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Intestinal parasites in children enrolled in early childhood centers of São Mateus, state of Espírito Santo, Brazil

Parasitos intestinais em crianças matriculadas em centros de educação infantil de São Mateus, Estado do Espírito Santo, Brasil

Marcela de Souza Lima[1;] Schayra Minine Damázio[2;] Aparecida Rios Soares[3;] Guilherme Pinho do Prado[4;] Marco Antônio Andrade de Souza[5*]

[1]Farmacêutica do Laboratório Teuto, Anápolis, Goiás; [2]Farmacêutica do Hospital Infantil Francisco de Assis, Cachoeiro do Itapemirim, Espírito Santo; [3]Farmacêutica do Laboratório de Análises Clínicas do Centro Universitário Norte do Espírito Santo da Universidade Federal do Espírito Santo; [4]Graduando em Farmácia do Centro Universitário Norte do Espírito Santo da Universidade Federal do Espírito Santo; [5]Professor Adjunto do Departamento de Ciências da Saúde, do Centro Universitário Norte do Espírito Santo da Universidade Federal do Espírito Santo.

Abstract

Introduction: *Intestinal parasites are often associated with morbidities caused to the general population. School children are a major risk group for parasitic infections due to their higher susceptibility and higher degree of exposure to primary sources.* ***Objective:*** *Verify the prevalence of intestinal parasites in children enrolled in Early Childhood Education Centers (CEIM) of São Mateus, Espírito Santo, Brazil.* ***Methodology:*** *Between the months of February 2010 and April 2013, fecal samples were collected from children aged between 1 and 6 years enrolled in CEIM of the city of São Mateus. Prior to the collection and in all CEIM, a lecture to parents/guardians and staff was held in order to clarify the research objectives, to guide on how to collect and store samples and signed the informed consent term. Once collected, the samples were sent to and processed in the Clinical Laboratory of the Universidade Federal do Espírito Santo by the spontaneous sedimentation method, and the sediment was examined in triplicate, after staining with lugol.* ***Results:*** *From a total of 378 samples analyzed in 10 CEIM, 137 (36.2%) were positive for various parasitic forms: Giardia lamblia 18.2%, Entamoeba coli 11.1%; E. histolytica/E. dispar 9.0%, Ascaris lumbricoides 5.0%, Hookworm 3.4%, Trichuris trichiura 1.8%, Endolimax nana 2.4%, Enterobius vermicularis 1.6%; Iodamoeba butschli and Hymenolepis nana with 0.3% each.* ***Conclusion:*** *The results showed high prevalence of intestinal parasites, in particular G. lamblia, indicating the need for implementation of preventive, sanitary and educative measures in CEIM, with the participation of the entire school community and parents.*
Keywords: *Parasitic diseases. Child.*

Resumo

Introdução: Os parasitos intestinais estão frequentemente associados a morbidades causadas à população em geral. As crianças em idade escolar representam um importante grupo de risco às infecções parasitárias em virtude da maior suscetibilidade e maior grau de exposição às fontes primárias. **Objetivo:** Verificar a prevalência de enteroparasitoses em crianças frequentadoras de Centros de Educação Infantil (CEIM) no município de São Mateus, Espírito Santo, Brasil. **Metodologia:** Entre os meses de fevereiro de 2010 e abril de 2013, amostras fecais foram coletadas de crianças, com idade entre 1 e 6 anos, matriculadas nos CEIMs de São Mateus. Antes da coleta foi realizada uma palestra dirigida aos pais/responsáveis e aos funcionários para esclarecer os objetivos da pesquisa, orientar sobre a forma de coleta e armazenamento das amostras e assinar o termo de consentimento livre e esclarecido. As amostras foram encaminhadas e processadas no Laboratório de Análises Clínicas, da Universidade Federal do Espírito Santo, pelo método de sedimentação espontânea, sendo o sedimento examinado em triplicata, após coloração por lugol. **Resultado:** Do total de 378 amostras analisadas em 10 CEIM, 137 (36,2%) apresentaram-se positivas para diversas formas parasitárias: *Giardia lamblia* 18,2%; *Entamoeba coli* 11,1%; *E.histolytica/E. dispar* 9,0%; *Ascaris lumbricoides* 5,0%; Ancilostomídeo 3,4%; *Trichuris trichiura* 1,8%; *Endolimax nana* 2,4%; *Enterobius vermiculares* 1,6%; *Iodamoeba butschli* e *Hymenolepis nana* com 0,3% cada. **Conclusão:** Os resultados demonstram elevada prevalência de parasitos intestinais, em especial *G. lamblia*, indicando a necessidade de implementação de medidas preventivas, sanitárias e educativas nos CEIM, com a participação de toda a comunidade escolar e responsáveis.
Palavras-chave: Doenças Parasitárias. Criança.

