http://dx.doi.org/10.1590/1678-4162-12732

Arq. Bras. Med. Vet. Zootec., v.75, n.1, p.35-40, 2023

Parasitological diagnosis of fecal samples from domestic dogs from the municipality of Niterói, Rio de Janeiro, Brazil

[*Diagnóstico parasitológico de amostras fecais de cães domésticos provenientes do município de Niterói, Rio de Janeiro, Brasil*]

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ABSTRACT

From 2015 to 2021 the prevalence of parasites was evaluated in fecal samples of dogs from the municipality of Niterói, RJ. The samples were examined at the Laboratory of Diagnostic Support in Parasitic Diseases (LADDP) of the Veterinary School at the Federal Fluminense University (UFF), using centrifugal flotation, sedimentation and mini-FLOTAC techniques. Of the 1,037 samples examined, 30.6% (318/1,037) showed positive results for some parasitic infections, of which 80.5% (256/318) were positive for only one species of parasite and 19.5% (62/318) for multiple infections. Parasitism by *Ancylostoma* caninum was the most prevalent, with 39% (124/318), followed by *Giardia* sp., 16% (51/318); *Toxocara canis*, 14.5% (46/318); *Trichuris vulpis*, 8.5% (27/318); *Cystoisospora canis*, 8.5% (27/318); *Dipylidium caninum*, 7.9% (25/318); and *Cryptosporidium* sp., 5.6% (18/318). The parasitological diagnosis of dogs in urban areas is the best choice to evaluate the efficacy of control measures adopted for parasitic infections, including those with zoonotic importance.

Keywords: dog, feces, parasitosis, zoonosis

RESUMO

Durante o período de 2015 a 2021, foi avaliada a prevalência de endoparasitos em amostras fecais de cães provenientes do município de Niterói, RJ. As amostras foram analisadas no Laboratório de Apoio Diagnóstico em Doenças Parasitárias (LADDP) da Faculdade de Veterinária da Universidade Federal Fluminense (UFF), sendo usadas as técnicas de centrifugo-flutuação, sedimentação simples e mini-FLOTAC. Das 1.037 amostras analisadas, 30,6% (318/1.037) apresentaram resultados positivos para alguma infecção parasitária, sendo dessas 80,5% (256/318) positivas para apenas uma espécie de parasito e 19,5% (62/318) para infecções múltiplas. O parasitismo por Ancylostoma caninum foi o mais prevalente, com 39% (124/318), seguido por Giardia sp., 16% (51/318), Toxocara canis, 14,5% (46/318), Trichuris vulpis, 8,5% (27/318), Cystoisospora canis, 8,5% (27/318), Dipylidium caninum, 7,9% (25/318) e Cryptosporidium sp., 5,6% (18/318). O diagnóstico parasitológico de cães em áreas urbanas é a melhor alternativa para a avaliação da eficácia dos programas de controle de infecções parasitárias, incluindo aquelas com importância zoonótica.

Palavras-chave: cão, fezes, parasitose, zoonose

INTRODUCTION

Infections caused by helminths and protozoa may result in relevant diseases in domestic animals that often might infect humans. Knowledge about parasitosis and the updated data survey on their epidemiology are essential for the adoption of proper preventive and curative measures.

The municipality of Niterói occupies a territorial area of 133,757km², with 515,317 inhabitants and a canine population estimated at 10% of the human population (IBGE, 2020). Because of

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Submitted: March 23, 2022. Accepted: November 11, 2022.

technological advances and mainly to the improvement in preventive disease management, the lifespan of dogs has increased significantly. However, many preventive care measures, like treatment and prophylaxis of parasitic diseases, are not adequately performed. Consequently, parasitic infections may present worrying prevalence rates, including those with zoonotic importance (Serra *et al*., 2003; Brener *et al.*, 2005; Katagiri and Oliveira-Sequeira, 2008; Barros *et al.* 2013; Ramos *et al.* 2015).

