

HIGH PREVALENCE OF *Strongyloides stercoralis* INFECTION AMONG THE ELDERLY IN BRAZIL

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SUMMARY

Little is known about the frequency of intestinal parasites in the elderly due to a lack of attention given to the occurrence of these infections among older adults. This study compares the frequency of *Strongyloides stercoralis* and other enteroparasites between elderly living in nursing homes (n = 100) and those noninstitutionalized (n = 100) from Uberlândia, state of Minas Gerais, southeastern Brazil, associated with data of epidemiological and socio-demographic conditions. Through coproparasitological examination of both groups, enteroparasites were detected in 15 of 200 individuals examined (7.5%; CI: 5.1- 9.9). *S. stercoralis* was the most frequent parasite 10/200 (5%; CI: 4.2-5.8), being significantly higher in males and in individuals with autonomy for daily living activities. There were no statistical differences in the prevalence of parasites between the two groups compared. In conclusion, *S. stercoralis* infection was highly prevalent in elderly patients and it does not depend on whether the individual was institutionalized or not.

KEYWORDS: *Strongyloides stercoralis*; Elderly; Intestinal parasites; Brazil.

INTRODUCTION

The aging of the human population constitutes a great challenge for the modern society^{7,11,13,17}. It became necessary to accomplish epidemiological studies to know the profile of the elderly population, and also the needs and demands for social and health services that guarantee good health and improvement of their life quality^{9,14,43}.

Age-related malnutrition, morphological and physiological alterations and immunity dysfunction can enhance susceptibility for cancer, chronic degenerative and autoimmune diseases, increasing illness and death rates in elderly people^{8,15,18,34}.

According to the World Health Organization, protozoal and helminth intestinal infections are believed to affect 3.5 billion people worldwide, causing illness in 450 million³⁵. Helminth infections are highly prevalent in tropical and subtropical areas, where the low socioeconomic level and the precarious hygienic-sanitary conditions are favorable for the transmission and maintenance of these pathogens⁴⁵. Among the parasitic nematodes, *Strongyloides stercoralis* is the most aggressive parasite, since it may cause hyperinfection and dissemination of strongyloidiasis through auto-infection^{20,23,27}. Thus, chronic intestinal parasitism in elderly patients may result in a serious health problem^{27,29,32}.

According to the prevalence, the infection by *Strongyloides* is classified as: sporadic (< 1%), endemic (1-5%) and hyperendemic (> 5%)²⁸ and its heterogeneous worldwide distribution makes the strongyloidiasis

an important current subject. For instance, in healthcare of the Valencian community (Spain), in a total of 493 cases of strongyloidiasis diagnosed, 94% were found in patients in the 51-91 years age group². Little is known about the frequency of intestinal parasites in the elderly in Brazil or in the rest of the world due to a lack of studies on the occurrence of some neglected infections among older individuals.

Thus, the aim of this study was to compare the frequency of *S. stercoralis* and other enteroparasites among older adults living in nursing homes and non-institutionalized older individuals, associated with data of epidemiological and socio-demographic conditions.

MATERIALS AND METHODS

This study was approved by the Research Ethics Committee of the Federal University of Uberlândia and was evaluated from August 2002 to August 2003.

Group 1 consisted of 100 (42 men and 58 women) asymptomatic older people (≥ 60 years old), picked randomly from among the 139 individuals living in nursing homes, from four philanthropic institutions in Uberlândia, state of Minas Gerais, southeastern region of Brazil.

Group 2 consisted of 100 (41 men and 59 women) randomly selected asymptomatic non-institutionalized elderly (≥ 60 years old) from the Centro Educacional de Assistência Integrada (CEAI) that renders service in health, education, culture, leisure and social welfare fields.

A questionnaire was used to evaluate the epidemiological and socio-demographic data of the elderly people.

