

PREVALENCE AND TRANSMISSION OF INTESTINAL PARASITOSIS IN HUMAN BEINGS FROM ZONA DA MATA, MINAS GERAIS, BRAZIL

PREVALÊNCIA E TRANSMISSÃO DE PARASITÓSES INTESTINAIS EM SERES HUMANOS NA ZONA DA MATA DE MINAS GERAIS

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ABSTRACT: Intestinal parasites are closely related to basic sanitary conditions, socioeconomic status, level of education, age and hygiene habits of the population; it is a serious Brazilian public health problem. This study aims to identify the prevalence of intestinal parasites in two municipalities of Zona da Mata, State of Minas Gerais, Brazil. We analyzed the samples using spontaneous sedimentation technique. In Viçosa, collecting data from hygienic and sanitary characteristics was possible by applying a structured questionnaire. The diagnosis revealed 11.2 % intestinal parasites in urban areas and 27.7% in rural areas. In Muriaé, the prevalence of intestinal parasites was 13.85% in urban areas. The majority of parasites found in Viçosa were *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Entamoeba coli* and *E. histolytica*. Furthermore, in Muriaé we found *Strongyloides stercoralis*, *Ascaris lumbricoides*, *Ancylostoma* sp, *Taenia* sp, *Hymenolepis nana*, *Enterobius vermicularis*, *Giardia lamblia*, *Endolimax nana*, *Entamoeba coli* and *E. histolytica*. These parasites may indicate principally instability in the socio-economic conditions, serving as an important warning for local public health. In both areas, enteroparasitosis is high and it is of great importance to initiate sanitary measures to reduce them.

KEYWORDS: Prevalence. Enteroparasitosis. Risk factors. Zona da Mata-Minas Gerais.

INTRODUCTION

Worldwide, parasites, protozoa and pathogenic helminthes affect around more than two million people (MORRONE et al., 2004). In developing countries, intestinal parasites are responsible for high morbidity, which is an important determinant of infant morbidity and mortality (OLIVEIRA, 2004). In Brazil, intestinal parasites are still a serious problem for the public health, causing significant morbidity and mortality, which is an important health and social problem, mainly in low socioeconomic level of the population (BARRETO, 2006).

Ascariasis, trichuriasis, hookworm infections and some intestinal nematodiasis are among the neglected tropical diseases of high importance and impacts on public health, but are not restricted to tropical and subtropical regions (ANDRADE et al., 2010). Parasites can cause several injuries to the hosts, such as intestinal obstruction (*Ascaris lumbricoides*), malnutrition (*A. lumbricoides* and *Trichuris trichiura*) iron deficiency anemia (hookworm), abdominal pain, nausea and weight loss (*Taenia* sp.), diarrhea and

poor absorption (*Entamoeba histolytica*, *Isospora belli* and *Giardia lamblia*). Clinical manifestations are dependent on the type of parasite and health status of the patient (FERREIRA et al., 2000; LINDSAY et al., 2007; PFUETZENREITER; PIRES et al., 2000).

An epidemiological survey carried out in Brazil showed that 55.3% of the sampled children were parasitized, and 51% of them had polyparasitism (ROCHA et al., 2000). Although intestinal parasites are relevant in epidemiology and public health, it was difficult to perform fecal examinations on a larger scale, which could contribute to clarify the consequences in general population (ANDRADE et al., 2010).

The variation in frequency of intestinal parasites is closely related to the area of study, sanitation conditions, socioeconomic status, level of education, age, individual hygiene habits and even direct contact (person to person), especially in daycare centers, nursing homes, orphanages and clinics (GURGEL et al., 2005).

Ferreira et al., (2006) performed a study with children in municipal daycare centers in Guarapuava (PR) and related risk factors for

intestinal parasites, linking close relation between precarious life conditions, intestinal parasitosis and inappropriate development. Parasites are highly found in places where the living conditions and sanitation are unsatisfactory or nonexistent (ANDRADE et al., 2010). According to the Brazilian Institute of Geography and Statistics (IBGE, 2004), the percentage of population served by potable water supply is smaller in rural area compared to the urban area in all Brazilian regions, with a difference of 91.9% to 25.2%, respectively.

