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Original Article

Intestinal parasites in cancer patients in the South of Brazil

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Abstract

Intestinal parasitic infections in immunocompromised patients can lead to serious complications when not diagnosed and treated early. This study aimed to investigate the frequency of intestinal parasites in cancer patients undergoing chemotherapy in the South of Brazil. Three fecal samples collected from each patient (73 individuals) were processed by Ritchie and Faust techniques and submitted to specific staining methods for intestinal protozoa. A 61.6% parasite and/or commensal positivity was found. Helminths identified were *Ascaris lumbricoides* (33.3%), *Taenia* spp. (6.6%), *Strongyloides stercoralis* (4.4%) and *Trichuris trichiura* (2.2%). Among protozoans, *Giardia lamblia* (26.6%), *Cryptosporidium* spp. (13.3%) and *Cystoisospora belli* (4.4%) were identified. The presence of *Entamoeba coli*, *Endolimax nana* and *Entamoeba hartmanni* was also recorded. The results obtained warn of the importance of fecal parasitological diagnosis and the use of specific staining methods for the detection of intestinal parasites in cancer patients. These exams should be regularly requested at the patient's first clinic visit, given the high prevalence found in this study and the possible severity of such conditions for these individuals.

Keywords: intestinal parasites, immunocompromised patients, cancer.

Parasitos intestinais em pacientes com câncer do Sul do Brasil

Resumo

As parasitoses intestinais em pacientes imunocomprometidos podem levar a graves complicações se não diagnosticadas e tratadas precocemente. Este estudo teve como objetivo investigar a frequência de parasitos intestinais em pacientes oncológicos submetidos ao tratamento quimioterápico. Foram coletadas três amostras de fezes de cada paciente, sendo processadas pelas técnicas de Ritchie e Faust e submetidas à métodos de coloração específicos para protozoários intestinais. Foi encontrada positividade de 61,6% para parasitos e/ou comensais. Os helmintos identificados foram *Ascaris lumbricoides* (33,3%), *Taenia* spp. (6,6%), *Strongyloides stercoralis* (4,4%) e *Trichuris trichiura* (2,2%). Dentre os protozoários, foram identificados *Giardia lamblia* (26,6%), *Cryptosporidium* spp. (13,3%) e *Cystoisospora belli* (4,4%). Também foi registrada presença de *Entamoeba coli, Endolimax nana* e *Entamoeba hartmanni*. Os resultados encontrados alertam para a importância do diagnóstico parasitológico de fezes junto à utilização de colorações específicas para parasitos intestinais em pacientes oncológicos, sendo que os mesmos deveriam ser requeridos como conduta já na primeira consulta clínica destes pacientes, dada à elevada prevalência aqui constatada e a possível severidade que tais moléstias podem acarretar nestes indivíduos.

Palavras-chave: parasitos intestinais, pacientes imunocomprometidos, câncer.

1. Introduction

Current estimates indicate that at least a quarter of the world's population, mostly in developing countries, is chronically infected with intestinal parasites (Alemu et al., 2011). Despite sanitation improvement and hygiene education in recent decades, these infections continue to be characterized as a major cause of morbidity worldwide (Lustigman et al., 2012). In immunocompromised individuals, such agents are recognized as important enteric pathogens, and may lead to fatal complications (Marcos and Gotuzzo, 2013).

Among intestinal parasites, *Cryptosporidium* spp. and *Strongyloides stercoralis* stand out for their opportunist character. These parasites can lead to serious complications in patients with immune deficiency. Cancer patients, in turn, become immunocompromised either as a result of

the disease itself or due to therapeutic agents/procedures causing immunosuppression (Silva et al., 2011; INCA, 2016). For this reason, it is extremely important that prevalence and risk factors associated with parasitic infections be determined for this group (Utzinger et al., 2012).

Different groups of immunocompromised individuals have been studied regarding intestinal parasites; however, cancer patients are still poorly investigated. Such limitation of studies is harmful, since research of this nature could serve as the basis for adopting specific preventive measures to these patients, as well as providing new approaches to oncologists (Pacheco et al., 2014).Therefore, the aim of this study was to evaluate the frequency of intestinal parasites in cancer patients undergoing chemotherapy treatment in the South of Brazil.

2. Methods

2.1. Place and study populati on

This was a prevalence epidemiological study whose research subjects were cancer patients referred to chemotherapy in two specialized clinics in the city of Pelotas, located in southern Rio Grande do Sul (RS) State, south of Brazil. Is worth informing that Pelotas is a major county in southern RS, receiving patients from all over the South of the State, and that all neoplastic patients who attended both clinics in a 06 month period were invited to participate in the study.

