Risk factors for the occurrence of schistosomiasis mansoni in a quilombola community in an endemic area in northeastern Brazil

Fatores de risco para a ocorrência de esquistossomose mansoni em uma comunidade quilombola em uma área endêmica no nordeste do Brasil

Factores de riesgo para la ocurrencia de esquistosomiasis mansoni en una comunidad quilombola en un área endémica del noreste de Brasil

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ABSTRACT

Objective: To identify the risk factors related to Schistosomiasis mansoni in a quilombola community located in a highly endemic area in the Northeast of Brazil. **Methods:** This is an ecological epidemiological study conducted with 497 individuals, of both sexes aged over 4 years. Information on sociodemographic, economic, and environmental data from the quilombola community of Patioba was collected through a questionnaire, stored in an Excel database, and evaluated by descriptive statistics. **Results:** From the sample, 53.92% were women and 46.08% men, approximately 43.25% of the population had incomplete elementary education, 58.35% had a family income between 1 and 3 minimum wages, 49.89% disposed sewage in the street, 95.97% stated they had household garbage collection, 88.93% reported consuming well water, 65.19% reported having contact with natural waters, 26.15% had undergone diagnostic testing for schistosomiasis, and 15.69% had tested positive for the disease. During the visits, several snail breeding sites were observed. **Conclusion:** The absence of water supply and sewage treatment, the low socioeconomic status of the studied families, and the significant presence of the parasite's intermediate hosts in the streets of the settlement are strong indicators that this population is exposed to the risk of contracting the disease.

Keywords: Epidemiology, Schistosomiasis, *Schistosoma mansoni*, Quilombola community.

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RESUMO

Objetivo: Identificar os fatores de risco relacionados à esquistossomose mansoni em uma comunidade quilombola situada em uma área de alta endemicidade no Nordeste brasileiro. **Métodos:** Trata-se de estudo epidemiológico do tipo ecológico, conduzido com 497 indivíduos, de ambos os sexos com idade superior a 4 anos. As informações sobre dados sociodemográficos, econômicos e ambientais da comunidade quilombola de Patioba foram coletadas através de um questionário, armazenadas em um banco de dados no Excel e avaliados por estatísticas descritivas. **Resultados:** Da amostra, 53,92% eram mulheres e 46,08% homens, cerca de 43,25% da população possui fundamental incompleto, 58,35% possuem renda familiar entre 1 e 3 salários-mínimos, 49,89% despeja o esgoto na rua, 95,97% afirmaram ter coleta de lixo domiciliar, 88,93% declararam consumir água de poço, 65,19% declararam ter contato com águas naturais, 26,15% já realizaram o exame diagnóstico para esquistossomose e 15,69% já foram positivos para a doença. Durante as visitas foi observado diversos criadouros de caramujo. **Conclusão:** A ausência de abastecimento de água e de tratamento do esgoto, a baixa condição socioeconômica das famílias estudadas e a presença marcante dos hospedeiros intermediários do parasito pelas ruas do povoado são fortes indicadores de que essa população está exposta ao risco de contrair a doença.

Palavras-chave: Epidemiologia, Esquistossomose, *Schistosoma mansoni*, Comunidade quilombola.

RESUMEN

Objetivo: Identificar los factores de riesgo relacionados con la esquistosomiasis mansoni en una comunidad quilombola ubicada en una zona altamente endémica en el noreste de Brasil. **Métodos:** Este es un estudio epidemiológico ecológico realizado con 497 individuos, de ambos sexos, mayores de 4 años. La información sobre datos sociodemográficos, económicos y ambientales de la comunidad quilombola de Patioba se recopiló a través de un cuestionario, se almacenó en una base de datos de Excel y se evaluó mediante estadísticas descritivas. **Resultados:** De la muestra, el 53,92% eran mujeres y el 46,08% hombres, aproximadamente el 43,25% de la población tenía educación primaria incompleta, el 58,35% tenía un ingreso familiar entre 1 y 3 salarios mínimos, el 49,89% desechaba aguas residuales en la calle, el 95,97% afirmó tener recolección de basura domiciliaria, el 88,93% declaró consumir agua de pozo, el 65,19% declaró tener contacto con aguas naturales, el 26,15% se había sometido a pruebas diagnósticas para la esquistosomiasis y el 15,69% había dado positivo en la enfermedad. Durante las visitas, se observaron varios criaderos de caracoles. **Conclusión:** La ausencia de suministro de agua y tratamiento de aguas residuales, la baja condición socioeconómica de las familias estudiadas y la presencia significativa de los hospedadores intermediarios del parásito en las calles del asentamiento son fuertes indicadores de que esta población está expuesta al riesgo de contraer la enfermedad.

