

# Schistosomiasis mansoni as an occupational disease: the importance of establishing the link

## Esquistossomose mansônica como doença profissional: a importância de estabelecer o nexo

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## Abstract

This study highlights the profile of rural workers with schistosomiasis mansoni, an endemic disease acquired during their work activities in flooded areas in the Baixada Maranhense. In order to analyze the social security and labor legislation used to grant benefits and the causal link that establishes the relationship between the work situation and the onset of the disease, we performed a bibliographical research on the topic and a documentary research on the formal legal plan of social security. This study addresses the need to recognize this relationship in endemic regions in order to improve what is proposed by the *List of Work-Related Diseases*.

**Keywords:** Schistosomiasis; Occupational disease; Social security legislation; Causal link.

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## Resumo

Este ensaio destaca o perfil do trabalhador de área rural, portador da Esquistossomose mansônica, doença endêmica adquirida durante suas atividades laborais em áreas alagadas da baixada maranhense. Faz-se uma análise da legislação previdenciária e trabalhista utilizada para fins de concessão de benefícios e do nexo causal que estabelece a relação entre a situação de trabalho e o surgimento da doença. Para tal, utilizamos pesquisa bibliográfica sobre a temática e pesquisa documental do plano jurídico formal da previdência. O estudo aponta para a necessidade de reconhecer esta relação nas regiões endêmicas, no sentido de aprimorar o proposto na “Lista de Doenças Relacionadas ao Trabalho”.

**Palavras-chave:** Esquistossomose; Doença profissional; Legislação previdenciária; Nexo causal.

## Introduction

The significant prevalence of schistosomiasis in endemic areas poses specific challenges for some fields of knowledge, hindering a more effective disease control. This approach raises questions about the behavioral patterns of these populations and the link between their work and the onset of this disease. The contribution of collective health—and more specifically the field of occupational health—is necessary to legitimize schistosomiasis as an occupational disease, that is, to include it in the *List of Occupational Diseases* of the Brazilian social security system. The building of the list is a dynamic process that takes into consideration the way the work is performed, the peculiarities of the workplace, and the agents involved. Currently, some lists are already being updated, but when it comes to biological agents, they still do not meet the needs of rural workers from various locations.

Occupational health is a field of knowledge that studies the dynamic process of labor relations, considering the unhealthy conditions to which workers are exposed in order to avoid possible diseases and accidents. Workers share the health and mortality profile of the general population, according to their age, sex, social group, or participation in a specific risk group. They may fall sick or die from work-related causes due to their current or former occupation or the adverse conditions under which they perform or performed their work (Brasil, 2001; Mendes, 2013a).

## From “occupational diseases” to “occupational health”

According to Mendes (2013b), in 1700, the Italian physician Bernardino Ramazzini published the book *De Morbis Artificum Diatriba*, which was later translated as *Diseases of Workers*. The author aimed to study the occupation of patients as a basic condition for a good medical history, besides highlighting the relevance of environmental problems as threats to their health.

By including new determinants in a new research model, Ramazzini reiterated the need to correlate the

health status of a given population and its working conditions. Over the years and in the light of the socio-environmental process, Ramazzini's ideas were consolidated and the workers' way of living, which was reflected in morbidity and mortality, triggered greater reflections and, thus, better protection practices.

According to Laurel (1983), by questioning the bioecological model of causality, expanding the range of disease determinants, a process of historical construction based on a history of struggles for better health conditions in the work environment is traced before the current regulatory standards.

With a new approach, occupational health becomes a multidisciplinary field of multiple actions, including the issue of environmental and labor survival. Since rural workers need to work, they are daily exposed to physical (excessive heat and humidity), ergonomic (inadequate postures), chemical (residues derived from contaminants) and biological (parasites) risks, which compromise the health of both these workers and people in the community.

When performed in an unhealthy environment, work can be an important "occupational" risk factor, which is strictly related to the local socioeconomic and environmental structure. Therefore, we highlight the need to integrate actions to protect workers' health and control environmental risks, besides social productive development actions.

### **Workers' environment in the Baixada Maranhense**

The environmental characteristics of the Baixada Maranhense—located in the municipality of São Bento, Maranhão, Brazil, and used as a reference for the application of the regulations that underlie this study—require a special approach of occupational health and specifically the professionals responsible for protecting workers' health, considering the rural population dispersion and its heterogeneity, land configuration, vegetation, soil types, climate, sanitation, health education, cultural variety, and local socioeconomic status.

In this region, the relationship between man and water is particularly important, especially in the workplace, where workers spend most of their time developing agriculture, hunting, and fishing activities.