Non-invasive techniques can detect many species of gastrointestinal parasites that have the domestic dog as a host through the collection of fecal material and processing coproparasitological diagnosis (Matosinhos, 2012). The objective was to perform the diagnosis and determine the prevalence of gastrointestinal parasites in fecal samples obtained from domestic dogs treated in Niterói, RJ, during the period from 2016 to 2021.

MATERIAL AND METHODS

This is a retrospective study, carried out through consultations to the LADD files of the Veterinary School of the Federal Fluminense University (UFF), using data concerning the period from October 2015 to December 2021 (certificate number on ethics committee: 4535081021). The samples were processed by the techniques of centrifugal flotation, simple sedimentation and mini-FLOTAC (Sloss *et al.* 1999; Barda *et al*. 2013). Besides, the study also analyzed the results of the coproparasitological tests, age profile and sex.

The results are expressed in prevalence ratio, using the terminology according to Busch *et al.* (1997). To compare species prevalence, mono- or polyinfections, sex and age profile, the Qui-square test was performed with a significance level of 95%. Data analyses were carried out with the Program BioEstat 5.3 (Ayres *et al.*, 2007).

RESULTS

During the period from 2016 to 2021, 1,037 fecal samples of dogs from the municipality of Niterói were examined. Table 1 shows the prevalence data by species, emphasizing the highest prevalence of *Ancylostoma caninum*, followed by *Giardia* sp. and *Toxocara canis*. There is a significant difference between the prevalence rates of some species, especially *A. caninum*, which differed statistically from all others.

Table 1. Prevalence of parasites in fecal samples from dogs from the municipality of Niterói, RJ, during the period from 2016 to 2021

Species	No. of positive samples	Prevalence
Ancylostoma caninum	124[a]	39.0%
Giardia sp.	51[b]	16.0%
Toxocara canis	46[b]	14.5%
Trichuris vulpis	27[c]	8.5%
Cystoisospora canis	27[c]	8.5%
Dipylidium caninum	25[c]	7.9%
Cryptosporidium sp.	18[c]	5.7%
Total	318	100.0%

Note: Different letters in the rows indicate statistical difference ($p<0.05$).

Among positive animals, 54.1% (172/318) were female and 45.9% (146/318) were male, with no statistical difference ($p=0.5110$) between them. The number of youngsters corresponded to 24.8% (79/318) and adults to 75.2% (239/318), with a statistical difference between them ($p=0.0023$).

The prevalence of positive fecal samples was 30.6% (318/1,037), of which 80.5% (256/318) was for one species of parasite and 19.5% (62/318) for multiple parasites. Figs. 1 and 2 show the associations by age groups and sex regarding mono- and poly infections. There was a statistical difference between youngsters ($p=0.01474$) and adults ($p<0.00001$), as well as between males and females ($p<0.00001$ in both).

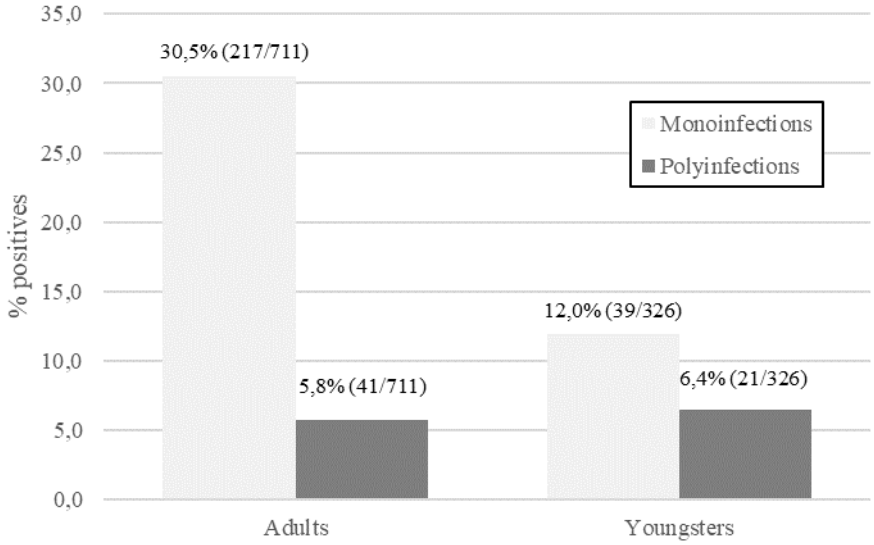

Figure 1: Prevalence of positive dogs for parasitic mono- and polyinfections, by age profile, in coproparasitological tests performed at the Laboratory of Diagnostic Support in Parasitic Diseases at UFF, during the period from 2016 to 2021.

