Original Article

Study of Soil Contamination by Toxocara Spp. Eggs in Fasa, South of Iran from April to December 2018

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Abstract

Background & Objective: Toxocariasis is a parasitic disease caused by dog ascaris and cat ascaris. Raising pets, especially dogs or cats, has been part of modern life and this raising is the cause of soil contamination by *Toxocara* spp. eggs. Contacted with contaminated soil is considered the main reservoir of transmission of *Toxocara* infection to humans. This survey was carried out to clarify the current status of soil contamination by *Toxocara* spp. eggs.

Materials & Methods: Soil contamination by *Toxocara* spp. eggs was surveyed in Fasa from April to December 2018. In this study, 56 soil samples were collected from 10 public parks in Fasa. The soil samples were provided by the flotation method and examined by a microscope.

Results: The results of this study showed that six (60%) of 10 parks were contaminated by Toxocara eggs. Out of 56 samples collected, 54 *Toxocara* spp eggs were found.

Conclusion: High prevalence of *Toxocara* spp. eggs in soil samples of this study can be associated with the rising population of stray dogs or cats and pets in public parks, the carriers of adult worms and the active source of soil contamination.

Keywords: *Toxocara*, Fasa, Soil, Contamination

Introduction

Toxocariasis or Visceral Larval Migrans (VLM) syndrome is one of the zoonotic parasitic diseases that is produced by *Toxocara Canis* and *Toxocara Cati*, in which *Toxocara Canis* is more significant (1, 2). Every worm in the intestines of dogs and cats contaminated daily can deliver a large number of eggs, which along with the stool, are removed from the body of dogs and cats. Humans consumeing food and contaminated water, as well as being in contact with soil contaminated with this worm are affected by toxocariasis (3-5). However, according to some researchers, the probability of transmission of this disease by animals with direct physical contact of human is not very high, since it takes the egg excreted with the dog and cat stool at least 2 weeks to reach the infectious stage to contaminate the soil. Therefore, soil as a reservoir for *Toxocara* parasites is essential for the spread of the disease.

The infection can be transmitted to the human body whenever it contacts the contaminated animals and contaminated soil (6, 7). After the egg enters the intestines, the larvae migrate it and penetrate the intestinal wall through the blood vessels and lymph nodes into the liver, lungs, heart, brain, eyes, and some of the tissues. Then, there is a granuloma around the larvae that causes them to separate from host tissues. The variety of symptoms depends on the number and location of the granulomas and host responses relative to

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the larval antigen. In general, there are three clinical forms in toxocariasis: Visceral Larva Migrans (VLM), Ocular Larva Migrans (OLM) and Occult Toxocariasis (Covert toxocariasis = CT), where the contamination by each one leads to its own symptoms (7-9). There are several methods for evaluating the prevalence and frequency of egg worms one of which is saturated sucrose, and soil contamination by the egg of the infection has been reported more or less in different parts of the country. Numerous studies in Iran show that the prevalence of *Toxocara* eggs is increasing significantly in soil samples. Since research carried out in different parts of the country indicates a significant difference between different parts of the country regarding egg outbreaks (10, 11), the formalin-ether diagnostic method is used along with the saturated sucrose (sheathers) method. Although the formalin-ether method is a standard diagnostic procedure for parasitology with a very high diagnostic power, none of the previous studies have been performed using the formalin-ether method. Considering the importance of *Toxocara* hygiene and the close relationship between dogs and cats with humans and the exact knowledge of the prevalence of this worm, the prevalence of *Toxocara* was investigated with two formalin-ether and saturated sucrose (sheathers) diagnostic methods in Larestan, south of Iran in 2018, which will be discussed later.

Materials & Methods

This cross-sectional descriptive study was conducted from April to December 2018 to investigate soil contamination by Toxocara parasite in Fasa. A total of 56 soil samples were collected from 10 public parks to determine the prevalence. About 200 gr soil was taken at 10 cm depth at the center of an isolated area from each place. After transferring them to the parasitology laboratory of Jahrom University of Medical Sciences, the samples were dried at room temperature for 48 hours. Subsequently, large particles were removed using a conventional sieve. Afterward, a 150-micron beaker was used for separation. Then, for concentration and isolation of *Toxocara* eggs from the soil, a saturated sucrose (sheathers) method was used (12-14).

Saturated Sucrose (Sheathers):

In this method, 10 gr of each sample was poured into a glass tube and mixed with 100 ml of saturated sucrose (sheathers) using the applicator for 20 minutes. The specimens were then spilled on 5 cc falcons, and the coarse particles immediately emerged from the tube. The solution was added again to the tube to create a convex surface at the top of the tube, then it was placed under a microscope cover glass 22x22 over the tube aperture and the tube was placed in one place for 15 minutes. After 15 minutes, the samples were analyzed under light-microscopy for egg identification. After observation, the microscope slides and microscope cover glass 22x22 were washed with distilled water, and the contents were centrifuged for 5 minutes at 2500 rpm and then transferred from the centrifuge tubes to the microtip. Finally, the samples were poured into 3% potassium dichromate and dichromate, and they were examined for maturation and better detection of parasites for a week. All isolates were studied for a specific study by acid-fast specific staining. After calibrating the optical microscope, all the parasites were identified and detected using a saturated sugar solution (13).

