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Prevalence of Trichuriasis in Shelter Dogs of Kırıkkale with Emphasis on Turkish Reports

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Abstract

The whipworm, *Trichuris vulpis*, dwells in the caecum and infrequently the colon in the dog. The present study aimed to detect trichuriasis in shelter dogs in Kirikkale province, Türkiye. The other reports originated from Türkiye on trichuriasis were addressed together with the results. The investigation was conducted from January through December of 2022. The faecal samples were obtained from 200 dogs (mixed breed, older than 1 year) from two different shelters in Kirikkale. The faecal samples were analysed by centrifugal flotation both zinc sulfate and saturated salt solution. *Trichuris* spp. eggs were only found in 0.5% of the faeces (1/200), while other parasite eggs or oocysts were found in 21.5% of the faeces examined (43/200). The eggs of *Toxocara* spp. (6%, 12/200), *Toxascaris* sp. (2.5%, 5/200), *Taenia* spp. (2.5%, 5/200), hookworm eggs (0.5%, 1/200), *Isospora* spp. oocysts (11%) (22/200) and *Sarcocystis* spp. sporocysts (0.5%, 1/200) were detected. Only 3/200 (1.5%) of the dogs evaluated had mixed infections. Regarding the detection of all parasite eggs and oocysts, the zinc sulfate flotation technique outperformed the flotation with saturated salt solution. Canine trichuriasis has rarely been reported in Türkiye. The results of this study also support the previous reports.

Keywords: *Trichuris* spp., shelter dog, faecal examination, prevalence.

INTRODUCTION

Trichuris vulpis (Nematoda: Enoplida) lives in the caecum and rarely in the colon in dogs (Doganay, 2021). Male and female parasites are 4.5-7.5 cm long (Saari et al., 2019). The adult parasite has a whip-like morphology, and it is called "whipworm" (Traversa, 2011). The parasite develops without any intermediate host (monoxene) (Taylor et al., 2007). The first stage larva develops in the egg within a few months under suitable humidity and temperature conditions in nature (Anderson, 2000; Traversa, 2011; Doganay, 2021). The eggs including first-stage larvae (L1) are responsible for host infection (Taylor et al., 2007). Following oral ingestion of the eggs containing L1, larvae 1 enters in the Lieberkuhn crypts and subsequently invade the mucosa of the large intestine in the host (Saari et al., 2019; Doganay, 2021). The prepatent period is 2-3 months (Traversa, 2011). Trichurosis is generally asymptomatic in dogs (Doganay, 2021) and some clinical signs are observed during the prepatent period (Traversa, 2011). However, severe clinical signs can be observed in some dogs infected with trichuriasis (Taylor et al., 2007).

Canine trichuriasis has been reported in worldwide (Traversa, 2011). *Trichuris vulpis* is a neglected parasite in dogs and the prevalence rates are reported as 17.6-22.8% in Italy (Capelli et al., 2006; Liberato et al., 2018). Trichuriasis has also been detected in dogs in the neighbour countries of Türkiye (Papazahariadou et al., 2007; Mirzaei and Fooladi, 2012; Tavassoli et al., 2012; Iliev et al., 2017; Diakou et al., 2019; Iliev et al., 2020; Shukur, 2021; Issa et al., 2022). *Trichuris* spp. is reported between 10.42-15.1% in dogs from Bulgaria (Iliev et al., 2017; Iliev et al., 2020), 3.5-9.6% from Greece (Papazahariadou et al., 2007; Diakou et al., 2019), 4.38-68% from Iraq (Shukur, 2021; Issa et al., 2022) in 4.3-36.2% from Iran (Mirzaei and Fooladi, 2012; Tavassoli et al., 2012). Diagnostic methods, climatic conditions, housing and feeding conditions and ages of sampled dogs are responsible for differences of prevalence (Traversa, 2011).

