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IMPORTANCE OF EDUCATIONAL ACTIONS IN THE PREVENTION OF *ASCARIS LUMBRICOIDES*

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ABSTRACT

Ascariasis, caused by the nematode *Ascaris lumbricoides*, is highly prevalent in Bahia, particularly in the Rio Jiquiriçá Basin, affecting schoolchildren in at-risk areas. This study analyzed the significance of educational initiatives in addressing the epidemiology of ascariasis in municipalities within Bahia's Vale Jiquiriçá region. Data on infection rates were collected from municipal health departments between 2011 and 2017, covering Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra. Only Ubaíra provided data, showing the highest prevalence in 2014 with 459 cases and the lowest in 2017 with 59 cases reported by July. Additionally, seven science and biology textbooks from public schools were analyzed, revealing that only two adequately addressed ascariasis with self-explanatory and educational content, while the others offered superficial information. Although ascariasis is one of the most widespread parasitic diseases globally, it is not a compulsory notifiable condition, leading to a lack of awareness about the local endemic status. Textbooks often fail to provide comprehensive information on the risks and prevention of the disease. This underscores the urgent need for educational initiatives through collaboration among school administrators, municipal leaders, and health departments to foster knowledge and prevent infections.

Keywords: Sanitary Conditions; Racial Inequality; Unified Health System.

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INTRODUCTION

Ascaridiasis is a parasitic disease caused by an intestinal nematode of the species *Ascaris lumbricoides*, also known as roundworm. This pathogen is widespread globally and is the most common of the helminth infections in humans (Cimerman; Cimerman, 2010).

According to Rey (2011), ascaridiasis represents a serious public health problem, especially in developing countries. Silva et al. (1997), in a study conducted to assess the prevalence of this parasite in endemic regions, found that approximately 31% of people were infected, with Brazil exceeding this average, presenting up to 39% of the population with the infection. The infection occurs in urban areas, but primarily in rural regions, affecting people of different age groups (Fonseca; Prado Filho, 2010).

The infection can occur primarily due to lack of basic sanitation, poor hygiene conditions, and the ingestion of water, raw or polluted vegetables containing eggs in the infective larval stage (Brasil, 2010). Transmission happens through the ingestion of these eggs, which can also be found in the soil. Children, who have the habit of putting dirty hands in their mouths, are the most affected and show the most significant clinical repercussions of the parasitic infection (Costa-Macedo et al., 1999).

Knowledge about the prevalence of intestinal helminths is scarce or even nonexistent for certain regions of the country (Carvalho et al., 2002). In Bahia, specifically in the Jiquiriçá Valley, in municipalities such as Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra, it is common to see people using the river water that runs through the valley (Simões et al., 2006), engaging in activities ranging from fishing to water sports (Santos et al., 2008).

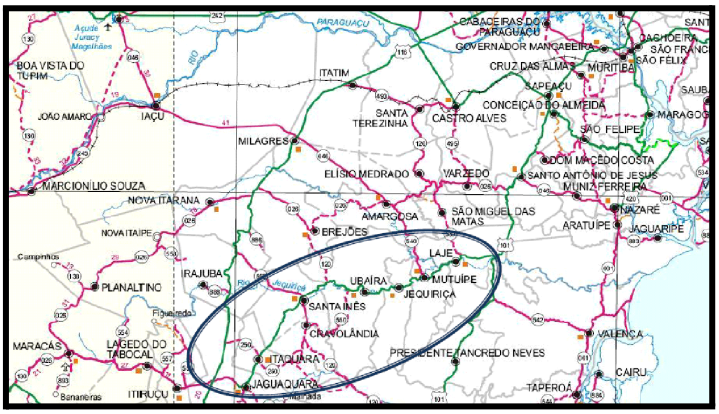
Although ascaridiasis is rarely reported, it is a disease that poses risks to people's quality of life. Therefore, it is essential that individuals recognize the risk factors and have an awareness of the problem at hand. Thus, as important as evaluating its occurrence is the dissemination of information that can reduce the prevalence of *A. lumbricoides* infection. Moreover, considering that diagnosis is most often made in children (Costa-Macedo et al., 1999), schools become a crucial space to discuss the issue, reinforcing the teaching of basic preventive measures to be adopted in people's daily lives through awareness.

