopic investigation and the application of the questionnaire allowed to delineate the community profile regarding the maintenance of the dynamics of the disease cycle. According to the results analysis, most of the infected individuals deposit their waste "in the bush". This fact, together with the greater exposure to the environmental conditions of the region, as well as the greater contact with water, are determining factors for the maintenance of the disease cycle, and therefore, for the high prevalence verified.

According to the data presented in Table 4, 50% of the male population was contaminated, against an infection rate of 40% of the female population. According to some authors (Resende et al., 2005), in areas endemic for Schistosomiasis, there is a higher prevalence the male population, possibly due to behavioral factors, such as occupational and leisure activities, which would be more related to this gender.

Regarding the age group, the highest prevalence was among individuals with ages varying from 2 to 19 years, corresponding to 46.51% of those infected. The analysis of the data obtained reveals that, among individuals with greater

contact with water, 65.52% were in the age group between 2 and 19 years. Thus, the higher degree of contact with water, associated to the fact that the first contact with the parasite occurs when the patient's immune system has not yet acquired resistance to infection, may explain the higher prevalence of the disease in this range age. This result is compatible with what is reported by Vitorino et al. (2012) when they affirm that in general, the age group with the highest infection rates is between 15 and 20 years. In addition, the analysis of the results showed that the elderly people had the lowest prevalence of schistosomiasis. Some authors believe that this may be related to the fact that individuals at that age would have a lower degree of contact with water, as well as due to a greater resistance acquired with age, through successive contacts with the parasite (Abreu 2011; Vitorino et al. 2012).

In terms of infection intensity, it was verified that more than half of the infected individuals had light infection intensity (53.49%). This finding is compatible with results reported by other authors (Barbosa and Barbosa, 1998; Moza et al., 1998). A possible reason for this finding is that in endemic regions, due to successive reinfections, individuals acquire a greater resistance to the parasite, and with that they tend not to present high parasite loads (Vitorino et al., 2012).

In terms of length of residence, more than half of the individuals who lived in the locality for more than one year (51.22%) were infected, whereas only one of the 13 residents who lived less than one year (7, 69%) had the disease. The time of one year was considered to be enough time for an individual to make contact with the existing water collections at the study site. The obtained results evidenced the fact that a longer residence time contributes to a greater exposure to the risk factors for infection, typical of an endemic region.

It was verified that an important factor for the positivity of the disease was the degree of knowledge that the individual possessed about it. Among the individuals who declared that they did not have any knowledge, a prevalence of 49.33% was found, whereas among those who reported having some knowledge about schistosomiasis, the prevalence was 30%. These results are in agreement with reports of several authors, who affirm that information is one of the main weapons to combat this disease, especially in endemic areas, because without information, it is very difficult to interrupt the cycle of disease contagion (Vitorino et al, 2012; Coura; Conceição, 2010; Tibiriça et al., 2008).

As previously mentioned, the degree of contact with water is one of the most important aspects when analyzing the prevalence of SM in a region, since it is through the water that the contagion cycle occurs. According to the results obtained, 63.04% of the individuals with degree of intense contact (grade II) were infected, whereas only 28.57% of the individuals with less degree of contact with water had the disease. The visits made to the locality showed that there were no adequate basic sanitation conditions, such as the lack of piped water in the residences, which led residents to use the existing water collections in the locality for basic daily activities, such as consumption, hygiene and leisure, which is decisive for the perpetuation of the disease transmission cycle (Gazzinelli et al., 2006).

The analysis of the results presented in Table 4 indicates that the length of residence (OR = 11.5114), the degree of contact with water (OR = 3,9383), knowledge about the disease (OR = 2.0148) and the gender (OR = 1.5141), were the most significant epidemiological variables regarding the positivity of the disease. On the other hand, the educational variable (OR = 0.6417) did not show a significant influence on the presence of the disease.

In the present study no infected snails were found, but it was possible to perform the georeferencing of nine permanent breeding sites of Biomphalaria, potential intermediate host for the parasite and one of the determinant risk indicators for the maintenance of the disease cycle.

Identifying problems at the local level assists in the health care of the population. Thus, awareness and participation of the population is of fundamental importance for the interruption of the disease cycle, and therefore for its control (Vitorino et al., 2012, Coura & Conceição, 2010).

As regards the spatial distribution of positive human cases of Schistosomiasis mansoni, it is verified by the Kernel

intensity analysis (Figure 2) that the cases occur in the whole area of the village of the rural community of Tingui, intensifying in the area most near the river Dangra. This result is consistent with the expectation that people living closer to the region's main water collection are more likely to contract the infection.

5. Final Considerations

The prevalence of schistosomiasis mansoni found in the community was 45%, and the age group with the highest frequency (46.51%) was between 2 and 19 years. The locality presents several water collections in which Biomphalaria breeding sites were identified, which is an indicator of risk for the continuity of the transmission cycle. The results indicate that most of the infected individuals deposit their waste "in the bush", which suggests that it is a determining factor for the maintenance of the disease cycle, and therefore, for the high prevalence verified. According to the results obtained, length of residence, degree of contact with water and knowledge about the disease were the three most significant variables regarding the positivity of the disease. The residents' lack of knowledge about the disease, which resides specifically in an endemic region, is worrying, and reveals the lack of preventive educational actions related to the disease by the SCP. Knowledge of the data collected and the results obtained can, and should, serve as a subsidy so that public managers in the municipality of Malhador can seek more efficient ways to break the cycle of transmission of the disease, reducing its prevalence in the studied locality.

Suggestions for future work, sanitary education for the residents, together with the PCE to monitor infection and reinfection rates, analyzing the main risk factors, bacteriological analysis of water from the water collections used by the residents.

Acknowledgments

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