Correspondente/*Corresponding*: *Marco Antônio Andrade de Souza, Universidade Federal do Espírito Santo, Departamento de Ciências da Saúde. Centro Universitário Norte do Espírito Santo, CEP: 29932-540 – São Mateus, ES – Brasil. Email: marco.souza@ufes.br

INTRODUCTION

Intestinal parasites represent today an important public health problem, manifesting endemic forms not only in Brazil but worldwide. Estimates show that about 2 billion people have some intestinal parasite, especially

cases of ascariasis (1 billion), hookworm disease (239 million), trichuriasis and giardiasis (200 million), of which 50% are represented by children at school age[1,2].

Its prevalence is closely related to quality of life and habits of the population, since individuals belonging to lower social classes, usually inhabitants of regions with poor sanitation conditions, can act as a source of infection for the entire community[3,4].

In this context, it is noteworthy that in the transmission dynamics, water and soil provide conditions for the development of infective stages of parasites, leading to their transmission to humans5,6.

Furthermore, foods may be important sources of infection due to the influence of bad habits of food handlers and conditions of the product in relation to sanitation and environmental control[7,8].

Thus, some researchers have observed an alarming prevalence of intestinal parasites in food handlers of Cascavel, Paraná, with predominance of protozoa Endolimax nana and Entamoeba coli and in lettuce samples sold in street markets and supermarkets of Recife, Pernambuco, which showed some type of parasitic form, either by the use of water contaminated by fecal waste for irrigation or by improper handling during cultivation or trade of these products[9,10].

In addition, many insects also act as reservoirs or biological or mechanical vectors for pathogens[11], thereby contributing to the spread of diseases.

When prevalence studies on intestinal parasites are aimed at children, researchers consider Early Childhood Education Centers (CEIM) as exposure environments, as they present favorable conditions for the transmission of pathogens[3,12]. Among them, easy interpersonal contact and poor hygiene conditions, and importantly, at this age, children are in the phase of oral exploration, and take any objects into their mouths, including those found in soils perhaps contaminated, not washing their hands before meals and after using the toilet, inadequate training of staff from CEIM, as well as improper food handling[4,18,20].

In this sense, and taking into account the lack of studies on parasitic diseases in the city of São Mateus, Espírito Santo, especially in children, the aim of this study was to determine the prevalence of intestinal parasites in children enrolled in CEIM.

METHODOLOGY

Ethics Research Committee

The study project was carried out after approval by the Ethics Research Committee of the Centro Universitário Norte do Espírito Santo of the Universidade Federal do Espírito Santo (No. 11/2010), with the informed consent term signed by parents or legal guardians of those who participated in the research.

Description of the study area

The city of São Mateus is located in northern state of Espírito Santo (W 18º43'15'', S 39º51'41''), about 222 km away from the state capital Vitória, Espírito Santo, with an estimated population of 109,067 habitants[13].

Its origin dates back to the early 16th century, when the first Portuguese settlers arrived at the village, at around 1544, which makes this city as one of the oldest in Brazil[14].

According to the Municipal Secretariat of Education15, the city has 38 CEIM, 27 in urban and 11 in rural areas. As a criterion for selection of samples, 10 of them were studied, by random drawing, representing approximately 30% of the total.

Collection of biological data

Between the months of February 2010 and April 2013, fresh fecal samples were collected on alternate days, for one week, from children aged between 1 and 6 years enrolled in CEIM of the city of São Mateus.

Prior to the collection and in all CEIM, a lecture to parents/guardians and staff was held in order to clarify the research objectives and guide on how to collect and store samples. At that time, parent/guardian signed the informed consent term authorizing the child's participation in the survey, receiving universal collectors.

Once collected, the samples were sent to and processed in the Clinical Laboratory of the Centro Universitário Norte do Espírito Santo of the Universidade Federal do Espírito Santo by the spontaneous sedimentation method[16], and the sediment was examined in triplicate, after staining with Lugol.

The results of parasitological examinations were delivered at daycares and once intestinal parasites were found, the children's parents were instructed to look for local health units for treatment.