Among the measures or actions that can be utilized, the textbooks used by students are understood to be a highly important tool for disseminating information and carrying out a preventive and awareness-raising approach to ascaridiasis. Thus, the present study aimed to analyze the importance of educational actions in the epidemiology of ascaridiasis in the Bahian municipalities of the Jiquiriçá Valley: Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra, based on the study of the frequency of *A. lumbricoides* cases recorded by the health departments of these municipalities. In addition, it evaluated how the topic of ascaridiasis is presented in the 7th-grade Science textbooks in elementary education and the Biology textbooks for the 2nd and 3rd grades of high school.

METHODS

The research was conducted in the Bahian municipalities of Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra, located in the Jiquiriçá Valley (Figure 1), approximately 250 km southwest of Salvador, the capital of the State of Bahia.

Figure 1. Highlighted location of the municipalities to be studied in the Jiquiriçá Valley–BA.



Source: www.valedojiquirica.com

According to data from the Brazilian Institute of Geography and Statistics (IBGE, 2017), the total population of the municipalities under study is 164,572 people (Table 1), with Cravolândia having the smallest population, at 5,576 inhabitants, and Jaguaquara the largest, with 56,033 inhabitants.

Tabela 1. Número populacional dos municípios da área de estudo.

Municipalities	Population
Cravolândia	5.576
Itaquara	8.592
Jaguaquara	56.033
Jiquiriçá	15.106
Laje	24.306
Mutuípe	22.998
Santa Inês	11.161
Ubaíra	20.800
Total	**164.572**

Source: IBGE, 2017.

According to Santana and Julião (2021), the main economic activities of the municipalities under study are directly linked to livestock, agriculture, and ecological and rural tourism. Some of them are characterized by having waterfalls as their natural and cultural heritage, which stand out as the main tourist attraction in the entire Jiquiriçá Valley.

The Jiquiriçá River, which gives its name to the valley, is part of the Recôncavo Sul hydrographic basin and is located in the central-eastern region of the State of Bahia (Fernandes et al., 2010). The river flows through the cities and supports other activities, such as fishing. At the same time, it is also possible to observe the dumping of urban household waste directly into the river, with no evidence of any form of treatment, despite the fact that its water is also used for bathing purposes (Santana; Julião, 2021).

This study involved the analysis of reported cases of ascaridiasis, for which a proposal was submitted to the Municipal Health Departments (SMS) of Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra, through a document issued by the Director-General of Santa Inês IF Baiano Campus, at the request of those responsible for the study. Data on reported cases of ascaridiasis from 2010 to 2017 were requested.

An analysis was also conducted on the content related to ascaridiasis in textbooks used by the municipal public education network in the cities of Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra. The textbooks were obtained through the collaboration of students enrolled in the educational institutions, who lent the materials. After the analysis, the materials were returned to the students.

The records provided by the Ubaíra Health Department were tabulated, analyzed, and interpreted with the aim of comparing relevant data for the research, specifically the absolute number of *Ascaris lumbricoides* cases in the municipality. Additionally, the topic of ascaridiasis covered in the textbooks from the National Textbook Program (PNLD) for 7th-grade Science in elementary public schools and Biology for 2nd and 3rd grades of high school was evaluated and critiqued. This process was conducted through a methodological approach to the subject of ascaridiasis, involving an analysis of content selection as well as how the topics were presented in written form.

The entire study was conducted with the permission of the Municipal Health Departments (SMS) of the involved municipalities, through an official letter requesting authorization for the research and explaining its purpose, stating that all collected records would be used for educational research purposes, in compliance with ethical and moral standards. Additionally, authorization was requested for potential publications in scientific and educational outlets.