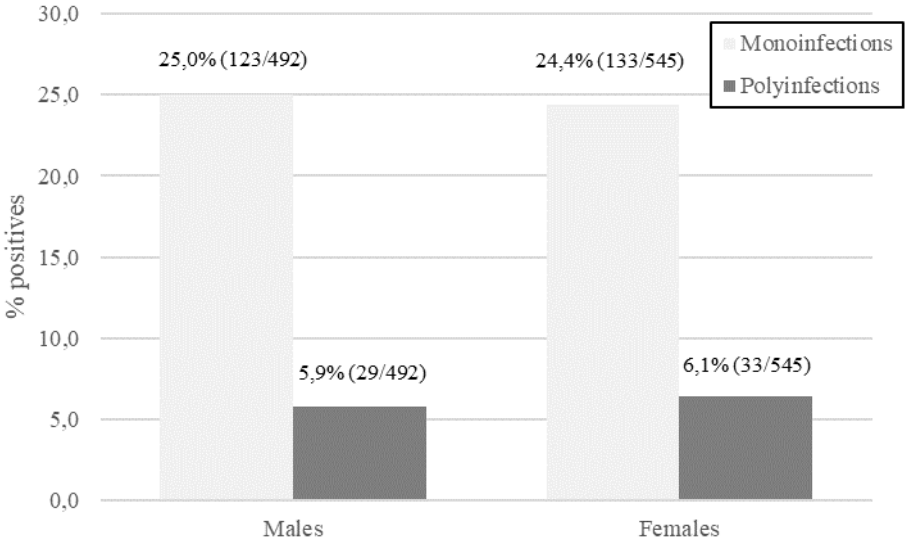

Figure 2. Prevalence of dogs positive for parasitic mono- and polyinfections, by sex, in coproparasitological tests performed at the Laboratory for Diagnostic Support in Parasitic Diseases at UFF during the period from 2016 to 2021.

DISCUSSION

Gastrointestinal parasites are common in dogs and can occur at high prevalence rates in several regions of Brazil and other countries (Funada *et al.*, 2007; Torrico *et al.*, 2008; Gennari *et al.*, 2016; Tamponi *et al.*, 2020; Sobotyk *et al.*, 2021).

According to Katagiri and Oliveira-Siqueira (2007) the last decades have been marked by intense technological progress and important social changes, with repercussions in both human and animal health. Unfortunately, zoonosis caused by intestinal parasites of dogs has not ceased to be a permanent public health problem

in developing countries and is also a growing concern in developed countries.

In Niterói, RJ, Brener *et al.* (2005) and Barros *et al.* (2013) carried out studies on the prevalence of parasites in dogs and reported a prevalence of 33% (70/212) and 18.3% (44/240), respectively. In the present study, we found a prevalence of 30.6% (318/1,037), using an analysis period and a sample size larger than the previous authors. The prevalence found reveals that the rate of parasitism in dogs in the municipality of Niterói has not changed significantly in the last two decades, which is worrisome for the One Health approach.

According to Dantas-Torres and Otranto (2014), *Ancylostoma caninum* is the most prevalent nematode in coproparasitological surveys of dogs in urban areas, and the data described here in agreement with the findings of those authors. Furthermore, according to Silva *et al.* (2021), *Ancylostoma caninum* is a parasite that determines significant clinical changes in dogs, causing dermatitis, hemorrhagic enteritis, anemia, pneumonia, and death. The third-stage larvae present in the soil can penetrate human skin, leading to cases of cutaneous larva migrants, also known as creeping eruption, which is an important zoonosis with an intense local inflammatory reaction.