RESULTS

Of the total 585 containers of feces collection, only 378 samples returned (64.6%), 195 (51.6%) of males and 183 (48.4%) of females. Of these, 137 samples (36.2%) were positive for at least one type of intestinal parasite. Among them, 73 (53.3%) corresponded to males and 64 (46.7%) to females (Table 1).

***Table 1** – Frequency of individuals infected by intestinal parasites according to gender in the 10 Early CEIM of São Mateus, Espírito Santo. February 2010 to April 2013*

	Male N(%)	Female N(%)	Total N(%)
Total number of samples analyzed	195 (51.6%)	183 (48.4%)	378 (100%)
Total and frequency of infected children	73 (19.3%)	64 (16.9%)	137 (36.2%)

***CEIM:** Early Childhood Education Centers.*

Positive results were found in all 10 CEIM studied. Proportionally to the number of samples analyzed, the CEIM with the highest number of infected individuals was number 3, in which it was found that from a total of 41 samples, 23 (56.1%) were positive (Table 2).

Table 2 *– Number of positive and negative individuals according to gender verified in 10 CEIM of São Mateus, Espírito Santo, February 2010 to April 2013*

Institution	Negative		Positive		Total individuals analyzed	% Positive
	M	F	M	F		
CEIM 1	18	13	18	13	62	50.0%
CEIM 2	03	02	01	01	7	28.6%
CEIM 3	07	11	11	12	41	56.1%
CEIM 4	09	15	02	04	30	20.0%
CEIM 5	23	20	07	07	57	24.6%
CEIM 6	19	21	17	08	65	38.5%
CEIM 7	11	14	11	08	44	43.2%
CEIM 8	12	03	06	06	27	44.4%
CEIM 9	17	10	06	01	34	20.6%
CEIM 10	05	01	01	04	11	45.4%

CEIM: *Early Childhood Education Centers.*

As for the distribution by species (Table 3), protozoan Giardia lamblia was the only parasite found in all daycare units and showed the highest prevalence, with 18.2%, among positive cases. The other protozoa were: E. coli (11.1%), Entamoeba histolytica/E. dispar (9.0%), E. nana (2.4%) and Iodamoeba butschlii (0.3%). Among helminths, Ascaris lumbricoides (5.0%) was the most prevalent, followed by hookworm (3.4%), Trichuris trichiura (1.8%), Enterobius vermicularis (1.6%) and Hymenolepis nana (0.3%).

Table 3 *– Distribution of protozoa and helminths by species in the 10 CEIM of São Mateus, Espírito Santo, February 2010 to April 2013*

Parasite species	Number of cases	% Among Positive Cases
Giardia lamblia	69	18.2
Entamoeba coli	42	11.1
E.histolytica/E. dispar	34	9.0
Endolimax nana	09	2.4
Iodamoeba butschlii	1	0.3
Ascaris lumbricoides	19	5.0
Ancilostomideo	13	3.4
Trichuris trichiura	7	1.8
Enterobius vermiculares	6	1.6
Hymenolepis nana	1	0.3

CEIM: *Early Childhood Education Centers.*

Monoparasitism was found in 65.8% of infected individuals, biparasitism in 24.0% and polyparasitism in 10.2%. The most frequent association was E. coli + E. histolytica/E.dispar (8 cases). Parasitic associations and their occurrence are shown in Table 4.

Table 4 *– Number of parasitic association in the 10 CEIM of São Mateus, Espírito Santo, February 2010 to April 2013*

Species	Number of cases
E. coli + E. histolytica/E.dispar	8
G. lamblia + A. lumbricoides	3
G. lamblia + E. coli	3
G. lamblia + E. histolytica/E.dispar	3
G. lamblia + T. trichiura	2
E. coli + E. nana	2
G. lamblia + E. nana	1
G. lamblia + H. nana	1
G. lamblia + E. vermicularis	1
G. lamblia + Hookworm	1
I. butschlii + E. coli	1
E. coli + Hookworm	1
E. coli + A. lumbricoides	1
E. coli + E. histolytica/E. dispar + G. lamblia	4
E. coli + A. lumbricoides + E. histolytica/E.dispar	2
E. coli + E. histolytica/E.dispar + E. nana	1
E. coli + G. lamblia + Hookworm	1
E. histolytica/E.dispar + G. lamblia + Hookworm	1
E. histolytica/E. dispar + G. lamblia + E. vermicularis	1
G. lamblia + E. nana + T. trichiura + E.coli + E. histolytica/E.dispar	1
E. coli + A. lumbricoides + E. histolytica/E.dispar + E. vermicularis	1

CEIM: *Early Childhood Education Centers.*

DISCUSSION

Under the parasitological point of view, lower social classes and places with poor hygiene-sanitary conditions are those that intestinal parasites find fertile environment for propagation[8,12,20].