The high prevalence of parasitic diseases in Brazil is due to the difficult access to basic sanitation and lack of health education programs for the poor population, resulting in high morbidity and often linking up the cases of chronic diarrhea and malnutrition, compromising the physical and intellectual of the population (MELO, 2010).

This study aimed to determine the prevalence and risk factors of intestinal parasites transmission in the rural and urban areas in Zona da Mata, Minas Gerais, Brazil.

MATERIAL AND METHODS

Samples collected in Viçosa

Stool samples from 419 individuals were collected in 2008 and 2009. The residents were from Viçosa (MG), Brazil, in the Zona da Mata region. From all samples, 90 were from children from the urban area belonging to seven municipal day care centers; 63 samples were from children up to 10 years old from three neighborhoods of the city outskirts; and 266 samples were from children and adults in the countryside of Viçosa. Only children living in urban areas were assisted by the Family Health Program (FHP).

All samples were collected individually. From the total of sampled individuals, we collected data from 329 cases on the hygienic and sanitary characteristics through a questionnaire in which knowledge was taken as the hygiene habits and

living conditions. The samples were collected in plastic container with preservative MIF solution (Mercury, Iodine and Formaldehyde). For fecal diagnosis, it was used spontaneous sedimentation method HPJ (Hoffman method, Pons & Janer) (ARAÚJO, 2006). The Chi square test (χ^2) compared the groups, at 5% significance level of ($p < 0.05$).

Samples collected in Muriaé

Samples were conducted from May 2007 to February 2015, with patients treated in the hospital located in Muriaé. This Hospital receives patients from all municipalities of the Zona da Mata region. The information was obtained through Oracle Database 10G version, with SQL Bank Manipulation Tool Tools 1.6. All parasitological stool tests performed at the hospital during the period have been included, totalizing 1.832 samples. In Muriaé, applying the epidemiological questionnaire was not possible.

The sample identification procedures were performed in the Clinical Analysis Laboratory of the Hospital using spontaneous sedimentation techniques (HPJ). The samples were collected in plastic container with preservative MIF solution. Patients were considered positive after confirmation of any enteroparasite (helminths or protozoa).

RESULTS

The parasitological diagnosis revealed 39% (163 individuals) intestinal parasites in Viçosa, 11.2% from urban areas and 27.7% from rural zone. There was no statistically significant difference between the prevalence of urban and rural areas, as shown in Table 1. The most prevalent parasitic diseases in Viçosa were *Entamoeba coli*, *Ascaris lumbricoides*, *Entamoeba histolytica* and *Ancylostoma duodenale* respectively shown in Table 2.

Table 1. Comparison of intestinal parasites cases diagnosed in individuals living in urban and rural areas in Viçosa, Minas Gerais, Brazil, from 2008 to 2009.

Cases of intestinal parasites	Present		Absent	
	N	%	N	%
Urban area	47	11.2	372	88.8
Rural zone	116	27.7	303	72.3

There were differences ($p < 0.01$) between treatments using the chi-square test (χ^2) with Yates correction.

Ascaris lumbricoides was the major helminth found, 6.92%. *Ancylostoma duodenale* appeared in 3.57% and *Strongyloides stercoralis* was the third highest prevalence of helminths, 1.91%. Regarding the population interviewed in the city, 3.64% said they have open sewers, which is considered an important risk factor for the persistence of this helminth.

Considering intestinal protozoan, *Entamoeba histolytica* and *E. coli* were the most

prevalent (11.45% and 5.25%, respectively). *Giardia duodenalis* and *Giardia lamblia* also appeared in this study, both with 1.91%; the World Health Organization considers them as zoonoses. The prevalence for genus *Isospora* was 0.94%. We observed that 95.7% of the study population had the habit of consuming fruits and vegetables without appropriate washing.

