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The relevance of health education in controlling and preventing *Ascaris lumbricoides* infection in children

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ABSTRACT
Ascariasis is an intestinal parasitic infection caused by Ascaris lumbricoides. Although it is found globally, this disease is more prevalent in developing countries, such as Brazil, due to the lack of infrastructure and basic sanitation. The deficiency in Public Health services in these regions favors the spread of the parasite, especially among the economically disadvantaged population living in precarious conditions, affecting mainly children. The objective of this study was to conduct a detailed review of the importance of health education in controlling and preventing ascariasis in childhood. Using an indirect approach, searches were carried out in various databases available on virtual platforms. The results pointed to insufficient knowledge among the majority of the Brazilian population regarding the modes of transmission and prevention of this disease, contributing to high prevalence rates of this parasitic infection. Therefore, it is believed that the dissemination of more comprehensive knowledge and information about ascariasis is key to preventing this illness. Health education emerges as a crucial strategy to instruct the population, especially parents and caregivers, on hygiene practices and preventive measures. Investing in educational programs targeted at vulnerable communities can play a fundamental role in reducing the spread of the parasite and promoting healthy habits, resulting in a significant impact on the prevention and control of ascariasis, especially among children.

Keywords: Parasitic Load, Ascariasis, Health education, Primary Prevention.

1 INTRODUCTION

Enteroparasitosis refers to infections caused by parasites, which fall into two categories: helminths or protozoa. This condition represents the most common ailment globally, affecting individuals in all stages of life, especially children during their school years, potentially impacting their physical and mental development. Its occurrence is widespread worldwide, identified not only in

Brazil but also in other developing nations, exhibiting a variety of manifestations depending on levels of basic sanitation, socioeconomic status, education levels, age groups, hygiene practices, as well as the specific climatic and environmental patterns of each geographic area[3].

The most prevalent infectious ailments are associated with enteroparasitic infections, affecting approximately 3.5 billion people worldwide. In Brazil, millions of inhabitants suffer from some form of parasitic infestation. Among these parasites, ascaridiasis stands out, a widely predominant helminthic infestation globally, caused by the nematode *Ascaris lumbricoides*, commonly known as roundworm. This condition causes the ailment called ascaridiasis or ascariasis, presenting symptoms such as nausea, vomiting, and a clinical picture that can worsen, resulting in malnutrition due to fluid loss caused by diarrhea, anemia, intestinal obstruction, and difficulties in nutrient absorption[6].

As of January 2022, the World Health Organization (WHO) estimated that over 1 billion people globally were susceptible to infection by this agent, revealing a significant global public health challenge. Another contributing factor to the increasing incidence of these parasitic infections is the negative impact resulting from the migration from rural to urban areas, a consequence of uncontrolled city growth. This phenomenon is exacerbated by environmental pollution that facilitates the spread of these diseases. Transmission occurs through contaminated water, soil, and food, finding favorable conditions to spread in areas lacking infrastructure and basic sanitation services, significantly affecting the populations in these regions, especially children. They are more susceptible to infection when playing in contaminated areas, leading to potentially having hands with parasite eggs directly in their mouths or handling toys and objects that may later come into contact with the mucous membranes of other children[5, 6].

Therefore, the spread of these parasites is more prevalent in environments such as daycares and educational institutions. The purpose of this article was to conduct a literature review on the relevance of health education in addressing *Ascaris lumbricoides* in Brazilian children. Additionally, it aimed to understand and explain the life cycle of this parasite, as well as its methods of transmission, to identify and comprehend the most effective strategies for preventing this infection[4]. The objective of this study was to conduct a detailed review of the importance of health education in controlling and preventing ascariasis in childhood.

2 MATERIALS AND METHODS

The methodology employed in this study is qualitative and descriptive, centered on a bibliographic search. It was conducted through consulting online databases such as Google Scholar, Scientific Electronic Library Online (SciELO), CAPES Portal, PubMed, and by reviewing books available at the University of Gurupi, Paraíso do Tocantins campus library. The search terms used

were: "parasitoses in children," "health education in Brazil," "childhood enteroparasitosis," and "ascariasis."