RESULTS

Initially, eight Municipal Health Departments in the Bahian municipalities of Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, Santa Inês, and Ubaíra, located in the Jiquiriçá Valley, were visited in 2017 to deliver the official letter issued by the Director-General of IF Baiano Campus Santa Inês to the health secretaries, requesting data on *Ascaris lumbricoides* cases from 2010 to 2017.

The data were requested for three consecutive weeks following the delivery of the letter. Of the eight municipalities, the Ubaíra Health Department was the only one that provided data for the research, after three follow-ups, covering the period from 2014 to 2017..

Of the seven municipalities that did not provide the data, the Santa Inês Health Department was the only one to report that the city did not have such data, justifying that they are not part of any existing program in the area. According to the information, when *Ascaris lumbricoides* eggs are found in analyses, the result is given directly to the patient but not recorded. The other municipalities, Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, and Mutuípe, responded that they could not provide the

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results showing the number of patients with *Ascaris lumbricoides* because there were no records in the health departments. Based on the responses obtained, it was observed that these municipalities do not have any program to meet the demand for these cases.

The only results presented in this study are from the municipality of Ubaíra, which provided access to the data in a handwritten notebook containing information on the samples analyzed between January 2014 and July 2017. In comparison with the absolute number of cases recorded by the Health Department, 2014 was the year with the highest number of positive samples for *Ascaris lumbricoides*, totaling 459 cases. In contrast, 2017 had the lowest number, with only 59 cases, still in the process of being counted.

The year 2017 had the fewest samples analyzed, with only 281 samples collected in the months of March, June, and July, whereas 2014 had the highest number, with 4,443 samples analyzed throughout the year. In this comparison, it was possible to observe that the greater the number of analyses, the higher the chances of finding positive samples for *Ascaris lumbricoides*, as shown in Table 2.

Table 2. Number of ascaridiasis cases in the municipality of Ubaíra - Jiquiriçá Valley: Municipal Health Department for the period 2014 to 2017.

MONTHS	PERÍODOS							
	2014		2015		2016		2017	
	Analyzed samples	Positive for A. lumbricoides	Analyzed samples	Positive for A. lumbricoides	Analyzed samples	Positive for A. lumbricoides	Analyzed samples	Positive for A. lumbricoides
January	193	43	6	0	---	---	---	---
February	471	42	---	---	---	---	---	---
March	413	39	---	---	---	---	3	3
April	358	40	258	29	---	---	---	---
May	425	48	403	65	63	11	---	---
June	204	21	303	19	515	61	96	20
July	334	41	453	45	388	81	182	36
August	360	30	392	37	471	127	---	---
September	436	44	---	---	494	114	---	---
October	344	50	112	9	180	44	---	---
November	296	34	678	89	14	4	---	---
December	209	27	---	---	18	6	---	---
Total	**4043**	**459**	**2605**	**293**	**2143**	**448**	**281**	**59**

Source: Secretaria Municipal de Saúde de Ubaíra.

When comparing the years 2015 and 2016, both had eight months of analysis recorded. However, 2015, which had a total of 2,605 samples analyzed, resulted in a lower number of positive samples, with a total of 293 cases of *Ascaris lumbricoides*. In contrast, 2016, with a total of 2,143 samples analyzed, resulted in 448 positive samples. It was noticeable that 2014 had the highest incidence of cases, followed by 2015, 2016, and 2017, showing a decrease in numbers from one year to the next.

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Seven textbooks from the National Textbook Program (PNLD) for elementary and high school were analyzed, consisting of three 7th-grade Science books, two 2nd grade (high school) Biology books, and two 3rd grade (high school) Biology books (Table 1), with the aim of evaluating how the topic of ascaridiasis is addressed in these educational materials. The textbooks are used by eight public schools in the municipalities of Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra, located in the Jiquiriçá Valley, Bahia.

Frame 1. Science and Biology textbooks used by public elementary and high schools in the municipalities under study: Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra.