Palabras clave: Epidemiología, Esquistosomiasis, *Schistosoma mansoni*, Comunidade quilombola.

INTRODUCTION

Schistosomiasis mansoni is an infectious parasitic disease caused by the helminth *Schistosoma mansoni*, with intermediate snail hosts of the genus *Biomphalaria*. It ranges from asymptomatic cases to chronic conditions, potentially becoming a debilitating and incapacitating disease (WHO, 2015; SOUZA FPC, et al., 2011).

The disease is one of the most common human parasitic infections globally, with transmission reported in 78 countries. It is estimated that approximately 240 million people are currently infected, with another 700 million at risk of contracting the disease (COLLEY DG, et al., 2014; WHO, 2021).

In Brazil, it affects around 1.5 million people, with the Northeast region having the highest prevalence, and Sergipe standing out as the state with the highest prevalence of schistosomiasis in the country (KATZ N, 2018). Recognized as one of the Neglected Tropical Diseases (NTD) by the World Health Organization (WHO), its

disproportionate impact on the poorest and most marginalized populations is significant. Despite efforts in control programs, it remains one of the most significant health problems, especially in emerging countries (STEINMANN P, et al., 2006; UTZINGER J, et al., 2009). The epidemiological complexity of this disease includes biological, socioeconomic, political, and cultural factors that contribute to its maintenance (BRASIL, 2014; RAMOS JR. AN, et al., 2019).

Lower socioeconomic conditions and inadequate basic sanitation, coupled with a climate conducive to the spread of the parasite significantly increase the risk of schistosomiasis infection. Human exposure to contaminated water sources and the presence of intermediate hosts of *Schistosoma mansoni* contribute to the disease transmission cycle (FERREIRA DC, et al., 2021; COLLEY DG, et al., 2014).

The connection between lifestyle, socioeconomic inequalities, environmental conditions, and health impacts highlights different risks of schistosomiasis exposure. In rural and peri-urban areas of Brazil, infection prevalence is linked to the reliance on contaminated water sources, poor living conditions, agricultural and fishing activities, a lack of sanitation, limited education, and migration from endemic areas (KLOOS H, et al., 2008).

Factors such as using water for recreational purposes also contribute to contact with contaminated water and sewage, intensifying the risk of infections (GRIMES JET, et al., 2015). Disease transmission is influenced by a combination of interconnected factors, the importance of which varies depending on the local context (WHO, 2022). Therefore, analyzing the social context, especially of marginalized populations, it is essential to understand and effectively address this reality.

The Quilombola communities, despite their historical and cultural significance, face a reality marked by extreme poverty, with the vast majority depending mainly on the Bolsa Família Program – a federal government cash transfer program in Brazil aimed at social assistance (CARDOSO CS, et al., 2018). Currently, the quilombola population in Brazil corresponds to 0.65% (around 1,327,802 people) of the country's total inhabitants and around 68.19% of this ethnic group resides in the Northeast Region (IBGE, 2023).

These communities, often located in rural areas, face significant challenges in accessing government programs and essential services. The lack of adequate access to government services is reflected in the poor infrastructure of these communities, with lower educational levels and a lack of basic amenities such as piped water, sanitation, and garbage collection. These conditions contribute to the creation of an evident scenario of social and economic vulnerability, which in turn, fosters the emergence and spread of diseases, especially parasitic ones (ALAGOAS, 2015).

As pointed out by Santos KMP and Garavello MEPE (2016), although quilombola communities are part of the country's cultural heritage, they face serious problems in terms of access to healthcare and quality of life. These difficulties also extend to food and nutritional insecurity.

Despite advances in public policies aimed at promoting the health of the quilombola population, there are still many difficulties in accessing basic services. In this way, understanding the living and health conditions of quilombola communities and the production of knowledge in this context can contribute to the implementation of new policies aimed at sanitation and health education (IBGE, 2023; ANDRADE AM, et al., 2022).

Therefore, this study aimed to establish the association between specific indicators of schistosomiasis development, population behaviors regarding contact with natural waters, as well as socioeconomic conditions, contributing to understanding the consequences of these factors in the epidemiological scenario of the studied quilombola community.

METHODS

Study Type

This is an ecological epidemiological study in which sociodemographic, economic, and environmental data were collected and evaluated from a quilombola community in an area with a high prevalence of schistosomiasis in Northeast Brazil.

Study Area and Population

The study was conducted in the quilombola community of Patioba, in the municipality of Japaratuba – Sergipe, in August 2022. The entire Patioba community was invited to participate in this study. The chosen location is composed of a population of 632 inhabitants15.

