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Evaluation of the importance of basic sanitation in the prevention of parasitosis in public schools: A brief bibliographic review

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ABSTRACT
Basic sanitation corresponds to the control of physical agents in which they can exert harmful effects on human health. Intestinal parasitism is one of the most relevant public health problems in the country, affecting mainly school-age children, due to the precariousness of compliance with basic sanitation and water quality laws. The objective of this study was to evaluate the importance of basic sanitation in the prevention of parasitic diseases, as well as to investigate the presence of parasitic diseases in public school students. The methodology adopted was a descriptive qualitative literature review, using the descriptors Basic Sanitation, Health Promotion, Children, Parasitosis in Children and Right to Health. The following electronic databases were used: Google Scholar, Scientific Electronic Library Online (SciELO), Legislation Portal, Instituto Trata Brasil Portal and the Human Parasitology Book available in the virtual library of the São Francisco de Barreiras University Center UNIFASB/UNINASSAU. As an inclusion criterion, we used articles that addressed the incidence of parasitosis in relation to basic sanitation that were in Portuguese or English, published between 2009 and 2020. And as exclusion criteria, articles in languages other than English or Portuguese, articles that have been published prior to 2009, articles that were not in accordance with the proposed theme and are not available for free. Obtaining results in which it was found to be predominant in children aged 0 to 15 years, enrolled in schools and daycare centers. The most common protozoa Giardia, Entamoeba coli and Endolimax nana were found, while the most common helminths were Ascaris lumbricoides, Trichuris trichiura and Strongyloides stercoralis. Most parasitic infections are acquired by the fecal-oral route, through contamination of water and food, and children are vulnerable to contamination. This review pointed out that efforts to control child parasitism are still insufficient, requiring better actions and strategies to strengthen the inspection of health surveillance in homes.

Keywords: Water Quality, Parasitic Infections, Children, Public Health.

1 INTRODUCTION

Brazil has Law No. 11,445, of January 5, 2007, which designates national guidelines for basic sanitation and for the federal sanitation policy. However, according to the World Health Organization

(WHO), there are more than 3.5 billion citizens in the world contaminated with some kind of intestinal parasite. In addition, it states that infectious and parasitic diseases continue to stand out among the main causes of mortality, causing approximately 2 to 3 million deaths per year 1,2.

Basic sanitation is defined as a set of actions that aims to maintain the quality of the environment, to promote health, prevent possible diseases and raise the quality of life of citizens. So it's intimately intertwined with the conditions population health, through the preservation of the environment and educational measures, implementing lectures for children and their guardians with the support of public agencies 3, 4. By law, basic sanitation is considered a public service and has four main activities: (a) drinking water supply; (b) sanitation; (c) urban cleaning and solid waste management; and (d) urban stormwater drainage and management. However, even though it is a citizen's right, the reality is still far from what the law provides for a large part of the population. Many live without access to safe drinking water and final disposal of solid waste, leading to diseases, mainly from parasitosis 5, 6.

One of the main routes that enable the transmission of parasitic diseases is water and is directly related to places with poor basic sanitation and inadequate water treatment. Brazil establishes Ordinance 2,914, of December 12, 2011, which provides for the procedures for the control and surveillance of the quality of water for human consumption and its potability standard.

Intestinal parasitism is one of the most relevant public health problems, especially due to its correlation with the degree of malnutrition of populations, resulting in a deficit in the physical, psychosomatic and social development of students and the population. In the country, the main affected groups are school-age children, due to their precarious living conditions, lack of personal hygiene habits, contact with possible infected places such as soil, water and sand, and immature immune systems 7.

Preschool children, who supposedly do not yet have the hygienic habits necessary to prevent diseases, and their immune system is not fully effective for the elimination of parasites, stand out in transmission, and are great disseminators of eggs in the feces, due to the lack of basic sanitation 8,9.

Parasitosis causes worrisome sequelae with physical and mental damage to health and is related to difficulty in learning for children and adolescents, low performance in the work routine of adults and, as a result, an increase in costs with drugs for the treatment of parasitosis. Among the parasites commonly observed in school-age children are Giardia lamblia (giardiasis), Ascaris lumbricoides, Trichuris trichiura, Schistosoma mansoni, Ancylostoma duodenale, Entamoeba coli and Endolimax nana. 10.

The objective of this review was to evaluate the importance of basic sanitation in the prevention of parasitic diseases, as well as to observe the presence of parasitic diseases in public school students.