School Grades		Collection	Authors/ Year	Publisher	Year Of Use
Elementary textbooks	**7th grade**	Learning with everyday life.	Canto, 2015.	Moderna	2017, 2018, and 2019
		Investigate and discover.	Lopes, 2015.	Saraiva	2017, 2018, and 2019
		Apoema Project.	Pereira; Santana; Waldheim, 2013.	Editora do Brasil	2017, 2018, and 2019
High school textbooks	**2nd grade**	Connections with Biology.	Bröckelmann, 2013.	Moderna	2015, 2016, and 2017
		Be the protagonist	Osorio, 2013.	Edições SM	2015, 2016, and 2017
	3rd grade	BIO	Lopes e Rosso, 2013.	Saraiva	2015, 2016, and 2017
		The diversity of living beings	Amabis and Martho, 2013	Moderna	2015, 2016, and 2017

The textbooks analyzed in this study were produced by four different publishers: Edições SM, Editora do Brasil, Moderna, and Saraiva. Editora Moderna stands out, representing three of the seven textbooks analyzed, with one for elementary school and two for high school. Saraiva appears as the publisher of two books, one for elementary school and one for high school. Edições SM and Editora do Brasil each provide only one textbook, one for elementary school and the other for high school, respectively.

All publishers provide reusable copies, with a PNLD seal on the covers indicating the prohibition of selling the educational material and its usage period, which is three consecutive years after being reviewed. The three elementary school textbooks are in their first year of use, as their covers show the years 2017, 2018, and 2019 for usage. The four high school textbooks are in their third and final year of use, as their covers indicate the years 2015, 2016, and 2017 for usage (Table 1).

A similarity can be observed in the choice of the 7th-grade Science textbook, from the "Aprendendo com o Cotidiano" collection, by two elementary schools, one from the municipality of Jiquiriçá and the other from Ubaíra, as shown in Table 2. This textbook does not cover the topic of ascaridiasis and provides very limited information, using only half a page to supposedly address the subject. In a brief summary, it generalizes all nematodes. The parasite is mentioned only as one of the examples and is referred to as "lombriga," its common name, without mentioning its scientific name. It is clear that the author limits the discussion of the disease ascaridiasis caused by *Ascaris lumbricoides* in this short paragraph. The text also does not describe the parasite's characteristics, the harm it can cause to health, or the prevention methods. Below the summary, there is an image of the parasite, identified as female, which includes only its size information.

Frame 2. List of 7th-grade textbooks used in elementary schools in the municipalities under study.

BIBLIOGRAPHY			JIQUIRIÇÁ	MUTUÍPE	SANTA INÊS	UBAÍRA
Elementary textbooks	**7th grade**	Canto, 2015: Aprendendo com o cotidiano.	X			X
		Lopes, 2015: Investigar e conhecer.			X	
		Pereira; Santana; Waldheim, 2013: Projeto Apoema.		X		

High school textbooks	**2nd grade**	Bröckelmann, 2013: Conexões com a Biologia.		X		
		Osorio, 2013: Ser protagonista.				X
	3rd grade	Lopes e Rosso, 2013: BIO			X	
		Amabis e Martho, 2013: Biologia em contexto.	X			

The 7th-grade textbook from the "Projeto Apoema" collection, used by an elementary school in the municipality of Mutuípe, presents the topic of ascaridiasis in a concise and didactic manner, starting with an introduction to nematodes in general, in which *Ascaris lumbricoides* is used as an example. The scientific and common names of the parasite are mentioned, as well as the corresponding disease, ascaridiasis, how it develops, and the prevention methods to combat it. The textbook also includes representative images illustrating the parasite's life cycle and body structure.

The 7th-grade textbook from the "Investigar e Conhecer" collection, used by an elementary school in the municipality of Santa Inês, presents the topic of ascaridiasis in a brief summary, where the author mentions the main characteristics of *Ascaris lumbricoides* and the parasite's life cycle in the human body. The textbook includes an image of the parasite with a caption that provides both its common and scientific names, as well as the approximate size of females and males. There is also a brief summary describing the characteristics of the parasite, the harm it can cause to health, and preventive measures (such as basic sanitation).