Inclusion and Exclusion Criteria

The study included residents of the quilombola community of Patioba, aged 4 years and older, of both sexes, who agreed to participate in the project and signed the informed consent form (ICF). Individuals who did not respond to the questionnaires were excluded from the study. In the case of minors, authorization for participation in the research was the responsibility of their guardians.

Data Collection

Initially, a lecture on schistosomiasis was conducted for the community, where important information about the disease was provided. The research objectives were explained, as well as the Informed Consent Form (ICF), and all questions were clarified. Individuals who agreed to participate in the study signed the Informed Consent Form (ICF) or the Informed Assent Form (IAF). For underage individuals, their parents were responsible for authorizing their participation by signing the ICF and for completing their socio-environmental questionnaire. However, regarding the IAF, it was signed by the minor individual who was able to read and write.

The data collection instrument used was a questionnaire, applied to research participants during home visitations. This material consisted of questions regarding demographic, social, and health conditions of the individuals, as well as some aspects of schistosomiasis and lifestyle habits.

Results Analysis

A database was created with the assistance of Microsoft Office Excel 2021 (Microsoft Corp., Redmond, WA, USA) for the organization and storage of collected data. Descriptive statistical analyses were performed on epidemiological data related to the community, population, and the presence of schistosomiasis, as well as its determining factors.

Ethical Aspects

The research adhered to the principles outlined in Resolution 466/2012 of the National Health Council, encompassing autonomy, non-maleficence, beneficence, justice, and equity. The study received approval from the National Ethics and Research Commission, under opinion number 6,590,838, CAAE: 54930621.9.0000.5054, from the Research Ethics Committee of the Federal University of Sergipe, under opinion number 6,044,220, CAAE: 53005621.6.0000.5546 and acquired consent from the State Board of Health Surveillance of the Government of Sergipe, with additional backing from the Endemics Center of the Epidemiological Surveillance within the same state.

RESULTS

Out of 632 eligible residents to participate in the research, 497 (78,63%) were evaluated through self-declared responses, with 53.92% being women and 46.08% men. **Table 1** shows the socioeconomic data of the participants (**Table 1**).

The age of the participants ranged from 4-90 years old (median: 34 years old), with 26.55% of them being of school age. Approximately 43.25% of the population had incomplete elementary education, 58.35% had a family income between 1 and 3 minimum wages, and 35.41% received government aid. The village lacks a water supply and sanitation system; as a result, the majority of the population (49.90%) disposed of sewage in open-air conditions. Conversely, 95.97% of the residents reported having access to household garbage collection. The community's water supply came primarily from a well, with the majority of residents (88.93%) reporting consumption of water from this source, while others obtained water from cisterns and/or other sources.

Table 1 - Socioeconomic Profile of the Quilombola community of Patioba, n=497.

Variables	N	%
Age		
0 - 18	132	26,5
18 - 29	85	17,1
30 - 41	84	16,9
42 - 53	81	16,3
54 - 65	73	14,7
66 - 90	42	8,5
Sex		
Female	268	53,92
Male	229	46,08
Education		
Illiterate	38	7,65
Incomplete Elementary School	215	43,26
Complete Elementary School	16	3,22
Incomplete High School	80	16,10
Complete High School	103	20,72
Incomplete Undergraduate	14	2,82
Complete Undergraduate	9	1,81
Did not declare	22	4,43
Housing		
Owned	406	81,69
In Payment	7	1,41
Provided	45	9,05
Rented	29	5,84
Invaded	0	0,00
Undeclared	10	2,01
Family Income		
Up to 1 minimum wage	86	17,30
Between 1 and 3 minimum wages	290	58,35
Between 3 and 5 minimum wages	14	2,82
More than 5 minimum wages	3	0,60
Did not declare	104	20,93
Receives Government Aid		
No	321	64,59
Yes	176	35,41
Water Supply		
DESO	0	0,00
Cistern	7	1,41
Well	442	88,93
Neighborhood	0	0,00
River	0	0,00
Well + Cistern	29	5,84
Other	19	3,82
Solid and Liquid Waste Disposal		
Connected to Sewer System	0	0,00
Open-Air Sewage	248	49,90
Canal	12	2,41
Sealed Pit	218	43,86
Unsealed Pit	8	1,61
Mixed (Open-Air Sewage and Sealed Pit)	4	0,80
Did not declare	7	1,41
Garbage Disposal		
Public Collection	477	95,98
Burn	16	3,22
Did not declare	4	0,8
Total	100	-

Source: Silva AT, et al., 2024.