2 MATERIALS AND METHODS

This research is a descriptive qualitative bibliographic review, in which it provides a narrative concerned with the level of reality of the individuals, emphasis on situational details, which allows to characterize what is being studied.

The following electronic databases were used: Google Scholar, Scientific Electronic Library Online (SciELO), Legislation Portal, Instituto Trata Brasil Portal and the Human Parasitology Book available in the virtual library of the São Francisco de Barreiras University Center/UNINASSAU. For the research, the following descriptors were applied: Basic Sanitation, Health Promotion, Children, Parasitosis in Children and Right to Health. For the inclusion criteria, articles were used that addressed the theme incidence of parasitosis in relation to basic sanitation that were in the Portuguese or English language, published between the years 2009 and 2020. And as exclusion criteria, articles in languages other than English or Portuguese, articles that have been published prior to the year 2009, articles that were not in accordance with the proposed theme and are not available free of charge.

Several scientific publications were selected, addressing the theme analysis of the incidence of parasitosis in relation to basic sanitation, among the 17 selected articles and 2 ordinances to carry out this review, 2 addressed the theme of water quality, 6 on basic sanitation, 5 with emphasis on parasitosis and 6 describing the importance of health education.

3 RESULTS

The most prevalent protozoan addressed in the articles was Giardia, ranging from 2.7% to 61.1%, generating an average of 28.8% (Graph 1), presented in 14 of the 17 articles. While the most relevant helminth in the research was Ascaris lumbricoides, its prevalence ranged from 2.8% to 16.7%, generating an average of 9.10% (Graph 2), cited in 10 of the 17 articles. These data highlight the importance of basic sanitation, since giardiasis and ascariasis have their forms of transmission, respectively, through water and food contaminated with cysts and eggs containing the L3 larvae 13.

The studies highlighted the socioeconomic difficulties, which influence and limit parasitic prevention practices. The absence of toilets in homes, lack of water filters, absence of piped water at home, contaminated soils, and lack of access to health services and health education for the population, are important variables that corroborate the positive parasitological results in children's fecal samples 1.

The quality of water outside the potability standards is integrally interconnected with the lack of basic sanitation, where most of the articles studied report the prevalence of parasitosis in poor environments, where the population has little access to drinking water or even lack of water in the homes.

The literature review was initially based on 3874 references published in full in the Google Scholar, Scientific Electronic Library Online (SciELO) databases, of which 50 were selected by reading the titles, then the abstracts and finally, the complete reading of the articles, in which 17 met the predetermined inclusion criteria.

After analyzing the productions according to the theme, it was found that in the case of children, there was a predominance of children aged 0 to 15 years, duly enrolled in schools and daycare centers. Thus, representing the prevalence of intestinal parasitosis in school-age children, the following variables were selected: title, methodology, locality, age of the children, parasites found and year of publication, the results obtained are described in Chart 1.

Table 1. Prevalence of Intestinal Parasitosis in School-Age Children.

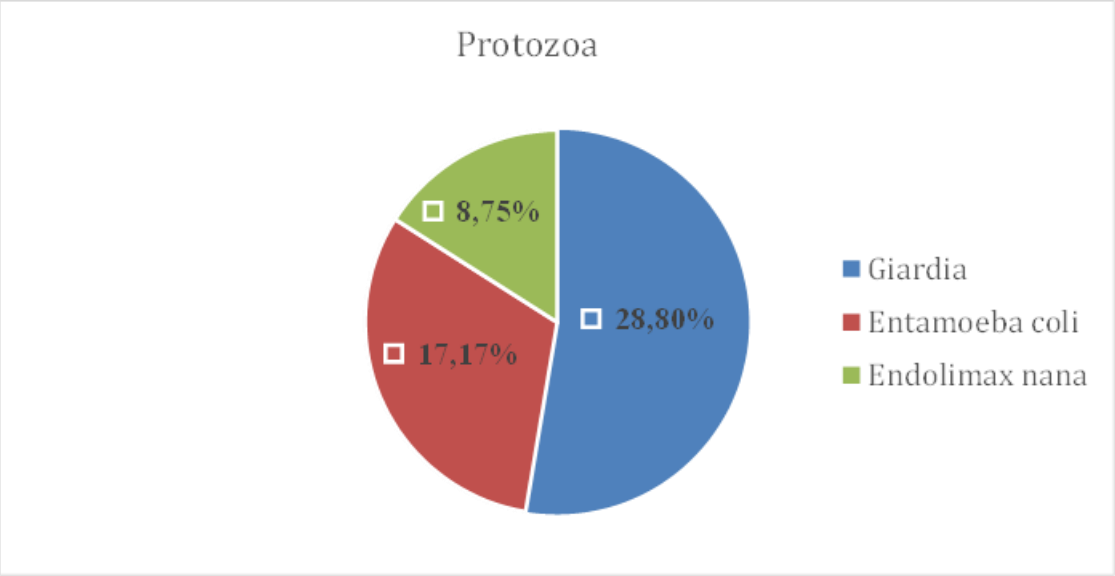
Title	Methodology	Locality	Age	Parasites	Year
HEALTH EDUCATION AS AN INSTRUMENT IN THE PREVENTION OF PARASITOSES1	This is a descriptive study of educational intervention, carried out in the neighborhood on the outskirts of the municipality of Crato - CE, in partnership with the Family Health (FH) strategy of the neighborhood. Seminar.	Municipality of Crato - CE	5 to 7 years	*Giárdia, Entamoeba histolitica, Entamoeba coli, Endomilax nana and Ascaris lumbricoides*	2009
IMPORTANCE THE STUDY		Children's Center Águas de District	0 to 5	*Giardia Lamblia*	
THE PREVALENCE OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	This is a qualitative and descriptive literature review.	Jurema Iretama- PR	Years	*Ascaris lumbricoides, Ancylostoma e Hymenolepis nana*	2010