The high school 2nd grade textbook from the "Conexões com a Biologia" collection, used by a high school in the municipality of Mutuípe, presents the topic of ascaridiasis in a very concise manner. It begins with a text covering characteristics shared by all nematodes, followed by charts displaying their models. The book provides basic information on the subject; however, the author includes a notable feature, which is the direct approach to the disease ascaridiasis, exemplifying *Ascaris lumbricoides*, infection mechanisms, the parasite's life cycle, symptoms caused by the disease, and prevention methods.

The high school 2nd grade textbook from the "Ser Protagonista" collection, used by a high school in the municipality of Ubaíra, addresses the topic of ascaridiasis but omits many details. It contains a brief paragraph that introduces the subject, initially discussing nematodes in general, but in a superficial manner. The author simplifies the explanation of the parasite *Ascaris lumbricoides* and continues by mentioning the risks and the infection. However, the disease ascaridiasis is not mentioned in any paragraph.

The high school 3rd grade textbook from the "A Biologia em Contexto" collection, used by a high school in the municipality of Jiquiriçá, begins with the topic of nematodes, providing a more detailed explanation. It directly addresses the parasite *Ascaris lumbricoides* but does not mention the disease ascaridiasis.

The high school 3rd grade textbook from the "BIO" collection, used by a high school in the municipality of Santa Inês, presents the topic related to ascaridiasis, discussing nematodes in general, followed by the example of the parasite *Ascaris lumbricoides*. The disease ascaridiasis, caused by this parasite, is mentioned; however, there is no in-depth discussion of its causes and prevention methods.

Among the three 7th-grade Science textbooks used by elementary school students, two discuss *Ascaris lumbricoides*, mentioning the disease caused by the parasite, infection mechanisms, and prevention methods. These are from the "Investigar e Conhecer" and "Projeto Apoema" collections. The textbook from the "Aprendendo com o Cotidiano" collection, used in two elementary schools in the municipalities under study, Jiquiriçá and Ubaíra, was the only one evaluated that does not mention the scientific name of the parasite *Ascaris lumbricoides*.

All four 2nd- and 3rd- grade Biology textbooks used by high school students discuss *Ascaris lumbricoides*; however, only one mentions the disease ascaridiasis, infection mehcanisms, and prevention methods. This is the textbook from the "Conexões com a Biologia" collection.

From this analysis, it is evident that the 7th-grade Science

textbooks in elementary school provide a more detailed approach to the topic of ascaridiasis. In contrast, the subject is not as thoroughly addressed in the 2nd- and 3rd-grades high school textbooks, as shown in Table 3.

Frame 3. General comparisons of textbooks used by public elementary and high schools in the municipalities of Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra.

Authors/Collection			Amount of content in the book	Presentation	Cientific name	Images/ figures
Elementary textbook	7th grade	Canto, 2015: Aprendendo com o cotidiano.	½ page	Presents the topic in a summarized form	Does not present	Presents(incorrect caption)
		Lopes, 2015: Investigar e conhecer.	½ page	Presents the topic	Presents	Presents
		Pereira; Santana; Waldheim, 2013: Projeto Apoema.	½ page	Presents the topic in a summarized and didactic form	Presents	Presents
High School textbook	2nd grade	Bröckelmann, 2013: Conexões com a Biologia.	½ page	Presents the topic in a summarized form	Presents	Presents
		Osorio, 2013: Ser protagonista.	1 and ½ page	Presents the topic with limited information	Presents	Does not present
	3rd grade	Lopes e Rosso, 2013: BIO.	1 and ½ page	Presents the topic, generalizing all nematodes	Presents	Does not present
		Amabis e Martho, 2013: A Biologia em contexto.	½ page	Presents the topic	Presents	Does not present

DISCUSSION

The Municipal Health Departments of the Bahian municipalities of Cravolândia, Itaquara, Jaguaquara, Jiquiriçá, Laje, Mutuípe, and Santa Inês did not provide any numerical data to be presented in this study, as all representatives stated that the municipality in question did not have any program to meet the demand for these cases. In research conducted by Santana and Julião (2021) in these same municipalities, it was revealed that the lack of maintenance of work tools is also one of the factors that hinders the provision of data.