The adult form of *A. caninum* lives in the small intestine of the host organism. Notwithstanding a predisposition for the infection of young dogs, Funada *et al.* (2007) and Ferreira *et al.* (2016) found a high prevalence of infected adult animals. Similarly, the results presented here show a higher prevalence of infected adults. This is relevant because most dogs that walk the streets and public squares in the municipality of Niterói are adult animals, and sometimes their owners often do not pick up their feces.

The lack of correct parasite control in companion animals and the absence or low effectiveness of population control programs for stray animals are significant factors in the maintenance and transmission of parasites and parasitic diseases in urban environments, including some of zoonotic importance. Serra *et al.* (2003), in a study carried out in the metropolitan region of Rio de Janeiro, found a prevalence of parasitism by *Ancylostoma* sp. of 43.5% among domestic and stray cats, bearing out the importance of this parasitosis in the study region.

Giardia sp. infection was the second most prevalent; however, it was not possible to distinguish the species, although *G. duodenalis*, also known as *G. intestinalis* or *G. lamblia*, is described with higher prevalence in coproparasitological tests in dogs (Lallo and Bondan, 2006). This parasite is restricted to the gastrointestinal tract and usually causes an asymptomatic infection, which helps to disseminate cysts in the environment and might contaminate humans and other animals. In humans, it compromises weight gain and is responsible for several extraintestinal and post-infectious complications, including post-infectious irritable bowel syndrome, chronic fatigue, growth deficiency, and cognitive impairment (Buret *et al.*, 2015).

Dipylidium caninum infection is clinically characterized by digestive problems, such as diarrhea in dogs and, in some cases, problems for public health, mainly enteritis in children. It is more prevalent in abandoned animals due to the higher chance of ectoparasitim infestation, although it may also affect domiciled dogs (Quiroz, 1994; Urquhart, 2001).

Infections in young animals can result in nonspecific symptoms such as weight loss and digestive disorders. The increase in the number of adult specimens in the intestine may promote mucosal thickening and increased secretion with leukocyte infiltrate (Sánchez *et al.*, 1999).

In relation to hosts, transmission is determined by several factors, such as eating habits, the life form of animals and certain human behaviors that allow dogs access to intermediate hosts (Sánchez *et al.*, 1999).

There is great concern in Brazil about the occurrence of waterborne parasites, particularly *Cryptosporidium* and *Giardia*, found here with prevalence of 5.7% and 16%, respectively. This concern is expressed in Ordinance 518 of 2004 of the Ministry of Health, in the chapter on water quality standards, which recommends the absence of pathogens like enterovirus, *Cryptosporidium* and *Giardia*. The presence of these parasites in dogs suggests risk to the human population, and this fact should be considered in

parasite control programs for dogs and humans in the municipality of Niterói.

Toxocariasis was the third most prevalent parasitosis in the dogs examined. It is caused by the nematode *Toxocara* spp., which can establish an erratic cycle, with migration of larvae through various tissues. This parasitosis in human hosts is known as Visceral Larva Migrans and represents a threat to the health of children and young companion animals, and therefore should be avoided and controlled. Contamination occurs after the ingestion of parasite eggs containing second-stage larvae that might be present in public areas frequented by infected dogs (Mirdha *et al.*, 1998; Gilioli and Silva, 2000; Acha and Szyfres, 2003; Brandão *et al.*, 2009).

CONCLUSIONS

This study shows that *Ancylostoma* sp., *Giardia* sp., and *Toxocara* sp. were the most prevalent parasites in examined fecal samples from dogs from the municipality of Niterói. As these parasites entail a potential risk of zoonotic transmission, these results are epidemiologically relevant and contribute to updating data on endoparasitic infections in dogs in the study region. Therefore, the study reinforces the importance of regular parasitological testing for the accurate diagnosis and treatment of parasitosis in companion animals. Such measures can reduce the persistence and spread of parasitic diseases in dogs and humans.

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