Both groups were submitted to an individual stool examination of three fecal samples. Fecal samples were collected in plastic vials without preservatives with intervals of one to four days, and processed by three coprological methods: the Baermann³, HOFFMANN *et al.*²¹ and RITCHIE³⁰ and by the Safranin/Methylene Blue staining technique⁴. Six hundred samples were collected. There being four slides for each sample and for each method. A total of 9,600 slides were analyzed under light microscope (Olympus, CH-2, Japan) at x100, x400 and x1000 by two investigators. Positive cases for parasites were referred to the nearest health unit in order to receive specific treatment.

Statistical analysis was performed with a relative test of the difference between two proportions (Z) using Statistics for Windows - Release 4.5 statistical software (Statsoft Inc. 1993) to determine the association between Groups 1 and 2. A 95% confidence interval (CI) was stipulated. Results were considered significant when $p < 0.05$.

RESULTS

Table 1 characterizes both groups according to epidemiological and socio-demographic aspects. In Group 1 the ages ranged from 60 to 98 years old and in Group 2 from 60 to 96 years old. In both groups, women were predominant (58% in Group 1 and 59% in Group 2).

Parasites were detected in 15 of 200 elderly individuals examined (7.5% CI: 5.1-9.9). Fecal consistence of all the samples collected was not diarrheic. The age group distribution of enteroparasite infected elderly respectively for Groups 1 and 2 was 60-69 y [3/28 (9.3%) and 0/35]; 70-79 y [0/32 and 5/47 (10.6%)] and ≥ 80 y [5/40 (12.5%) and 2/18 (11.1%)]. A possible tendency for progressive increase of the parasitism was observed among the age groups, though a statistically significant difference was not seen.

Table 2 presents the frequency of the parasites in both groups; *S. stercoralis* was the most frequent parasite 10/200 (5% CI 4.2-5.8). All infected subjects presented asymptomatic strongyloidiasis. The proportion of infected men in relation to women was 4:1 in both groups. A case of co-infection was observed in Group 1. From the 10 *S. stercoralis* positive cases eight (80%) were male subjects with autonomy for activities of daily living (ADL) ($p < 0.05$). Three of the ten infected elderly (30%) had a past history of alcoholism, two (20%) being from subjects of Group 1, one of them shedding filariform larvae (L3) in the feces, as well as the individual of Group 2.

DISCUSSION

The frequency (7.5%) of enteroparasites found in this study reveals clinical and epidemiological importance. The control of enteroparasite infection is still a challenge in developing countries due to susceptibility of the host, favorable conditions of the environment, low socioeconomic level and precarious hygienic sanitary conditions^{16,45}. SIRIVICHAYAKUL *et al.*³⁹ have found that the prevalence of infection is much higher in institutionalized mentally handicapped than in non-institutionalized people, since collective living conditions are risk factors for high prevalence of parasitism at the institutions. However, the parasite

Table 1

Distribution of epidemiological and socio-demographic parameters in institutionalized (Group 1) and non-institutionalized (Group 2) elderly from Uberlândia, Brazil

Parameter of elderly	Group 1 (n = 100)	Group 2 (n = 100)	Significance level
Age (years)	76.2 ± 10.0 SD	72.9 ± 7.3 SD	
Gender			
Males	42	41	N.S.
Females	58	59	N.S.
Marital status			
Single	51	11	$p = 0.0001$
Married	7	55	$p = 0.0001$
Widow/er	27	30	N.S.
Divorced	12	4	$p = 0.0383$
NI	3	0	N.S.
Education			
Illiterate	36	13	$p = 0.0002$
Elementary	29	84	$p = 0.0001$
High school	2	3	N.S.
NI	33	0	$p = 0.0001$
ADL			
Independent	38	98	$p = 0.0001$
Partially dependent	23	1	$p = 0.0001$
Dependent	39	1	$p = 0.0001$
Alcoholic			
Yes	6	5	N.S.
No	94	95	N.S.
Income			
No income	19	1	$p = 0.0001$
Salary	0.81 ± 0.4 SD	2.1 ± 1.4 SD	N.S.