Although the Ubaíra Health Department provided the data for this study, it is important to highlight that it does not have a specific program aimed at recording the reported cases of *A. lumbricoides*, and the entire procedure for counting the data is done manually. This highlights the need for the implementation of a notification program for cases of ascaridiasis in these municipalities, as all of them are located in an area considered endemic.

Globally, ascaridiasis is characterized as the most common intestinal parasitic disease affecting humans (Bethony et al., 2006); however, it is not included in the list of notifiable diseases in any ordinance of the Brazilian Ministry of Health. This may be one of the reasons why the municipalities under study do not have a specific monitoring and control program for it.

Considering the data for analysis provided by the Ubaíra Health Department, it is evident that there is significant variation between the years 2014, 2015, 2016, and 2017. It is noticeable that 2017 had the least analyses and positive samples for the parasite *A. lumbricoides*, which causes the disease. This number is likely directly related to the awareness campaigns organized by the municipality's Health Department during that year. Ascaridiasis is a silent disease that poses many risks to people's quality of life and deserves greater attention, as it is associated with over 60,000 deaths per year worldwide (WHO, 2002)..

The supply of potable water, sanitary sewage, and waste collection are some of the services that directly improve and influence the quality of life of communities. According to IBGE data (2017), only 35.5% of households in the municipality of Ubaíra have an adequate sewage system. The waste collected by the company responsible for basic sanitation in the city is dumped directly into the Jiquiriçá River, while the municipality's population pays an 80% fee on their water bill for sewage treatment. It is still possible to observe, not only in Ubaíra but also in the cities of Cravolândia, Jiquiriçá, Jaguaquara, Itaquara, Laje, Mutuípe, and Santa Inês, households discharging sewage directly into the river (Santana; Julião 2021).

It is noticeable that the Jiquiriçá River, which flows through all the municipalities under study, is contaminated and in a state of decline. This is an aggravating factor that increases the number of cases in an endemic area. Thus, recognizing the infection mechanisms of the disease is crucial for preventive measures to be taken. However, knowledge about the prevalence of intestinal helminths is scarce or even nonexistent in certain regions of Brazil (Carvalho, 2002). This can be observed in the use of the river water for various activities, ranging from fishing to water sports, in the municipalities under study.

It is of great importance the development of basic preventive measures (Neves, 1998), especially educational programs aimed at improving basic sanitation conditions to reduce the rates of *A. lumbricoides* infection (Lincoln; Freire, 2000).

According to Souza and Lopez (2002), actions involving health education are indispensable in the school environment, as this is the most conducive setting for promoting educational measures that generate knowledge and improve people's quality of life. When these aspects are worked on together to achieve a common goal, benefits are generated for everyone (Rocha, 2008).

The textbook, a material frequently used by teachers and students, plays a very important role in the promotion of knowledge, and through it, many educational actions to combat ascaridiasis can be triggered, as it provides the scientific and theoretical foundation to its disseminators. However, careful attention must be paid to the selection of this educational material. In this study, it was observed that not all books meet the demands required by the PNLD. Over the years, the PNLD has made significant progress in better distributing textbooks to public school students, such as restructuring and modernizing content, halting the sale of unapproved titles, and even launching appropriate titles that meet the indicated criteria (Vasconcelos; Solto, 2003).

Despite the advances in the PNLD, the lack of organization in some school units regarding the distribution of textbooks to students was evident. During this research, in which the topic of ascaridiasis was analyzed in seven Science textbooks for the 7th grade and Biology textbooks for the 2nd and 3rd grades, used by the public elementary and high school networks in the municipalities of Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra, there was significant difficulty, particularly in obtaining the materials for analysis. All the books were borrowed from students in the school networks. After the analyses, the materials were returned, as it became clear that there is a shortage of books in the schools. According to Coelho (2014), to avoid a shortage of textbooks in school networks, it is essential to have a system for tracking the distribution and return of the copies by students..