Dog trichuriasis has been rarely reported and the prevalence varies between 0.6-7.89% in Türkiye (Mimioglu et al., 1959; Doğanay, 1990; Zeybey et al., 1992; Unlu and Eren, 2007; Baklaya and Avcıoğlu 2011; Cicek and Yilmaz, 2012; Gurler et al., 2015; Oge et al., 2017; Nas and Bicek, 2018; Afhsar et al., 2022). In addition to necropsy and faecal examination results, *T. vulpis* eggs are reported as 2.27% in the hair samples of the dogs in Türkiye (Karaaslan, 2015). *Trichuris* spp eggs are recorded as 2.4% of the sand samples collected in some public parks located in Ankara, Türkiye (Oge and Oge, 2000) and as 21.42% in the sludge samples of the wastewater treatment plant in Elazig, Türkiye (Obek et al., 2000). The present study, it was aimed to detect the prevalence of *Trichuris* spp. in dogs living in shelters in Kirikkale. The results obtained were discussed together with the reports originating from Türkiye on this parasite.

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MATERIALS AND METHODS

All animal handling was made according to the rules of the Animal Experiments Local Ethics Committee of Kirikkale University (E-60821397-010.99-129466). The study was carried out in a period between January and December 2022. The faecal samples were sampled from 200 dogs (mixed breed, over 1 year old) from two different shelters in Kirikkale province, Türkiye. The dogs live in separate kennels without contact with each other. Cleaning is made daily with pressurized tap water in the kennels. No attempt was made to collect faecal samples from dogs and they were sampled immediately after it has been dropped on the floor. Faecal consistency scores were recorded based on a modified faecal scoring system for dogs (https://vmc.usask.ca/documents/fecal-scoring-system.pdf). The samples were prepared using the centrifugal flotation technique both using the saturated salt solution and zinc sulfate (with a specific gravity of 1.3). After centrifugation (at 1500 rpm for 5 minutes), the upper part was put on a slide and covered by a cover slide and then they were examined under a light microscope (Leica DM100). Parasite eggs were diagnosed based on related references (Schmaschke, 2014).

RESULTS

In the present study, 145 of the faecal samples were taken from the dogs from Shelter 1 and 55 of them from Shelter 2. The parasitic eggs or oocysts were detected in 21.5% of faeces examined (43/200); however, *Trichuris* spp. eggs were observed in only 0.5% of the faeces (1/200). *Trichuris* spp. eggs were barrel- or lemon-shaped, yellowish-brown in colour, thick-walled, smooth on the surface, and have characteristic plugs at both ends symmetric and measured as 80x35 µm in diameter (Figure 1).

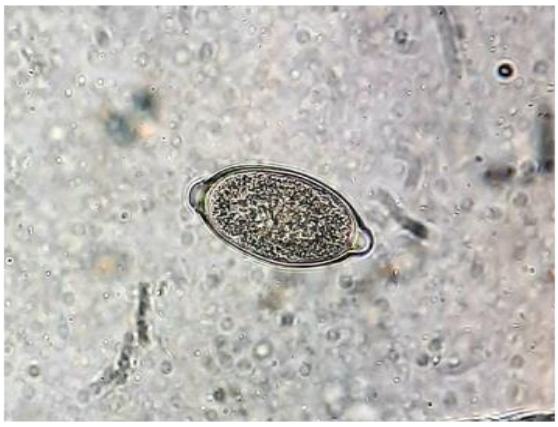

Figure 1. *Trichuris* spp. egg (x40).

Table 1. The results of faecal examination of the dogs in the shelters.

	Parasite species	Positive (n:200)	%
Helminths	*Trichuris* spp.	1	0.5
	Toxocara spp.	12	6
	Toxascaris sp.	5	2.5
	Taenia spp.	5	2.5
	Hookworm egg	1	0.5
Protozoon	*Isospora* spp. oocyst	22	11
	Sarcocystis spp. sporocyst	1	0.5

In the present study, the diagnosis rate of parasitic eggs or oocysts was slightly different based on the saturated solutions used the flotation technique. The parasite eggs or oocysts were detected as 7% of the dog faeces with the zinc sulfate flotation technique, whereas it was 1.5% during the analysis of the same samples with the saturated salt solution. While *Taenia* spp. eggs were observed only in the zinc sulfate flotation technique, they were not observed in the flotation with the saturated saline solution.