Contact patterns with natural water sources vary among families, with approximately 65.19% reporting contact with natural water sources for various reasons (**Table 2**), including domestic chores, personal hygiene, work-related activities, and leisure.

In **Table 3**, it can be observed that approximately 26.15% reported undergoing diagnostic testing for Schistosomiasis mansoni, and 15.69% tested positive for the disease. Among those who tested positive, 5.12% did not receive treatment (**Table 2**, **Table 3**).

Table 2 - Reasons for the Quilombola community of Patioba to have contact with untreated water sources.

Reason for contact with natural waters	N	%
Fetching water	111	22,33
Dishwashing	1	0,20
Laundry	176	35,41
Bathing/Personal hygiene	256	51,51
Swimming (Leisure)	87	17,51
Fishing	64	12,88
Crossing	62	12,47
Harvesting from the garden	32	6,44
Agricultural work	34	6,84
Sand extraction	6	1,21
Other	2	0,40

Source: Silva AT, et al., 2024.

Table 3 - Schistosomiasis-related data for the Quilombola community of Patioba.

	Yes (%)	No (%)
Have you received any information about schistosomiasis?	51,71	46,07
Do you know how the disease is transmitted?	50,3	46,07
Have you had schistosomiasis before?	15,69	81,49
Have you experienced symptoms?	8,24	79,67
Have you been tested for the disease?	26,15	57,94
Have you received treatment?	16,49	71,42

Source: Silva AT, et al., 2024.

DISCUSSION

The data from this study indicate that the Patioba village presents significant factors for the transmission of schistosomiasis, considering the history of disease cases, the lower socioeconomic and sanitary status of the residents, and the presence of Biomphalaria snails, the intermediate host of Schistosoma mansoni. It was identified that the most frequent age group was 0 to 18 years. Studies emphasize the importance of schistosomiasis in children and suggest that they may have a higher prevalence of infection due to factors such as a greater exposure to contaminated water, lack of preventive measures, and a lower immunity compared to adults (MARU DS, 2015; NYATI-JOKOMO Z and CHIMBARI MJ, 2017).

The predominance of females coincides with data found in other studies conducted in quilombola communities (BEZERRA VM, et al., 2015). Although data such as gender, is important for understanding the studied population, they are not considered determining factors for the development of Schistosomiasis mansoni since there is no scientific consensus on the influence of gender on this infection. Some studies report a higher prevalence in men, mainly associated with labor activities (COSTA JVB and SILVA FILHO JM, 2021) while others report a higher prevalence in women associated with a greater exposure through domestic activities (MUTENGO MM, et al.,2014) and some did not find this difference in prevalence based on gender (SOUSA MS, et al., 2020).

Regarding the educational context, lower education was identified, as the majority of this population (43.26%) has incomplete elementary education. Although not directly related to schistosomiasis, education is a relevant factor for the control of this parasitosis (VASCONCELOS CH, et al., 2009), as access to information increases the empowerment of the population, leading to greater adherence to healthcare, behavior change, and consequently, a reduction in disease prevalence.

A study conducted in China explored the effects of health education on controlling the risk of schistosomiasis transmission, and the results revealed a significant increase in knowledge and correct preventive measures among adults and students subjected to health education intervention (FENG J, et al., 2023).

The integration of education and public health promotes collective awareness, empowering communities to adopt appropriate prevention measures for a variety of diseases, including schistosomiasis (SACOLO H, et al., 2018). The results indicated that 17.30% of participants have a family income below the minimum wage. Previous research points out that the majority of individuals affected by Schistosomiasis mansoni reside in low-income contexts with limited financial resources (ROLLEMBERG CVV, et al., 2015).

Studies conducted in other quilombola communities highlight the direct connection between the prevalence of schistosomiasis and poverty, demonstrating the close relationship between precarious socioeconomic conditions and increased exposure to the parasite causing this disease (BEZERRA VM, et al., 2014; DAMAZIO SM, et al., 2013; AMORIM MM, et al., 2013).

This disease is strongly influenced by socioeconomic aspects, as impoverished populations are more prone to contract schistosomiasis due to the lack of access to basic sanitation. The absence of adequate sanitation facilities and proximity to infected water bodies increase exposure to the parasite, aggravating the spreading of the disease among individuals with lower income. Furthermore, the lack of effective actions by the schistosomiasis control program in this area limits the access to diagnosis and treatment, prolonging the transmission cycle of schistosomiasis in these vulnerable communities.