IMPORTANCE OF STUDYING THE PREVALENCE OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	This is a qualitative and descriptive literature review.	Kindergartens and Schools of the Community of Guaratu in the municipality of Guarapuava-PR	0 to 15 Years	*Giardia intestinalis e Ascaris lumbricoides*	2010
IMPORTANCE OF STUDYING THE PREVALENCE OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	This is a qualitative and descriptive literature review.	Timbaúva Municipal School of the Municipality of Porto Alegre – RS	6 to 14 months Years	*Trichuris trichiura, Ascaris lumbricoides , Entamoeba coli, Giardia lamblia, Strongyloides stercoralis, Hymenolepis nana and Enterobius vermicularis*	2010
IMPORTANCE OF STUDYING THE PREVALENCE OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	This is a qualitative and descriptive literature review.	Crèche of the public network of the Municipality of Guarapuava-PR	4 to 6 years	*Ascaris lumbricoides, Entamoeba coli and Giardia lamblia*	2010
IMPORTANCE OF THE STUDY OF PREVALÊNCI	Review study	Settlement affiliated to the Movement of Landless	5 to 14 months Years	*Giardia lamblia*	
THAT OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	bibliographic, qualitative and descriptive.	municipality of Campo Florido, Minas Gerais			2010

IMPORTANCE OF STUDYING THE PREVALENCE OF INTESTINAL PARASITES IN CHILDREN OF ESCOLAR10 AGE	This is a qualitative and descriptive literature review.	Institutions of Mirassol-SP	2 to 15 months Years	*Giardia lamblia e Ascaris lumbricoides*	2010
RELATIONSHIP OF INTESTINAL PARASITOSIS WITH SANITATION CONDITIONS BÁSICO14	This is a descriptive cross-sectional study that analyzed the results of parasitological examinations of the SUS user population in Chapecó (SC).	Chapecó-SC	3 to 8 years	*Entamoeba coli, Endolimax nana and Giardia lamblia*	2014
RELATIONSHIP OF INTESTINAL PARASITOSIS WITH SANITATION CONDITIONS BÁSICO14	This is a descriptive cross-sectional study that analyzed the results of parasitological examinations of the SUS user population in Chapecó (SC).	Chapecó-SC	9 to 14 months Years	Entamoeba coli, Endolimax nana and Giardia lamblia	2014

After analyzing all the articles, it was possible to verify that children and adolescents were affected by the prevalence of some parasites. Figure 1 represents the protozoa found, generating an average of the results and arranged below.

Figure 1: Numbers in percentage of protozoa found with higher prevalence in the articles.