Regarding biological agents, working hours may determine workers' exposure to a specific risk, since the frequency of a given agent or vector is higher at certain times of the day. This relationship refers to the infection by *Schistosoma mansoni* among farmers of flooded crops due to the simultaneity of working hours and the release of cercariae (Carneiro, Carneiro, and Brillet, 2004).

Due to the lack of effective sanitation and health education measures, a part of the population tends to dispose human waste directly on the soil, which creates a favorable situation for the transmission of the disease. Since the water volume is abundant, people seek their livelihood in flooded fields by fishing, hunting, and planting; therefore, they expose themselves to biological contamination due to their work activity (Carneiro, Carneiro, and Brillet, 2004; Gryscek and Espírito Santo, 2017; Melo et al., 2019).

Parasites that contaminate water sources are biological risk agents. Thus, the activities performed by rural workers, who are in contact with contaminated water during their daily work, can be considered occupational.

These activities, when performed in these conditions, can cause schistosomiasis, a disease that over time can incapacitate individuals and make them dependent on social security benefits. Thus, due to its form of contamination, the "work-disease" link would be established and social security would provide the benefits inherent to this process.

In this study, we analyzed documents used as a parameter to grant social security benefits, according to the established causal link, considering the working conditions of rural workers in the Baixada Maranhense and the infection by *Schistosoma mansoni* during work.

### **Methodological strategy**

Under certain conditions, schistosomiasis is considered an occupational disease when establishing the causal link between work activities and the disease, especially when located in endemic areas. Thus, analyzing regulations, especially the social security ones, that have not

yet legitimized schistosomiasis as an occupational disease is necessary.

This study was performed by a documental analysis of the formal legal plan used by social security to grant benefits, with the analysis of other documents related to this theme, and a bibliographic research on the topic.

As it was a documentary analysis, in accordance with Appolinário (2009), information was collected by a local strategy of documentary sources. Data were collected from the second quarter of 2017, after the pre-analysis phase, in which the means of conducting the research and its objectives were established, to 2019.

In the second phase of data collection, the material to be analyzed, which was related to formal documents and scientific approach content on the topic, was organized. The *List of Work-Related Diseases* (Ordinance No. 1,339/GM of November 18, 1999, Secretary of Health Care, Brazilian Ministry of Health), the *List of Occupational Diseases* (Regulatory Decree No. 6 of May 5, 2001, Portuguese Ministry of Labor, Solidarity and Social Security), the *List of Occupational Diseases* (Regulatory Decree No. 76 of July 17, 2007, Portuguese Ministry of Labor, Solidarity and Social Security), and the *Work-Related Diseases: Manual of Procedures for Health Services / Ministry of Health* (PAHO) stand out as formal documents used in this study. The granting of social security benefits provided for in manuals and regulatory instruments were based on these lists and manual (Brasil, 2001, 2008; Portugal, 2001, 2007).

By these documents, aspects related to biological agents, especially the presence and disposition of schistosomiasis mansoni, were analyzed, as well as the category of risks and/or agents, the presence of the disease on the list (according to the reported pattern of endemicity), its characterization, and the list of occupations likely to cause the disease. These aspects were analyzed over the time that they were officially published. At the end of the collection, data were descriptively analyzed and after the analysis was complete, an instrument was used to describe and discuss its results.

This study was performed from an evaluative research on occupational health conducted by the first author, which was approved by the Research

Ethics Committee of the Hospital Universitário of the Universidade Federal do Maranhão, under no. 045/11.

## Results and discussion

Biological agents have the potential to cause occupational diseases, which are, according to Durrani and Harrison (2016), human diseases caused by work-related exposure to microbial agents, including parasites. According to the authors, a disease is occupational when it relates some aspect of the work to contact with a biologically active organism; thus, occupational diseases can occur after contact with infected animals in agriculture and other situations.

Everything that allows the implantation or multiplication of the intermediate host snails of *Schistosoma mansoni* secondarily favors schistosomiasis. The natural lakes, weirs, dams, irrigation projects, and large channels existing in the Baixada allow the emergence of new foci of infection.

After being infected during their work activities (hunting, fishing, and agriculture), workers contract a disease of silent evolution and cumulative character, which lasts for a considerable time, hindering the causal link between work and disease in most cases. Sometimes, signs and symptoms are reported and perceived a long time after exposure to the harmful agent. In some cases, causality is not determined and the disease is not characterized as work-related.

### Establishing the causal link

In order to repair the damage caused and sometimes ensure their own survival, workers need the institutions to initiate a process to evaluate the damage, establish the causal or concausal link of occupational diseases and accidents at work, and grant the appropriate benefits.