3 THEORETICAL FRAMEWORK

Education is a comprehensive learning process that empowers individuals holistically, enabling the development of their intellectual, physical, and moral faculties. Within this context, health education, also known as education for health, constitutes a process that provides essential information for preserving or improving health status, aiming to promote it. It is a vital element in health protection and recovery programs, intending to empower individuals in various contexts, allowing them to make informed decisions to achieve a more favorable personal, family, and collective health status [1].

When educational practices are adequately employed, they empower individuals to acquire knowledge for the prevention of parasitic infections, achieving established goals, and emphasizing the importance of educational guidance to raise awareness among the population. Thus, the citizen becomes a promoter of health, as their daily actions contribute to improving family well-being. It is valid to assert that many countries still maintain cultural and social aspects entrenched in the population regarding hygiene habits, which require changes [2].

4 CHILDHOOD PARASITISM

The contact between children carrying parasites and those more susceptible, whether in a domestic or school environment, along with their frequent practices involving soil manipulation and the habit of putting dirty hands in their mouths, are factors that increase the likelihood of infection in the age range of 1 to 12 years [7]. While adults generally do not show symptoms of certain parasitic diseases, possibly due to changes in hygiene habits or immunity developed during childhood, children remain highly susceptible to intestinal parasitic infections as they can come into contact with these pathogens from the first months of life. Due to the lack of established hygiene routines, children continue to be the most affected group, significantly increasing the risk of infections. According to the authors, daycare centers represent favorable environments for the spread of parasitic diseases due to the intense interaction among children and often the poor hygiene conditions, frequently resulting from inadequate staff training [10].

5 BASIC SANITATION AND INFRASTRUCTURE

The absence of basic sanitation services and infrastructure contributes to the spread of parasitic diseases. Therefore, poor living conditions, lack of knowledge among the population regarding the transmission and control of these infections, the importance of personal hygiene principles, and adequate food preparation practices are contributing factors to the increased occurrence of intestinal

infections caused by parasites. The presence of *Ascaris lumbricoides*, one of the main intestinal worms affecting human health, is deeply associated with socioeconomic factors such as poverty, lack of education, and deficiencies in basic sanitation [9]. This interrelation reveals a complex reality that impacts the health of millions of people worldwide, particularly in regions where these conditions are interconnected. Poverty is a determining factor in the spread of *Ascaris lumbricoides* infections. Economically disadvantaged communities often face poor housing conditions, lack of access to clean water, and adequate sanitation. The absence of basic sanitation infrastructure, such as water and sewage treatment systems, significantly increases the risk of contamination by these parasites. Contaminated water and lack of hygiene facilitate the transmission of these infections, especially among children[8].

Furthermore, lack of education plays a crucial role in the spread of ascariasis. The scarcity of knowledge about proper hygiene practices, the mode of transmission of these parasitic diseases, and the importance of preventive measures contribute to high infection rates. In areas with low levels of education, individuals may not be aware of behaviors and habits that reduce the risk of *Ascaris lumbricoides* infection, resulting in increased vulnerability to the disease. An integrated approach to combat *Ascaris lumbricoides* contamination should address these interconnected aspects. Investments in health education programs, promotion of proper hygiene, and improvement in sanitation are essential to reduce the prevalence of these infections[14]. It is imperative that steps be taken to ensure equitable access to clean water, basic sanitation, and health education for socioeconomically vulnerable communities, as this is the only way to effectively address the challenge of ascariasis and other parasitic diseases that significantly impact the quality of life of the most disadvantaged populations. As observed in Table 01.