The Law of Guidelines and Bases (LDB) No. 9394/96, in its article 4, item VII, refers to programs supporting educational materials: "The State's duty with public school education will be fulfilled by ensuring the provision of educational services in elementary school through supplementary programs for educational materials [...]" (Brazil, 1996). According to Resolution No. 42 of 08/28/2012 of the Ministry of Education (MEC), since the school is the recipient of the textbook, it is required to maintain and preserve the material in good condition under its care until the end of the respective three-year cycle of use. Furthermore, according to the PNLD (2016), it is the responsibility of the educator to instruct their students on the conservation, handling, and return of the books at the end of each school year.

It is evident that the textbook is a crucial material in the teaching and learning process. Thus, when evaluating the content in the 7th-grade Science textbook from the “Aprendendo com o Cotidiano” collection, a similarity in its selection by two elementary schools from different municipalities, Jiquiriçá and Ubaíra, can be observed. Of the three elementary school textbooks analyzed, this was the only one that did not reference the disease ascaridiasis. The brief coverage, spread over half a page, does not seem to be a quality material for students to use without teacher explanation, as it not only lacks elements to help them identify the infection methods and prevention of the disease but also presents the limited content in a very confusing manner.

Upon evaluation, it can be observed that the choice of educational material is crucial in the teaching and learning process. It must correspond not only to the school's political-pedagogical project but also to the needs of both students and teachers, who should be involved in the selection of the textbook that will guide their lessons. Vasconcelos and Solto

(2003) emphasize that teachers are not always given the opportunity to analyze the content and select the material that will shape their classes. It is evident, therefore, that this is a factor that directly influences student learning, as instead of merely being a support tool, the textbook often becomes the main working guide, the basic directive for the educator in the classroom (Soares, 2002).

However, educational actions to combat ascaridiasis should not be developed solely in the classroom, based on textbooks. It is important for administrators to seek partnerships with the Municipal Health Department (SMS) to bring in community health workers to give presentations in schools, explaining the risks of the parasitic disease ascaridiasis, infection methods, and prevention against the parasite *A. lumbricoides*. Notably, the School Health Program (PSE), established in 2007, is based on the coordination between schools and the primary healthcare network and is a strategy for integrating health and education to promote citizenship and enhance Brazilian public policies.

According to Article 4 of the Law of Guidelines and Bases (LDB) No. 9394/96, textbooks play a crucial and necessary role in the teaching-learning process; however, they should not be used as the only learning resource available to students. According to Rojo (2013), these printed materials remain tied to a supposed tradition in their approach to teaching.

Most of the students attending schools in the municipalities of Jiquiriçá, Mutuípe, Santa Inês, and Ubaíra in the morning period are residents of rural areas, and for many of them, the textbook becomes their only source of information and research. According to Fonseca and Prado Filho (2010), ascaridiasis occurs in various areas, but primarily among residents of rural communities. Therefore, it is crucial that this topic be introduced in textbooks in a more comprehensive manner, so that in addition to learning how to recognize the infection mechanisms and prevention against the parasite *A. lumbricoides,* students can also become disseminators of information in their communities.

All seven textbooks under evaluation cover the topic, but five use only half a page to explain the content. These are from the collections: "Aprendendo com o Cotidiano," "Investigar e Conhecer," "Projeto Apoema," "A Biologia em Contexto," and "Conexões com a Biologia." Of these, three are used in elementary school and two in high school. Only two of the authors use a page and a half for explanation: "Ser Protagonista" and "BIO," both used by elementary school students.

When observing the 7th-grade Science textbooks in elementary school, it is noted that the best content coverage is found in the "Investigar e Conhecer" and "Projeto Apoema" collections. In contrast, despite being used in two elementary schools in the municipalities under study, Jiquiriçá and Ubaíra, the "Aprendendo com o Cotidiano" collection presents the content with the least emphasis.