Table 2. Prevalence (%) of intestinal parasites found in fecal examinations of individuals living in Viçosa municipality, from 2008 to 2009.

Enteroparasites	Positive	Prevalence (%)
Helminth		
<i>Ascaris lumbricoides</i>	29	6.92
<i>Ancylostoma duodenale</i>	15	3.57
<i>Strongyloides stercoralis</i>	08	1.91
<i>Trichuris trichiura</i>	05	1.19
<i>Enterobius vermicularis</i>	04	0.95
<i>Hymenolepis diminuta</i>	01	0.23
<i>Taenia</i> sp.	01	0.23
Total	64	15.23
Protozoa		
<i>Entamoeba coli</i>	48	11.45
<i>Entamoeba histolytica</i>	22	5.25
<i>Giardia duodenalis</i>	08	1.91
<i>Giardia lamblia</i>	08	1.91
<i>Isospora belli</i>	04	0.94
Total	90	21.46

Considering cestodea, only one case of *Hymenolepis diminuta* occurred and another one of *Taenia* sp., representing both 0.23% of the total occurrence. Despite the low prevalence of taeniasis in the population, open sewage favors the transmission and maintenance of this zoonosis. Characteristics such as low socioeconomic status, non-treated water consumption, open sewages, consumption of fruits and vegetables without appropriate washing were observed in this study.

In relation to households surveyed, 95.1% had pets and only 8.8% of people were assisted by the FHP. Regarding the monthly income in the urban zone, 59.1% of individuals who tested positive for some intestinal parasites had incomes from R\$301.00 to R\$ 500.00. There was a significant difference ($p < 0.05$) of income distribution and cases of intestinal parasites.

For age analysis, there was higher prevalence of intestinal parasites in the 0-6 years old children group (45%), showing a significant

difference ($p < 0.05$) compared with the 7-10 years old children group. In the rural zone, 1-4 years old children group had the highest prevalence (66.7%) of intestinal parasitism, which is probably due to lack of personal hygiene habits. Regarding positive results by age group in the rural zone, there was a decline of these values as the age group increases, confirming the downward trend for intestinal parasites as the age group increases.

The distribution of intestinal parasites prevalence according to age and gender was variable. There was no statistical significant difference ($p > 0.05$). By comparing the epidemiologically responsible variables for the maintenance and transmission of intestinal parasites (Table 3), a statistically significant difference occurred for the variables clean water, open sewages, network sewage, domestic animals, consumption of fruits and vegetables without appropriate washing, consumption of uncooked meat and routine feces parasitology test.

Table 3. Distribution of hygiene and sanitary characteristics and risk factors for the population in urban and rural areas in Viçosa from 2008 to 2009.

Hygienic and sanitary characteristics	Comments (N)	Total frequency	Frequency in urban area		Frequency in rural zone	
			Nº	%	Nº	%
Potable water ^(a)	329	62	53	85.5	19	14.5
Open sewer ^(a)	329	12	10	83.3	02	16.7
Rare meat consumption ^(a)	329	131	08	6.1	123	93.9
Sewage system ^(a)	329	286	46	16.0	240	84.0
Domestic animals ^(a)	329	313	47	15.0	266	85.0
Consumption of fruits and vegetables without appropriate washing ^(a)	329	315	49	15.5	266	84.5
Health Family Program (HFP)	329	29	29	100.0	*	-
Routine fecal examinations ^(a)	275	125	07	5.6	118	94.4
Habit of walking barefoot	53	21	21	100.0	*	-
Vacant lot near the residence	53	34	34	100.0	*	-
Smoking / Wash hands	53	44	44	100.0	*	-

* There were not collected data on these variables; (a) variables were statistically significant $p < 0.05$ between urban and rural areas in χ^2 test with Yates correction.