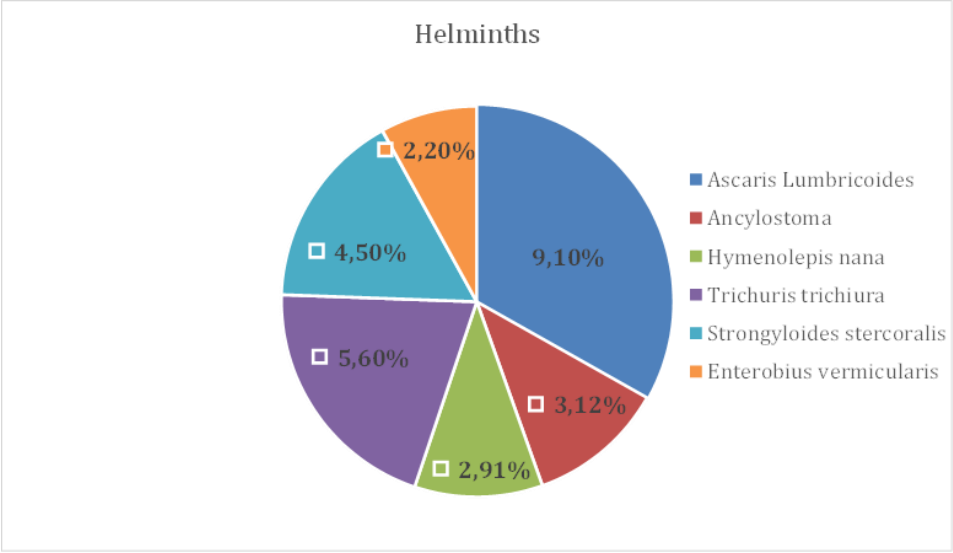


The genus Giardia stands out for being the most recurrent cause of epidemic outbreaks of diarrhea associated with drinking water, as also frequently analyzed in coproparasitological surveys carried out in different regions of the world, especially in children, compromising satisfactory physical development 13.

Entamoeba coli amebiasis and Endolimax nana are commensal, non-pathogenic protozoa that live in the human gut. These parasites are associated with places where they allow the accumulation of waste and feces eliminated by parasitized people, dirty places, such as sewers, streams, ponds and contaminated streams 14.

Figure 2 represents the helminths, according to the percentages of the parasites presented in each article used to carry out the research, an average was carried out, obtaining the results presented below.

Figure 2: Numbers in percentage Helminths found with higher prevalence in the articles.



Ascaris lumbricoide is the parasitism developed in man by a large nematode, popularly known as roundworms or. For the most part, the infection is mild and clinically benign, and its target audience is children. Usually, the form of contagion is unique, through the embryonated egg, containing second-stage larvae. The oral route is the penetration channel, in which there is a migratory cycle that passes through the lungs 16, 9.

Trichuris trichiura (helminthiases) are parasites of the large intestine, their transmission occurs when infected hosts eliminate eggs with their feces, commonly in places where basic sanitation is poor or absent. These worms inhabit mainly the cecum and ascending colon of the host. In cases of intense infections, they also occupy the distal colon, rectum, and distal portion of the ileum. Its eggs can be found in feces 5,13,17. Schistosoma mansoni is a helminth, in which its form of infection to humans occurs through the penetration of the larva into the skin or mucous membrane. After penetration, the parasite reaches the dermis encountering blood vessels (venous), where they can migrate to the lungs, heart, and systemic circulation. These parasites develop and mature in the liver, having their posthepatic phase for the deposition of their eggs 8. Schistosoma infection is often asymptomatic, but in some cases it can be severe, causing hepatosplenic lesions, which can lead to death. It is considered a common disease, it can be called of water belly or schist 9, 18.

Ancylostoma duodenale, the etiological agent of the Ancylostomatidae family, the infection occurs through penetration into the skin (skin-soil contact) or by ingestion of the third-stage larva found in contaminated water or food, and can survive between 1 and 3 years in the human intestine. The time between the introduction of the etiologic agent and the appearance of the first detectable forms of the etiologic agent is 35 to 60 days in cases of contagion by penetration and 30 days when by oral route 13.

Hymenolepis nana has a life cycle as a particularity, it is the only one among the cestoids capable of performing the direct or monoxenic cycle, requiring only one host. Another considerable factor is the short period of its cycle, making the eggs of this parasite available in a shorter time to contaminate other people. It is estimated that the number of infected people is 50 to 75 million worldwide, with a prevalence in children in daycare centers and schools, places with high levels of infection 3.

The species Enterobius vermicularis is previously commonly found in about 22.3 to 65% of school-age children. It is estimated that the predominance in children is at least double when compared to adults. Transmission can occur through different mechanisms, heteroinfection, indirect, external and internal autoinfection, and retroinfection13.