NI = not informed; ADL: activities of daily living; N.S. = no statistically significant difference. Salary = 85.5 dollars monthly income.

Table 2

Frequency of enteroparasites in institutionalized of Group 1 (n = 100) and non-institutionalized Group 2 (n = 100) elderly from Uberlândia, Southeastern Brazil

Enteroparasites	Group 1 Positives	Group 2 Positives	Significance level $p < 0.05$
<i>Strongyloides stercoralis</i> only	4	5	N.S.
<i>S. stercoralis</i> + <i>Giardia lamblia</i>	1	0	N.S.
<i>Giardia lamblia</i>	0	2	N.S.
Hookworms	2	0	N.S.
<i>Balantidium coli</i>	1	0	N.S.
Negatives	92	93	N.S.
Total	100	100	

N.S.: No statistically significant difference.

prevalence detected in the present study cannot be compared to the other studies due to the lack of studies among institutionalized individuals.

In spite of the fact that there were differences between the two groups regarding the socio-demographic parameters, these did not influence the results, due to the fact that the prevalence of enteroparasites was similar in both groups. In the population studied a slight increase frequency among women can be explained by a higher female life expectancy than that of men. The marital status, bachelors or widowers, associated with the lack of financial resources and loss of autonomy for ADL, may play an important role in the institutionalization process³¹. In Brazil, the idea that the care of the elderly is the responsibility of the family still flourishes. However, social policies are needed to aid and support those elderly without financial resources in order to avoid institutionalization^{9,12}.

In the present study, *S. stercoralis* was the most frequent enteroparasite among the infected individuals, 80% of them being men, all having presented asymptomatic strongyloidiasis. These findings were in accordance with other studies^{2,16,33}. The asymptomatic infection which occurs in most of the patients chronically infected may persist for several decades^{26,37}. However, in some cases the infection may be followed by symptoms such as diarrhea, abdominal pain, nausea, malabsorption, weight loss and anemia^{1,23}. Some reports have described a significant association between human T cell lymphotropic virus type-1 (HTLV-1) and *S. stercoralis* hyperinfection^{20,40,41}. Case reports of hyperinfection syndrome or disseminated infection in immunocompromised elderly showed high mortality indexes associated with the use of immunosuppressive therapy as well as protein-caloric malnutrition and the aging process^{32,42}. Chronic alcoholism is another factor referred to as a predisposition to strongyloidiasis, and the frequency of infection by *S. stercoralis* in alcoholic patient varies from 33.3% to 44%^{1,42}. In this study, among the individuals that had a past history of alcoholism, two were shedding (L3) larvae in feces, suggesting cases of hyperinfection. The findings suggest that strongyloidiasis remains a serious public health problem in older individuals. As demonstrated by three fecal samples, the prevalence of strongyloidiasis is probably underestimated in literature because the diagnosis is difficult and false negative results become frequent due to a scarcity or absence of worms at the moment of the examination in asymptomatic patients, because it is imperative that multiple stool samples be examined in order to make a correct diagnosis³⁸.

Hookworm infections have heterogeneous global distribution and high prevalence in the developing countries in tropical and subtropical areas^{6,10,45}. CHANGHUA *et al.*¹⁰ observed that the prevalence of hookworm infection increased with age. The frequency of hookworm infection (2%) found in this study was lower than that reported by different researchers in epidemiological studies carried out in provinces of China. The high prevalence of hookworm infections in elderly Chinese patients has been attributed to the constant soil polluted with human feces that is used for fertilizing vegetables^{6,10}, which does not occur in Brazil.

The highly significant association between hookworm and *S. stercoralis* (OR > 6), and the series of self-reported morbidity markers associated with these two helminth species are particularly noteworthy. The *S. stercoralis* age-prevalence curve showed an almost parallel

shape to the hookworm age-prevalence curve, reaching an infection rate of approximately 20% in older adults⁵. In the present study, infection by *S. stercoralis* and hookworm in institutionalized elderly was also detected; however, the probable source of infection was not due to institutionalization. They had no contact with the ground in any of the four institutions neither did they have contact with the external environment of the institutions; therefore it is possible that the elderly were infected prior to institutionalization.