In relation to Muriaé, intestinal parasites were found in 13.85% of the sampled population. The helminths were *Strongyloides stercoralis* (0.49%), *Ascaris lumbricoides* (0.33%), *Ancylostoma* sp. (0.27%), *Taenia* sp. (0.11%), *Hymenolepis nana* (0.11%), and *Enterobius*

vermicularis (0.05%). The protozoan were *Giardia lamblia* (5.29%), which was the most prevalent, followed by *Endolimax nana* (3.49%), *Entamoeba coli* (3.33%) and *Entamoeba histolytica* (0.38%) (Table 4).

Table 4. Intestinal parasites in patients treated at a hospital in Zona da Mata region (Muriaé-MG), from May 2007 to February 2015.

Description	Samples	%
Positive Tests	254	13.85%
Negative Tests	1578	86.15%
Total	1832	100%
<i>Giardia lamblia</i>	97	5.29%

<i>Endolimax nana</i>	64	3.49%
<i>Entamoeba coli</i>	61	3.33%
<i>Strongyloides stercoralis</i>	9	0.49%
<i>Entamoeba histolytica</i>	7	0.38%
<i>Ascaris lumbricoides</i>	6	0.33%
<i>Ancylostoma</i> sp.	5	0.27%
<i>Hymenolepis nana</i>	2	0.11%
<i>Taenia</i> sp.	2	0.11%
<i>Enterobius vermicularis</i>	1	0.05%

The higher prevalence in Muriaé was protozoa, which may indicate a deficiency in the treatment of water used for human consumption, since most of these can resist certain hard treatments. Brazilian law recognized the impact of these agents and recommended by Ordinance 518/2004 the search for *Cryptosporidium* and *Giardia* in water used as public supply.

According to the results, the parasite with the highest prevalence was *Giardia lamblia* with 97 positives (5.29%). About helminths, *Strongyloides stercoralis* (0.49%) was the most prevalent, followed by *Ascaris lumbricoides* (0.33%), *Ancylostoma* sp. (0.27%), *Taenia* sp. (0.11%), *Hymenolepis nana* (0.11%), and *Enterobius vermicularis* (0.05%).

Regarding the gender of patients, 1.172 (64%) were women, 32% from the 28-40 years old group and 68% from the 40-68 years old group. Six hundred and sixty patients (36%) were male, 17% from the 37-50 years old group and 83% from the 50-74 years old group. In women, parasites were positive for 8.40% and 5.45% in men. In both genders, the age group most affected with some parasitosis was patients from 40-68 years old for women and 50-74 years old for men.

DISCUSSION

It is important to consider the risk factors involved in the transmission of intestinal parasites and maintenance of their cycles. Campos et al., (2002) found an association between endoparasites and poor socioeconomic and environmental conditions, low family income and low homemaker educational level.

According to Oliveira, Germano (1992), Brazil has often vegetables fertilized and irrigated

with water contaminated with human faeces. It increases the risk of population to acquire diseases. Among the most frequently helminths worldwide around 25-30% of the worldwide population is infected with Ascariasis each year, with at least 10.000 deaths, mostly children, due to complications resulting from infections, as chronicity and intestinal obstruction (SILVA, 2005; SILVA et al., 1997).

Hookworm has broad geographic distribution with high occurrence, constituting one of the most common infections in rural zones. Its transmission relates to the direct contact of the skin or mucous membranes with infected soil, highlighting environmental contamination, which would avoid population diseases (LEITE, 2005) if prevented, as can be verified in this study.

There was high occurrence of protozoan, such as *Entamoeba coli* (11.45% in Viçosa and 3.33% in Muriaé). It is a commensal species, which rarely causes clinical symptoms, but is an important indicator of the parasitic situation of the analyzed environment. *Entamoeba histolytica* is the only specie in the genus that in certain cases can be pathogenic for humans (SILVA; GOMES, 2005). An estimation of 500 million individuals are infected by *E. histolytica* in the world, and 50 million of these present the invasive form, leading to 100.000 deaths per year, mostly for colitis and liver abscess (WHO, 1997). However, knowledge about commensal parasites is important as the individual has the parasite transmission cycle, showing the need for actions relating to educational activities (GONÇALVES et al., 2011).