2.2. Data and fecal sample collection

Data collection was started after an Informed Consent (IC) form was signed by each patient, who then answered a questionnaire aiming to outline their socioeconomic profile as well as identify other epidemiological characteristics. Along with the Informed Consent form, the patients were given an educational folder showing major intestinal parasites and ways to prevent them. After completing the questionnaire, the research participants were given three disposable bottles containing a duly identified MIF (merthiolate or mercury, iodine and formaldehyde) preservation solution. The collected material was taken to the Human Parasitology Laboratory of the Federal University of Pelotas for processing. This study was approved by the Ethics Committee under Protocol 502/589. All positive patients were referred to medical treatment.

2.3. Processing and analysis of fecal samples

The methods employed were macroscopic examination, Faust technique and Ritchie technique. Kinyoun staining for the detection of opportunistic intestinal coccidia was also used. After being processed, samples were analyzed under an optical microscope.

2.4. Data statistical analysis

For data analysis, an Excel 2007® software database was developed. The association between the results of fecal examinations and epidemiological variables identified in the questionnaire were weighed by the XIII Minitab statistical software version® using the chi-square test, and those associations with $p \leq 0.05$ were considered statistically significant.

3. Results

A total of 73 patients aged from 20 to 85 years from 15 different municipalities in southern Rio Grande do Sul (RS) State, Brazil, participated in the study. Of the patients surveyed, 45 (61.6%) were positive for one or more species of intestinal parasites and/or commensals (Table 1). Among positive patients, 53.3% showed single and 46.7% multiple parasitic infections. The most frequent association was that of *Ascaris lumbricoides* and *Giardia lamblia*, which represented 23.8% of cases of multiple parasitic infections.

As for socioeconomic and environmental variables evaluated, as shown in Table 2, only having dogs and/or cats as pets showed a statistically significant association with positive cases of intestinal parasites in cancer patients ($p = 0.025$).

The association between positive cases and the type of cancer was also evaluated, but there were no significant statistical differences. Breast cancer showed the highest occurrence (32/43.8%), followed by intestinal (10/13.7%) and stomach (6/8.2%).

4. Discussion

According to the National Cancer Institute, eight million new cases of cancer are diagnosed each year worldwide, with an increase of almost 40% over the last 20 years (Inca, 2016). Cancer patients run a great risk of developing enteroparasitic infections, as they are more susceptible to opportunistic agents due to anticancer treatment and are already immunocompromised because of the disease itself (Vento and Cainelli, 2003). These opportunistic infections are usually more severe in this group of individuals, and may even lead to fatal complications (Marcos and Gotuzzo, 2013). Of the 73 participants in the study, 45 (61.6%) were positive for one or more parasitic species, a similar index to that found in other studies, such as a 66.7% figure found in cancer patients in Brazil (Silva et al., 2011).

Table 1. Prevalence of intestinal parasites (pathogenic and commensal) and their frequencies in cancer patients from southern Brazil undergoing chemotherapy (n = 73).

Pathogenic parasites	**(%)**
Ascaris lumbricoides	33.3
Giardia lamblia	26.6
Cryptosporidium spp.	13.3
Taenia spp.	6.6
Strongyloides stercoralis	4.4
Cystoisospora belli	4.4
Trichuris trichiura	2.2
Commensals parasites	**(%)**
Entamoeba coli	31.1
Endolimax nana	26.6
Entamoeba hartmanni	4.4

Table 2. Association between socioeconomic and environmental variables with positive cases for intestinal parasites in cancer patients from southern Brazil.

Variables	Positive patients = 45/73			
	Total	Positive	%	p
Age				0.641
20-50 years	23	16	69.5	
51-85 years	50	29	58	
Gender				0.387
Male	17	12	70.6	
Female	56	33	36.9	
Family income				0.499
Until 1 minimum wage*	27	18	66.7	
more than one minimum wage*	46	27	58.7	
Educational level				0.465
Up to elementary school	43	28	65.1	
Beyond elementary school	30	17	56.7	
Housing				0.163
Masonry	70	42	60	
Wooden	3	3	100	
Peridomiciliar area				0.448
Pavement	35	20	57.1	
Others	38	25	65.8	
Plumbing				0.695
Yes	61	37	60.6	
No	12	8	66.7	
Residing in area				0.508
Rural	16	11	68.7	
Urban	57	34	59.6	
Garbage disposal				0.387
Public collection	56	33	58.9	
Others	17	12	70.6	
Vegetable garden				0.101
Yes	15	12	80	
No	58	33	56.9	
Dog and cat as a pet				0.025
Yes	48	34	70.8	
No	25	11	44	

*Minimum wage in Brazil = R$ 788.00 (approximately US $ 250.00 in July 2015).