According to the Brazilian Ministry of Health (2014), institutions and *a priori* the social security are supported by lists of occupational or work-related diseases to determine the relationship between activity and disease. These documents show concausality without the need for social security experts or other individuals to go to work environments. Thus, the possibility of establishing the on-the-spot link is

not recurrent, except in the presence of labor lawsuits, which go beyond the common spheres of social security, work, and/or health and their respective lists, manuals, and regulations.

Brandimiller (1997) shows a sequence of (partial) links: between activity and risk exposure, between risk and lesion, and between lesion and functional change. When considering partial links, the author refers respectively to a certain cause and effect relationship between activity and risk, risk and lesion, and lesion and functional change.

Workers who expose themselves in rural activities, when contracting the disease and later being temporarily or permanently incapacitated due to the damage caused by the parasite in its late phase, show different scopes of partial links, in line with Brandimiller (1997).

Studies show clinical and epidemiological aspects of schistosomiasis in endemic areas, its high risk of transmissibility due to favorable environmental conditions, and the occupational attribute found in the studied locations (Barbosa and Barbosa, 1998; Melo et al., 2019). In a cross-sectional epidemiological study with fishermen, Melo et al. (2019) showed that the activity performed by these workers exposes them to a relative risk of contracting the disease 3.6 times higher than other activities (leisure) due to the higher frequency of contact with water sources. They also observed intestinal disorders associated with the hepatointestinal and hepatosplenic forms of schistosomiasis, a condition that causes an important functional impairment due to the initial lesions that arose after infection.

Workers in the Baixada Maranhense not only fish, but also hunt and work in the fields. The time they spend at work, to the detriment of other activities, further reinforces the establishment of the link. The diagnostic implications and alterations found in their gastrointestinal system and other systems reaffirm the sequence of the aforementioned partial links.

### **From work-related diseases to social security legislation**

From the Brazilian Constitution of 1988, clinical medicine of individual curative character began to

evolve into a broader view of collectivity by assuming a preventive profile. Thus, the Brazilian Unified Health System (SUS), under an epidemiological perspective, introduced new practices related to occupational health, such as its participation in the edition of the *List of Work-Related Diseases*, which implements the Organic Health Law (Brasil, 2001).

Diseases assume a different character when categorized as occupational, that is, "... understood as produced or triggered by the exercise of work peculiar to a certain activity included in the respective list of the Ministry of Labor and Social Security" (Brasil, 1991).

When workers are unable to work due to diseases or accidents at work, they rely on the guarantee of survival provided by social security benefits, especially if the causal link is established.

Regarding the infection of rural workers by *Schistosoma mansoni* in São Bento, Baixada Maranhense, we can characterize schistosomiasis as an occupational disease due to the link established between its emergence and the work activity. We can look at this disease from a different perspective from that established in line with the hitherto legitimized social security.

Over time, the legislation aimed at the characterization of the social security causal link underwent some changes regarding etiological agents of infectious and parasitic diseases (IPDs). In compliance with the European list of occupational diseases, such as Regulatory Decree No. 6 of May 5, 2001 (Portugal, 2001), the list of occupational diseases published at the time represented the result of all review work performed to date by the National Commission for the Review of the List of Occupational Diseases. This version presented some alterations related to IPDs in the occupational context, but was not updated for schistosomiasis.

This list categorized schistosomiasis among "Tropical-disease-causing biological agents (code 55.02)," classifying all *Schistosoma* species as risk exposure factors in all their clinical forms. Based on this idea, according to Carneiro, Carneiro, and Brillet (2004), the *mansoni* species found in the Baixada Maranhense could be considered a risk agent and the various forms of clinical manifestations of the disease should be included in

the list. Gryscheck and Espírito Santo (2019) showed that the hepatointestinal form of schistosomiasis is the most frequent form of this disease, as well as part of its chronic phase, and may evolve to enlarged liver with a higher or lower degree of fibrosis. As the evolution of this disease is slow, at the time, the legislation established an indicative time limit of 15 years for the characterization of schistosomiasis as an occupational disease, considering the frequency of risk exposure.

The *Manual of Procedures for Health Services* is a reference instrument for work-related diseases of the Brazilian Ministry of Health (Brasil, 2001) and lists 15 infectious and parasitic diseases, according to Ordinance No. 1,339 of 1999. This list does not include any species causing schistosomiasis. At the same time, according to the reference list established by Regulatory Decree No. 6/2001 of May 5, 2001, of the Portuguese Ministry of Labor (Portugal, 2001, p. 2635), the benefit was granted to the following activities, which were considered likely to cause the disease:

- Work in offices, hospitals, or other health units and places where health care is provided involving contact with patients with the disease or clothes and other materials contaminated by them (collection, transportation, washing, sterilization, among others).
- Work in an analysis or research laboratory involving contact with the disease agent.
- Workers moving or staying in tropical countries (fishery workers, merchant marine workers, civil aviation workers).