The protozoan *Giardia lamblia* has high prevalence in developing and underdeveloped countries (WHO, 1997). Its transmission can occurs through water, vegetables, fruits and vegetables

poorly washed, serving as a vehicle for transmission of cysts (MELO et al., 2004). The high rate of infection caused by this parasite may indicate socioeconomic conditions considering these patients lifestyle, since the protozoa have fecal-oral transmission.

Pets should be considered, because they can act directly or indirectly as a potential disseminator of zoonosis. Despite not having been found positive cryptosporidiosis in both municipalities, a zoonotic disease often affects people living in contact with domestic animals as they serve as disseminators of oocysts of *Cryptosporidium* spp. to the environment (NAVARRO et al., 1997; FERNANDES et al., 2008).

Water origin must be analyzed, since it can act as a propagation vehicle for the infection of enteroparasitosis (OLIVEIRA, 2004), remembering that meat quality should also be taken into account because it can become a transmission vehicle, including for *Taenia saginata* and *Taenia solium*.

All enteroparasites reported in this study stand out, as they are current indicators of the health situation in the analyzed sites. Competent authorities related to public health should work with sanitary measures to reduce the parasitic indexes, since in addition to the safety and welfare of the population, there will be a drop in the amounts spent

with hospital treatments, funded by the Brazilian government.

CONCLUSIONS

The results reveal an epidemiological profile of enteroparasitoses in the Zona da Mata region in the State of Minas Gerais, based on the prevalence rates and risk factors identified in this survey.

Intestinal parasites are present in the environment affecting the human population primarily by ingestion of contaminated food and water.

The high prevalence of intestinal parasites reported in these municipalities is mainly due to scarce access to basic sanitation and the lack of health education programs.

ACKNOWLEDGMENTS

The authors would like to thank Fapemig (Research Support Foundation of Minas Gerais), CAPES (the Coordination for the Improvement of Higher Education Personnel), and CNPq (National Council of Technological and Scientific Development) for the financial support.

RESUMO: A prevalência de parasitoses intestinais está intimamente relacionada com as condições de saneamento básico, situação socioeconômica, nível de educação, idade e hábitos de higiene da população, e continua sendo um grave problema de saúde pública no Brasil. Este estudo tem como objetivo principal identificar a prevalência dos parasitas intestinais em dois municípios da Zona da Mata do Estado de Minas Gerais, Brasil. As amostras coletadas foram analisadas pela técnica de sedimentação espontânea. No município de Viçosa, foi possível coletar dados de características higiênicas e sanitárias através da aplicação de questionário epidemiológico estruturado, onde foi encontrada uma prevalência de 11,2% nas áreas urbanas e 27,7% nas rurais de parasitas intestinais. Em Muriaé, a prevalência de parasitas intestinais foi de 13,85% nas áreas urbanas. Os principais parasitas encontrados em Viçosa foram: *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Entamoeba coli* e *E. histolytica*. Em Muriaé foram encontrados *Strongyloides stercoralis*, *Ascaris lumbricoides*, *Ancylostoma* sp, *Taenia* sp, *Hymenolepis nana*, *Enterobius vermicularis*, *Giardia lamblia*, *Endolimax nana*, *Entamoeba coli* e *E. histolytica*. A presença destes parasitas se associaram à precariedade nas condições socioeconômicas e sanitárias da população, servindo como um importante alerta para a Saúde Pública. Pôde-se observar que, em ambas as cidades, as enteroparasitoses apresentaram altas prevalências, indicando a necessidade de se adotar medidas sanitárias para diminuir essas prevalências.

PALAVRAS-CHAVE: Prevalência. Enteroparasitoses. Fatores de risco. Zona da Mata-Minas Gerais.

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