Table 01 - Saneamento Brazil Panel

Saneamento Brazil Panel					
Year	Block	Indicator	Value	Unit	Fonte
2021	Sanitation operations	Population without access to water	33.211.937	people	SNIS
2021	Sanitation operations	Proportion of the population without access to water	15,8%	% of the population	SNIS
2021	Sanitation operations	Population without sewage collection	92.871.315	people	SNIS
2021	Sanitation operations	Proportion of the population without sewage collection	44,2%	% of the population	SNIS
2021	Sanitation operations	Index of treated sewage referred to consumed water	51,2%	%	SNIS
2021	Sanitation operations	Untreated sewage	5.221.572,64	mil m³	SNIS
2021	Sanitation operations	Distribution losses	40,3%	%	SNIS
2021	Health	Total hospitalizations due to waterborne diseases	128.912	Number of hospitalizations	DATASUS
2021	Health	Incidence of total hospitalizations due to waterborne diseases	6,04	Hospitalizations per 10 thousand inhabitants	DATASUS
2021	Health	Total hospitalizations - 0 to 4 years old	45.359	Number of hospitalizations	DATASUS
2021	Health	Deaths due to waterborne diseases	1.493	Number of deaths	DATASUS
2021	Health	Expenses on hospitalizations due to waterborne diseases	54.791.900,15	R$	DATASUS
2021	Education	Education level of individuals with sanitation	9,18	Years of formal education	IBGE
2021	Education	Education level of individuals without sanitation	5,31	Years of formal education	IBGE
2021	Education	School delay among youth with sanitation	1,53	Years of educational delay	IBGE
2021	Education	School delay among youth without sanitation	2,35	Years of educational delay	IBGE
2021	Education	Average score on ENEM (Brazilian National High School Exam) - with bathroom	535,69	Points	INEP
2021	Education	Average score on ENEM - without bathroom	468,31	Points	INEP

Source: Brazil Sanitation Panel - www.painelsaneamento.org.br

The absence of basic sanitation is intrinsically related to the increased incidence of parasitic infections. In regions or communities where there is inadequate access to water treatment systems, proper waste disposal, and sanitary facilities, the spread of intestinal parasites such as *Ascaris lumbricoides* becomes more prevalent[11]. The lack of sanitation directly contributes to environmental contamination with pathogenic agents, turning water, soil, and food into potential sources of parasitic infection. In environments lacking sanitation, individuals, especially children, are more susceptible to coming into contact with these parasites, resulting in a continuous cycle of infection and spread of these diseases. Therefore, the lack of adequate sanitary conditions plays a significant role in the rise of parasitic infections, negatively impacting the health and well-being of communities[10].

6 ASCARIASIS

Ascariasis is a pathological condition caused by worms from the Ascarididae family, with the causative agent being *Ascaris lumbricoides*, a type of light-colored nematode commonly known as roundworm. These parasites are frequently mentioned due to their global distribution, found throughout the world and more prevalent in regions with warm climates and deficient basic sanitation infrastructure. Although they can affect individuals of any age, they are more common in children between the ages of 2 and 10 [12].

An individual infected by the worm daily excretes thousands of parasite eggs through feces. In areas lacking proper basic sanitation systems, these feces contaminate soil and water. This process facilitates the transmission of *Ascaris lumbricoides*: a healthy person can inadvertently be

contaminated by ingesting these eggs present in the environment. Usually, children contract the infection through direct contact with the soil while playing, while adults tend to become infected by ingesting contaminated water or food. The eggs of these worms are highly resistant, remaining viable for several years when they find suitable conditions of humidity and temperature in the environment [15].

Filtering water, cooking food, and properly sanitizing raw fruits and vegetables are sufficient measures to eliminate the eggs and prevent the contamination of new individuals. Previous infection by A. lumbricoides does not provide immunity, and it is possible for the same person to develop the parasitosis several times throughout life. In ascariasis, the infestation is considered of low intensity when the number of parasites ranges from three to four worms, usually without symptoms. Adult worms can cause espoliative, toxic, or mechanical effects in medium intensity infestations, which have between 30 to 40 worms, or in massive infestations, with a quantity equal to or greater than 100 worms 1.

In these infections, the absorption of certain essential nutrients such as proteins, vitamins, lipids, and carbohydrates is frequent. In Loeffler's syndrome, a more severe lung condition, there is edema in the lung alveoli, along with a tissue infiltrate rich in eosinophils, triggering allergic manifestations and a clinical-radiological picture similar to pneumonia. One of the most prevalent complications is intestinal obstruction due to the parasites' coiling in the intestinal lumen [13].

7 FINAL CONSIDERATIONS

In light of the foregoing, it becomes crucial to emphasize the importance of sanitation practices to educate the population, especially children, who are more susceptible to infections due to their increased vulnerability. They often have direct or indirect contact with places or objects that may be contaminated and often lack adequate instruction regarding basic hygiene principles. Therefore, the implementation of sanitary education in the population's daily life becomes essential, as it is the main strategy to combat this parasite. Transmission mainly occurs through contact with contaminated soil, water, and food, hence investing in sanitary education is a crucial way to enhance and preserve individuals' health, effectively promoting it.

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