DISCUSSION AND CONCLUSION

The eggs of *T. vulpis* can survive in nature from rainy and cold winter season to hot summer months (Traversa, 2011). Dry conditions and direct sunlight can kill *Trichuris* spp. eggs (Bar and Bowman, 2012). *Trichuris* spp. eggs are inactivated at -20°C after 24 hours of incubation (Kines et al., 2021). In this study, the low trichuriasis rate in the sampled dogs (0.5%) may relate to the research area's climatic conditions. Kirikkale is located in the Central Anatolia which possesses a continental climate (cold winters and hot-dry summers). The infective stage larvae may not develop in the eggs on the soil because of the hot climatic conditions in this region. Canine trichuriasis has been reported as 0.7-7.89% in previous studies in the other parts of Central Anatolia, Türkiye (Gurler et al., 2015; Oge et al., 2017). Türkiye is surrounded by the sea on three sides and the coastal areas generally have a mild Mediterranean climate in contrary to the central part. There are some prevalence reports about dogs trichuriasis in the coastal regions of Türkiye (1.5- 6.9%) (Unlu and Eren, 2007; Gurler et al., 2015), however; there is no significant difference in the prevalence rate between the central and the coastal regions of Türkiye.

The prevalence of trichuriasis was low compared to toxocariasis in the dogs in this study (0.5% vs 6%). It is well known that *T. vulpis* eggs have a thick shell-like *Toxocara* spp., so the eggs of these parasites are known to resist natural conditions (Anderson, 2000; Taylor et al., 2007; Saari et al., 2019). However, the high prevalence of toxocariasis in the sampled dogs may be due to the different ways this parasite can infect the dog population such as intrauterine and transmammary transmission, eating of paratenic hosts or parasite eggs containing infective stage larvae. In contrast, *T. vulpis* is transmitted to the dog only in the oral way.

Dogs who live in shelters are exposed to various stressors, such as overcrowding or isolation, unfamiliar surroundings and noise, changing feeds, and restricted movement. Because of the stress factors and difficulty in preventing environmental contamination, animal shelters provide favourable conditions for the establishment and spread of parasitic infection (Raza et al., 2018). *Trichuris* spp. eggs are usually difficult to destroy in the environment (CFSPH, 2019). Prolonged desiccation and exposure to sunlight as well as heat treatment of solid surfaces, may ensure the elimination of eggs of the parasite (Raza et al., 2018; CFSPH, 2019). There are some data on the sensitivity of *Trichuris* spp. eggs to disinfectants (CFSPH, 2019). *Trichuris* spp. eggs are completely inactivated by some disinfectants such as 10% bleach and 10% iodine after five minutes of incubation, 95% ethanol after 48 hours, and 10% formalin after four weeks (Kines et al., 2021). In the present study, trichuriasis rate was detected as 0.5% in the sampled dogs. Any disinfectant has been not used in the sampled shelters. The low prevalence of the parasite can be explained by the faeces has been removed daily in the shelters. Separate kennels can reduce

possible parasitic contamination of the sampled dogs in the present study.

The clinical diagnosis of trichuriasis is made by faecal examination (Taylor et al., 2007). The flotation technique with saturated solutions generally is preferred (Traversa, 2011; Saari et al., 2019). The specific gravities of the saturated salt solution and zinc chloride solution are 1.20 and 1.30, respectively (Schnieder, 2006). Flotation carried out in saturated salt solution is generally used in laboratories because it is cheaper, however; the zinc sulfate flotation technique is known more reliable detection of *T. vulpis* infections (Zajac et al., 2002). It is probably due to the fact that comparing to other helminth eggs, *Trichuris* spp. eggs have a greater specific gravity (Zajac et al., 2002). Twice as many *T. vulpis* eggs have been found in the zinc sulfate centrifugal flotation technique (Gates and Nolan, 2009). Also, the zinc sulfate flotation technique is to be effective in the diagnosis of *Taenia* spp. eggs (Maurelli et al., 2018). In the present study, the eggs of *Taenia* spp. were found to only the zinc sulfate centrifugal flotation technique and this technique was more effective in terms of all parasite egg/oocyst detection (7% vs 1.5%).

Canine trichuriasis has rarely been reported in Türkiye from the past to the present. The results of this study also support this situation. The infective stage larvae may not develop in the eggs on the soil because of the hot climatic conditions in Türkiye.

Conflict of Interest

The authors declare that they have no competing interests.

Authorship contributions

Concept: G.N.A., S.A., Design: G.N.A., S.A., Data Collection or Processing: G.N.A., S.A., Analysis or Interpretation: G.N.A., S.A., K.Y., Literature Search: G.N.A., S.A., K.Y., Writing: G.N.A., S.A., K.Y.

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