The inadequacy of basic sanitation services plays a significant role in the development of waterborne diseases, including schistosomiasis (INSTITUTO TRATA BRASIL, 2019). The vulnerability to schistosomiasis transmission is exacerbated in the studied quilombola community, since 88.93% of the population lacks access to treated water. The primary source of water supply is artesian wells, and 49.9% of people discharge sewage in open-air, demonstrating that these families are exposed to precarious sanitary conditions, such as the lack of basic sanitation. Furthermore, during field activities in the community, it was observed that some households directly drain their waste into open channels around their homes, creating breeding grounds for snails.

According to some residents, contaminated water and snails invade homes and yards during the rainy season. As a result, they are sometimes forced to clean these areas and come into direct contact with them, creating potential for the establishment of disease transmission foci. A study conducted in another location in Sergipe demonstrated the relationship between basic sanitation and Schistosomiasis mansoni contamination, indicating that proper access to sewage systems is directly associated with lower disease prevalence. The authors observed that in areas with an established sewer network infrastructure, schistosomiasis occurrence is reduced (ROLLEMBERG CVV, et al., 2011). These findings highlight the importance of basic sanitation and sewage disposal measures for prevention and control of schistosomiasis, emphasizing that the absence of these measures is considered a risk factor for disease development.

The lack of access to treated water forces many of these individuals to use water from rivers, lakes, and other natural sources for washing clothes and bathing, increasing the risk of contracting schistosomiasis. Table 2 shows the main reasons that lead these people to seek natural water sources for bathing and personal hygiene (51.51%), washing clothes (35.41%), swimming (17.51%), and many other reasons. Contact with possibly contaminated water bodies is considered one of the main risk factors for schistosomiasis occurrence, according to a study conducted in villages in Yewa North, Republic of Benin, where the high previous prevalence of schistosomiasis infection was linked to frequent water contact practices (OSO OG and ODAIBO AB, 2020). The local population claims that there is regular garbage collection in the community; however, it

is still necessary to ensure that these waste materials have proper disposal, preventing them from being discarded in inappropriate locations near rivers and lakes. A study conducted along the coast of Pernambuco emphasized that inadequate solid waste management plays a significant role as a source of organic matter for the development of schistosomiasis-transmitting snails when they are discarded near water bodies (SOUZA MAA, et al., 2010).

The collected data indicate that this locality has a history of schistosomiasis occurrence, but a low coverage of examinations and treatments for schistosomiasis was observed in the studied community, along with a lower level of knowledge about the disease and its transmission. This lack of knowledge is concerning, especially considering that the population resides in the Brazilian state with the highest schistosomiasis transmission rate5, and the lack of information makes people even more vulnerable to the development of the disease.

According to data from DATASUS – Department of Health Informatics of the Brazilian Federal Government, there is no record of diagnostic and treatment actions for schistosomiasis in the Patioba locality in the last 10 years in the SISPCE – Information System of the Schistosomiasis Surveillance and Control Program (BRASIL, 2019).

According to information from the Schistosomiasis Control Program (PCE) in the state of Sergipe, individuals who reported having access to schistosomiasis diagnosis and/or treatment were possibly attended to in previously lived locations or through primary healthcare services, not linked to specific PCE actions.

This demonstrates a weakness in this program, in terms of decentralization of actions as municipalities are unable to provide schistosomiasis control actions to all communities in endemic areas, as indicated by a survey conducted by researchers at the Federal University of Sergipe from 2008 to 2017, where the number of municipalities performing PCE activities showed a decreasing trend and an approximate reduction of 4% per year, so that in 2017, only 34.66% of municipalities recorded activities, excluding even municipalities considered high endemicity in previous periods (CRUZ JIN, et al., 2020).

The authors of this study also highlight that this reduction in PCE adherence coincides with the emergence - or aggravation - of other epidemics in the state, such as dengue, chikungunya, Zika, among others, suggesting a possible diversion of public health agency attention (BRASIL, 2019).

In light of the obtained results, it becomes evident that the population of the Patioba community is exposed to various daily situations that increase the risk of contracting schistosomiasis. This analysis represents an initial step in gathering data about the living reality in the quilombola community of Patioba, but it requires continuity, especially the diagnosis of the entire population and access to treatment, as well as an assessment of any progressive harm that these individuals may have developed.

CONCLUSION

The absence of water supply and sewage treatment, the socioeconomic vulnerability of the studied families, and the significant presence of schistosomiasis intermediate hosts in the streets of the village are strong indicators of a risk of disease in transmission to which this population is exposed. It is important to apply multifactorial prophylactic measures to reduce cases of the disease, primarily focusing on the Sustainable Development Goals (SDGs): 1. No Poverty; 3. Good Health and Well-being; 6. Clean Water and Sanitation.

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