In comparison to the 2nd-year high school Biology textbooks, it is observed that the "Conexões com a Biologia" collection offers the best coverage of the content. Meanwhile, the "BIO" collection textbook presents the material with a significant reduction in information.
All the textbooks used in the public elementary and high school networks evaluated in this study discuss the topic related to ascaridiasis by generalizing all nematodes. However, there is a noticeable disparity in the approach, as only three of the seven books mention the disease: "Lopes, 2015: Investigar e Conhecer," from the elementary school network in Santa Inês; "Pereira; Santana; Waldheim, 2013: Projeto Apoema," and "Bröckelmann, 2013: Conexões com a Biologia," from the elementary and high school networks, respectively, in the city of Mutuípe. Therefore, the textbooks used by schools in the municipality of Mutuípe presented the content on ascaridiasis the best, making them the most appropriate for classroom use in comparison.

The four textbooks that do not mention the disease are distributed across five school networks: "Canto, 2015: Aprendendo com o Cotidiano," from the elementary school network in Jiquiriçá and Ubaíra; "Osorio, 2013: Ser Protagonista," from the high school network in Ubaíra; "Lopes and Rosso, 2013: BIO," from the high school network in Santa Inês; and "Amabis and Martho, 2013: Biologia em Contexto," from the high school network in Jiquiriçá. In general, the textbooks under evaluation do not provide research resources for students. Thus, teachers using these materials need to adopt other methodologies to teach the content related to the parasitic disease ascaridiasis.

Based on this study, it can be concluded that there is a significant lack of coverage of the topic of ascaridiasis in the textbooks used by public school students in the municipalities of Jiquiriçá, Santa Inês, and Ubaíra, all considered endemic areas. It is suggested, therefore, that these materials undergo a new evaluation, aiming for the content on ascaridiasis to be covered in a less superficial manner, through the presentation of illustrative images of the parasite *A. lumbricoides*, highlighting its characteristics and the most relevant factors, such as infection mechanisms, prevention methods, with a focus on hygiene habits and basic sanitation.

In addition, it is crucial that partnerships be established between the educational network administrators and the Municipal Health Departments to develop educational actions against parasitic diseases, with a particular focus on ascaridiasis. Considering that seven of the eight municipalities did not provide data for the study due to the lack of programs aimed at combating *A. lumbricoides*, it is suggested that a program be implemented to support parasitological analyses, with the goal of identifying and treating patients who test positive for the parasite. Furthermore, training healthcare professionals to provide the necessary information to the population is essential, guiding them on basic preventive care and establishing integrated health teams for disease control.

In addition, it is recommended that educational actions be promoted by the Municipal Health Departments (SMS) through workshops, health fairs with the distribution of informational pamphlets, and lectures by community health workers, in order to raise awareness about the infection mechanisms and prevention of ascaridiasis through basic hygiene care. Furthermore, it is important that the professionals responsible for performing basic sanitation work in the municipalities also participate in these actions, as this will highlight the harmful effects of improper sewage disposal into the Jiquiriçá River, not only for the ecosystem as a whole but especially for humans.

CONCLUSION

Although it is not on the list of notifiable diseases according to the Ministry of Health, ascaridiasis is the most widespread parasitic disease in the world, primarily affecting low-income individuals. To mitigate this situation, preventive measures must be taken so that people can recognize the risks posed by the disease and, consequently, the means of prevention. In this context, the implementation of educational health activities is certainly the best way to raise awareness among the population, as these can take place in the school environment and be open to the entire community, aiming to disseminate information more widely about the need to follow hygiene measures.

Moreover, educational actions constitute valid means of knowledge, which need to be developed through partnerships between school administrators, municipal administrators, and the Municipal Health Departments. These actions, in addition to being implemented in the communities, need to be carried out periodically with the goal of ensuring that people have a good quality of life.

Additionally, it is important to conduct educational health activities targeting rural populations, as they are the most affected by this disease. Many reasons highlight this need, but the lack of basic sanitation is the primary one. Coupled with this factor, the lack of information contributes to the high rates and spread of the disease. Thus, health workers play a crucial role in assisting the population, and it is essential that they are not only directed to urban residences but also to rural areas, with the aim of guiding the population on how to prevent infection.
Therefore, through knowledge about the risks of ascariasis, it is possible for the population to become more aware, not only taking preventive measures but also regularly seeking parasitological testing to detect the infection.

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