The most frequent parasite was *Ascaris lumbricoides* (33.3%), which showed a much higher prevalence than that found in AIDS patients in Brazil (7.7%) (Amancio et al., 2012). Infection by *A. lumbricoides* associated with other immunosuppressive diseases has been described in other studies and may be related to a wide prevalence of this helminth in humans around the world (Lau et al., 2007; Brum et al., 2013). It is worth mentioning that eggs of this helminth have been found in public parks within city limits, which is suggestive of a considerable risk of infection and its high prevalence among the local human population (Moura et al., 2013).

As for the protozoan *Giardia lamblia*, despite being most commonly found in children (Torres-Romero et al., 2014; Ferreira et al., 2015) it was diagnosed in 26.6% of patients in this investigation, in which the youngest infected individual was 20 years old. Its concomitant occurrence with cancer probably arises from a deficiency in the immune system of neoplastic individuals which causes an increased susceptibility to infections, since its occurrence is usually lower in adults due to the development of a certain degree of resistance (Silva et al., 2011). Although *G. lamblia* is not thought to be an opportunistic pathogen, the infection in immunocompromised patients may be more serious, with a marked proliferation of the parasite and, therefore, the worsening of his clinical condition (Cotton et al., 2011). *G. lamblia* prevalence was higher in this study as compared to that found in immunocompromised patients from other countries, such as 6.6% in immunocompromised patients in Saudi Arabia (Al-Megrin, 2010), and an 8.5% prevalence in patients undergoing dialysis in Turkey (Karadag et al., 2013).

The 13.3% *Cryptosporidium* spp. frequency was similar to that found in HIV-positive patients referred to the UFTM hospital (MG), where a 10.1% rate was found (Assis et al., 2013). However, this coccidial infection showed an even higher prevalence in immunocompromised patients from other countries, such as 53% in kidney transplant patients in Pakistan (Raja et al., 2014) and 43.6% for HIV/AIDS patients in Ethiopia (Alemu et al., 2011). In addition, studies have linked *Cryptosporidium* spp., among other parasites, to the development of cancer, inasmuch as it is believed that chronic inflammation of the intestinal tract due to the presence of the parasite could induce pathological disorders with adenocarcinoma genesis. Studies have also shown that even low doses of this protozoan may induce gastrointestinal neoplasia (Benamrouz et al., 2014; Oliveira, 2014). Nevertheless, this relationship has not been diagnosed in this study. More specific studies on this association should be performed.

The 4.4% *Cystoisospora belli* frequency in immunocompromised patients should be considered relevant, since this parasite can cause severe dehydration due to intense and prolonged diarrhea; less commonly, there may be extraintestinal dissemination, especially in immunosuppressed individuals (Resiere et al., 2003; Townsend and Cavuoti, 2015).

Strongyloides stercoralis occurrence (4.4%) showed a lower frequency than expected, certainly due to the methods used, which were not specific for the diagnosis of this parasite. Its worldwide prevalence varies between 10 and 40% in tropical and subtropical countries, but can reach up to 70% in HIV-positive patients co-infections. It is important to mention that this parasitic disease can be more severe and even attain high mortality rates in immunocompromised patients (Barros and Montes, 2014;

Mejia and Nutman, 2012). The Baermann-Moraes technique (specific for *S. stercoralis*) was not used in this study due to the use of MIF in collecting bottles distributed among patients, which prevents larva thermo-hydrotropism. MIF addition was necessary since it took the patients a few days until the next visit and fecal material delivery.

The presence of dogs and/or cats as risk factors in parasite infection was observed in this study. Although there is controversy regarding the sharing of parasitic infections between healthy domestic animals and humans, patients with severe immunodeficiency and malnourished children may be affected by opportunistic parasitic diseases, such as those caused by *Cryptosporidium* spp. (Curi et al., 2016; Bowman and Lucio-Forster, 2010). Even though there have been studies defining giardiasis as a zoonosis (Feng and Xiao, 2011), the genotype and subtype level division has reduced scientific acceptance of zoonotic transmission likelihood. Thus, further studies on *G. lamblia* and *Cryptosporidium* spp. molecular characterization are necessary, once the role of dogs and cats as potential zoonotic parasite sources cannot be definitely excluded and antiparasitic treatment of these pets should be regularly performed (Ballweber et al., 2010; Joffe et al., 2011).

5. Conclusion

With considerable enteroparasitosis levels among cancer patients, probably due to their immunocompromised condition, these individuals are at higher risk of acquiring infection by different parasitic species. Based on the results obtained in this study, fecal parasite examination and the use of specific methods for intestinal protozoa diagnosis before and during treatment of cancer patients, as well as specific treatments of positive patients for some parasitic infections so as to prevent more severe conditions that could entail potential complications for these patients, are suggested.

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