The general human infection index in this study (36.2%) is considered high, since Brazil has a national plan for surveillance and control of intestinal parasites[12]*, delegating powers in the three government branches, with the overall objective of reducing prevalence, morbidity and mortality from intestinal parasites in the country. Probably, these actions have failed due to the lack of municipal plan or total or partial non-compliance of its guidelines*[12].

Moreover, the values observed are similar to the results obtained by various researchers[3,17]*, who analyzed*

worms and parasite infestations in CEIM of cities of Uruguaiana, Rio Grande do Sul and Vespasiano, Minas Gerais, whose indexes were 38.4% and 22.7%, respectively.

In Espírito Santo, when assessing the prevalence of intestinal parasites in underprivileged children in the cities of Cachoeiro do Itapemirim and Guaçuí, 19.7% and 88.6% of parasitism were observed, respectively[4,18]. These prevalences were attributed to the fact that the communities under study lack of sanitation network and drinking water supply in many households.

The diversity of results found in works cited above reinforces that intestinal parasites are well scattered in the wide national territory and that their geographic distributions are conditioned to a multiplicity of factors that may influence the prevalence and intensity of infections. In this regard, infection rates observed in children from CEIM of São Mateus – G. lamblia (18.2%), E. coli (11.1%), E. histolytica/E. dispar (9.0%), E. nana (2.4%), A. lumbricoides (5.0%), hookworm (3.4%), T. trichiura (1.8%), E. vermicularis (1.6%), H. nana and I. butschlii, both with 0.3% – corroborate this condition.

When analyzing giardiasis, main intestinal parasitosis affecting the population aged 0-6 years[17,19], the predominance of G. lamblia, in this study, especially among children enrolled in CEIM, may be related to the fact that the cysts of this protozoan are already infectious at the time of its elimination in feces, not requiring a period of maturation in the soil as required, for example, by eggs of T. trichiura and A. lumbricoides. Thus, the interpersonal process of transmission is facilitated, which makes infection common, even in highly sanitized environments[12,19].

Besides the direct transmission through contamination of hands and subsequent ingestion of cysts present in excreta of infected individuals, there is indirect contamination through ingestion of contaminated water or food, rather frequent situations in school environments[9,10,12,19].

The E. coli protozoan was the second most prevalent in this study and A. lumbricoides was the most prevalent helminth, corroborating findings reported in literature[2,6,12], highlighting the prevalence of these parasites.

Species E. coli and E. nana, although not pathogenic to humans, have the same transmission mechanisms of other pathogenic protozoa (E. histolytica and G. lamblia), being indicators of fecal-oral contamination and poor socio-sanitary conditions of environments where children are inserted[5,8,17].

E. histolytica/E. dispar was the second most prevalent pathogenic protozoan. It is noteworthy that due to the risk of acquiring intestinal and extraintestinal invasive forms of amebiasis, special attention should be given to people with positive results[12].

Among helminths, A. lumbricoides (5.0%) and hookworm (3.4%) were the most prevalent. These soil-transmitted helminths indicate contact with contaminated environments such as sand or recreation sites in CEIM[2,6,8,20].

In analyzing the occurrence of associated infection, biparasitism occurred in 24.0% of total positive samples and polyparasitism in 10.2%. One reason for the common association between E. coli and E. histolytica/E. dispar may be the fact that these protozoa show the same transmission mechanism. Importantly, the simultaneous presence of more than one parasitic agent aggravates the clinical condition of the infection and, therefore, constitutes a risk to children's health by impairing their growth and development.

Taking into account that the results of this study suggest that children are subjected to conditions of poor sanitation and water treatment conditions, in this aspect is important to note that the vast majority of them live in extremely poor communities in the city of São Mateus, lack of personal hygiene, habit of walking barefoot and contact with contaminated environments such as sand and recreation areas, measures aimed at reducing the prevalence of parasitic infections must be taken to reverse this situation. Among them, the implementation of health infrastructure and water treatment with monitoring of the health conditions of communities in which they live, lectures and short courses for adults and dynamic activities for children encouraging them in basic attitudes that help reducing the infection rates.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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