This content lists activities incompatible with the forms of transmission of schistosomiasis in the work environment, however, the aforementioned manual does not even mention the disease. According to the vast literature, the Brazilian Ministry of Health (2014), and Veronesi and Focaccia (2015), this disease is not transmitted by direct contact between patients and susceptible individuals. For it to occur, the parasitized individual must contaminate the environment (fresh waters) with infected feces so that the parasite develop a complementary cycle from an intermediate host, the snail, and later infect humans. Studies show that, based on its transmission chain, schistosomiasis is a

waterborne disease. Thus, activities in which water is not a contamination vehicle, such as the health work listed above, are not likely to cause the disease. Workers who simply move to tropical countries and do not work in direct contact with “fresh” water are also not susceptible to infection. After all, according to the aforementioned authors, intermediate hosts do not develop in salt water, thus, the content of activities included in the list had no scientific support.

The lists that came after underwent some changes, but also did not consider the Baixada Maranhense an endemic area. The *List of Work-Related Diseases* of the Brazilian Ministry of Health (Ordinance No. 1,339 of November 18, 1999), which was revised and published in 2008 (Brasil, 2008), had the same pattern from the previous list.

The Social Security Regulation (Annex II of Decree No. 3,048/1999: “Occupational risk agents or factors related to the etiology of Occupational Diseases and other Work-Related Diseases,” Brazilian Ministry of Health, 1999) does not include the occupational aspect of schistosomiasis, that is, no evidence show a link between the pathogen (*Schistosoma*) and activities with risk of infection. Moreover, it does not consider the endemic characteristic of the disease as it does with other diseases listed in the same annex, such as leishmaniasis and malaria. Currently, this document guides the granting of social security benefits for patients with tropical diseases in the Baixada Maranhense.

Besides Decree No. 3,048/1999, other laws and texts are used to analyze types of social security links regarding occupational diseases and accidents at work. Article 21-A of Law No. 8,213/1991 (Brasil, 1991) addresses the performance of INSS medical experts and the establishment of the epidemiological technical link between work activity and disease. Decree No. 6,042/2007 is related to the Social Security Epidemiological Technical Nexus (NTEP) (Brasil, 2007), as it shows the relationship between disease and work activity from crossing the International Classification of Diseases (ICD-10), the National Classification of Economic Activities (CNAE), and Regulatory Instruction No. 31. It evaluates the injured individual without visiting the work environment based on three parameters: the professional technical or occupational link,

according to Decree No. 3,048/1999 (Brasil, 1999), the individual technical link for disease treated as accident at work, according to Law No. 8,213/1991 (Brasil, 1991), and the Social Security Epidemiological Technical Nexus (NTEP), in case of statistical significance ICD/CNAE of the aforementioned decrees (Cabral, Soler, and Wysocki, 2018).

The analysis of texts and legislation showed that the instruments used by institutions have gaps regarding the establishment of the link between work activity and schistosomiasis. Moreover, the informal nature of field work, due to the difficulty of access to legal instances, makes it even more difficult to validate schistosomiasis as an occupational disease, since it lacks specific parameters that lists do not include yet.

## Final considerations

Currently, the lists of occupational and work-related diseases, on which social security bases the granting of benefits to sick or injured workers, still limits the access of rural workers infected by *Schistosoma* to these rights. This disease, in its chronic phase, can permanently incapacitate workers or weaken them to death before they even receive proper social security aid. This may occur because schistosomiasis is still considered only a disease of peridomestic transmission and, as it is not specifically related to rural work, it is not legitimized in the social security list.

The legislation does not adequately classify schistosomiasis as an occupational and endemic disease of great epidemiological expression. Decrees do not yet provide a solid basis for experts to establish the causal link, including social security, due to the mismatch existing between lists and even institutions. Arguments for the establishment of a causal link for this disease tend to be fragile, since the epidemiological variations resulting from the different places where the disease occurs make it necessary for experts to go to work environments to confirm the causal link, which is not usual in the presence of the technical social security link.

Therefore, a broader revision of the legislation is necessary regarding the protection system for workers exposed to biological agents in Brazil,

including rural workers. Tropical diseases that affect endemic areas should be considered and legitimized as occupational diseases when the causal link is established, considering their high prevalence and incidence of cases.

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### Authors' contribution

Garrido and Carneiro participated in the study conception, analysis, and writing of the article. Carneiro participated in the study design and final revision of the article. All authors contributed to the methodology and discussion.

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