The frequency (1%) of *Giardia lamblia* was found lower than that observed by other authors, being all asymptomatic individuals^{19,22}. Nevertheless, *G. lamblia* may cause acute diarrhea, besides other symptoms such as, abdominal pain, nausea, vomiting, malabsorption, fever, appetite and weight loss²².

Balantidium coli is the only known pathogenic ciliated protozoa that can produce disease in humans. The infection may be subclinical in humans, as it is mostly in pigs, or may develop as a fulminant infection with bloody and mucus-containing diarrhea; this can lead to perforation of the colon. Occasionally, the parasite is able to invade organs and cause ulcerations in the mucosa and submucosa membranes, thrombosis in the affected vessels and even pulmonary colonization^{36,44}. In the present study, a case of asymptomatic balantidiasis was detected; possibly a chronic infection, since the infected individual was an 87 year old woman, who had been living in the institution for more than two years.

Balantidiasis is a zoonotic disease and is acquired by humans via the fecal-oral route from the normal host, the pig, where it is asymptomatic. Water is the vehicle for most cases of balantidiasis. Human-to-human transmission may also occur. The major factors leading to human balantidiasis include (i) close contact between pigs and humans, (ii) a lack of appropriate waste disposal in swine and human excrement contaminate drinking water sources (e.g., wells and streams) and food, and (iii) subtropical and/or tropical climatic conditions (e.g., warmth and humidity) favoring survival of cysts. In institutional populations (mental hospitals, prisons, and orphanages), where pigs are an unlikely source of infection, outbreaks are the result of asymptomatic carriers and the difficulties involved in maintaining hygienic control³⁶. In our study, the only elderly that presented *B. coli* in the feces were institutionalized and probably acquired the protozoan prior to the admission to the institution considering that the local hygienic conditions were strictly controlled and the elderly had no contact with the external environment.

Studies have suggested that elderly individuals have an increased risk for occurrence of severe cryptosporidiosis. *Cryptosporidium* is a cause of acute infectious diarrhea in elderly, the disease being characterized by a shorter incubation period, probably due to a greater inherent host susceptibility to parasite infection^{24,25}. This fact was not observed in this study and no case of cryptosporidiosis was detected in the elderly by using Safranin/Methylene-Blue staining technique⁴.

In conclusion, *S. stercoralis* infection was highly prevalent in the studied population and it does not depend on whether the individual was institutionalized or not. Therefore, early diagnosis through specific methods is relevant in asymptomatic elderly in order to prevent the risk of hyperinfection or disseminated infection, thus avoiding high mortality rates.

RESUMO

Alta prevalência da infecção por *Strongyloides stercoralis* em idosos do Brasil

Pouco é conhecido sobre a frequência de parasitas intestinais em idosos devido à falta de atenção dada à ocorrência destas infecções nesta faixa etária. Este estudo compara a frequência de *Strongyloides stercoralis* e outros parasitas intestinais entre idosos residindo em lares para idosos (n = 100) e aqueles não institucionalizados (n = 100) de Uberlândia, Minas Gerais, região sudeste do Brasil, associados com dados epidemiológicos e condições sócio-demográficas. Ambos os grupos foram submetidos a exames coproparasitológicos. Parasitos foram detectados em 15 dos 200 indivíduos examinados (7,5%; CI: 5,1 - 9,9). *S. stercoralis* foi o parasito mais freqüente 10/200 (5%; CI: 4,2 - 5,8), sendo significativamente maior em homens e indivíduos com autonomia das atividades diárias. Não houve diferença estatística entre a prevalência de parasitos quando os dois grupos foram comparados. Concluiu-se que a infecção por *S. stercoralis* foi altamente prevalente em idosos independente se institucionalizados ou não.

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