4 DISCUSSION AND CONCLUSIONS

According to the results, presented in figure 1, Giardia, Entamoeba coli and Endolimax nana appear as the main protozoa commonly found. In figure 2, among the six helminths, Ascaris lumbricoides, Trichuris trichiura and Strongyloides stercoralis are in higher prevalence.

The transmission of Giardia occurs by the fecal-oral route, the route of infection in humans is the ingestion of cysts. In places where there is a lack of basic sanitation and lack of efficient water treatment, Giardia is one of the most recurrent agents associated with water transmission, occurring directly or indirectly through the consumption of food or beverages prepared with contaminated water 13.

According to the studies, the symptomatology of the disease has a clinical spectrum that includes asymptomatic patients up to individuals with diarrhea, and it can also manifest as persistent diarrhea leading to weight loss. The predominant complications of giardiasis are related to malabsorption of nutrients such as iron, fat-soluble vitamins (A,D,E,K), vitamin B and lactose, compromising development In children's physical and cognitive disorders, these deficiencies in adults rarely cause serious damage15.

The transmission mechanism of Entamoeba coli and Endolimax nana, known as the smaller amoeba, occurs through the swallowing of mature cysts. Contaminated foods, such as raw vegetables (lettuce; watercress) and/or fruits (strawberries), consumption of untreated water infected by human waste are important carriers of cysts. Lack of home hygiene can favor the spread, ranging from 2 to 4 weeks in the incubation period 17.

Ascaris lumbricoides is transmitted through the ingestion of water or food infected with eggs containing the L3 larva, which cross the entire digestive tract and the larvae hatch in the small intestine, according to articles contagion can also occur through viable eggs accumulated under the nail mainly in children, ranging from 20 to 52% contamination levels. The pathogenesis is related to the parasite load present in the host, in low-intensity infections by larvae the individual does not present alterations, but in massive infections it may manifest liver and lung lesions 16.

Trichuris trichiura infection is observed in most of the infected under 15 years of age, corresponding to those infected with high parasite load and severe cases of this helminthiasis. Most parasitized individuals may remain asymptomatic, develop a dysenteric condition (abdominal pain, tenesmus, bloody mucosal diarrhea) or chronic colitis, in the most severe forms and with a higher parasite load, anemia and rectal prolapse may occur. Its eggs can be found in the faeces 5.

The genus Strongyloides stercoralis is the most important species that infects humans, it has specificities of developing a cycle of self-infection internally, an important factor that contributes to the severity of this helminthiasis. Hetero or primoinfection are the forms of transmission of this parasite, the infective filaroid larvae (L3) mechanically penetrate through the skin or mucosa. The

presentation of the infection occurs through the interaction between the parasite, the infected host and its location, in small quantities in the intestine they are asymptomatic, in the most severe forms they are related to extrinsic factors according to the parasite load and intrinsic factors causing enteritis, diarrhea and vomiting, facilitating the occurrence of self-infection 12.

Due to the problem of parasitic diseases, most of them are more evident in children and adolescents and especially in the needy social classes, according to the results, they depend on multiple factors that corroborate for the increase or decrease in prevalence, the actions of the authorities to inspect water quality were shown to be of paramount relevance distributed to the population, improvement of basic sanitation and health education actions developed with the population 1.

According to the studies, most parasitic infections are commonly acquired orally, through fecal contamination of water and food, resulting in which children were the most vulnerable to contamination. The school environment allows for greater contact with soil, and due to the lack of hygiene habits, the exploration of the oral phase by children is a means of great circulation and transmission of parasites. In these individuals, the disease is very relevant due to the frequency with which they cause a deficit that can affect physical and cognitive development, even resulting in death 7,11.

It is known that social and environmental aspects are directly related to the prevalence of parasitic diseases, and all articles were concerned with providing an analysis of socioeconomic and environmental aspects, as it helps to conduct actions and strategies that should be appropriate to each community1.

Since, despite the existence of laws, and ordinances such as No. 2,914, of December 12, 2011, which establishes definitions and provides for procedures for the control and surveillance of the quality of water for human consumption, precariousness was observed. The effectiveness of the right to sanitation is a key way to reduce infection rates and fulfill the right to health, with emphasis on the poorest localities 3.

The results of this review indicate that even though it is a public health problem, efforts to control and eliminate it are still insufficient, demanding better actions and strategies to strengthen the supervision of health surveillance in homes, implement health education with multidisciplinary participation, involving the target audience, parents, professionals and authorities.

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