Results

The research parks included Park Kodak, Park Azadi, Park Shahr, Park Mahaleh, Park Terminal, Park Fajr, Park Nojom, Park Shahrdari, Park Shahiddehghankhalili, and Park Meli, whose geographic location is shown in figure 1.

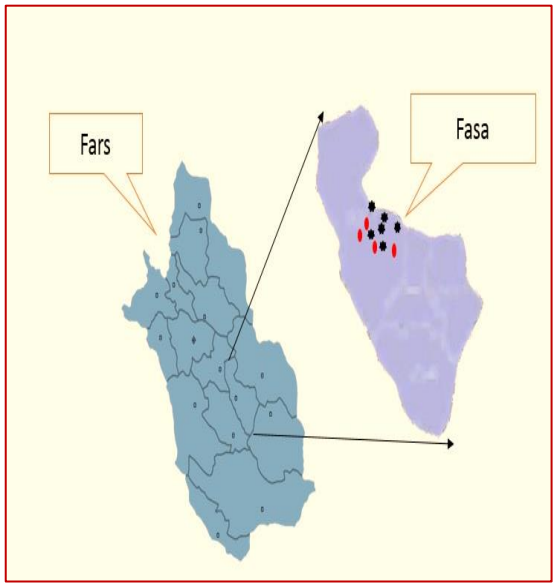

Figure 1. Geographic region image of Fars province, Fasa south of Iran. The studied areas are marked with plumage and scored with no signs of contamination with the * sign.

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Research results showed that six (60%) of 10 parks were contaminated by Toxocara eggs. A total number of 54 eggs were found by saturated sucrose (sheathers) method (figure 2). In this study, Park Kodak showed the highest contamination rate with 15 (%27.7) Toxocara spp. eggs and Park Terminal showed the least contamination rate with 5 (%9.25) Toxocara spp. eggs.

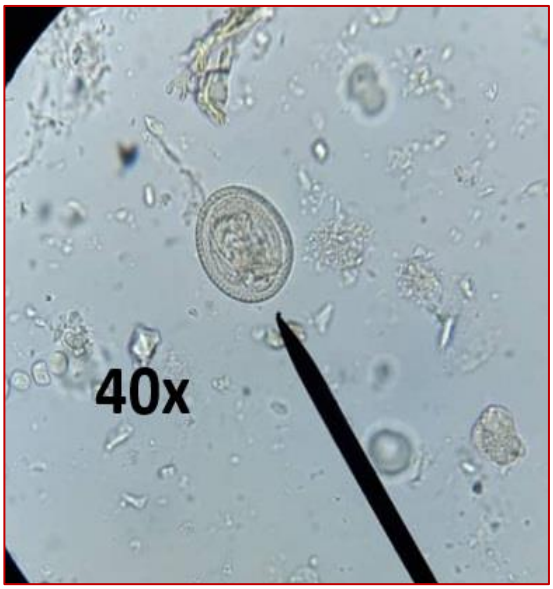

Figure 2. *Toxocara* spp. eggs image in soil from contaminated parks Fasa city, south of Iran 2018 (magnification 40x).

Discussion

Toxocariasis is one of the zoonotic diseases that causes pollution in animals and humans through soil. Soil contamination by *Toxocara* spp. eggs is a significant etiological agent of visceral larva migrans and ocular larva migrans in humans. Hence, studying the status of soil contamination in each region is a health priority. Parks and public places in each city are among the high-risk areas for infecting people, especially children who are playing. Several studies have been conducted in different regions of the country. In Iran, there are also reports of this disease over the last years so that mature worms of *Toxocara* have been reported in dogs and cats. Studies have reported 10%–51.6% and 9.4% – 52.7% prevalence of Toxocara in dogs and cats, respectively (12, 15-17). Using the saturated sucrose method in the present study, it was found that 6 of 10 parks (60%) were contaminated, which indicated the high level of soil contamination with *Toxocara* spp. Eggs in Fasa parks. In a study to investigate the pollution of the public parks in Arak city in 2014, Mohammadi et al. used the saturated sucrose method. Of the 15 parks examined, 4 parks (26.6%) were contaminated, while in the present study, the results indicated that the contamination was much higher than that of Mohammadi et al. (11). Moreover, in 2012, Karadeh et al. investigated the amount of soil contamination in the public parks of Tabriz using the saturated sucrose method. They reported an infection rate of 53.9%, which was consistent with the amount of contamination reported in this study (18). In a study to investigate prevalence and viability of eggs of Toxocara spp. in public parks in eastern Spain in 2001, Ybxkáñez et al. reported an infection rate of 67%, which was consistent with the amount of contamination reported in this study (9). In 2013, GhorbaniRanjbary et al. reviewed the frequency of Toxocara eggs in Shiraz public parks, using saturated sucrose method. Out of 20, three parks (15%) were contaminated, which is lower than this study (19). In 2015, Heshmat et al. investigated the rate of soil contamination in the public parks of Isfahan City. They reported an infection rate of 15.33% using the saturated sucrose method, which is lower than that of this study (19). In 2016, Rezanezhad et al. studied the contamination rate in the parks, elementary schools, and kindergartens in Jahrom City. They reported a contamination rate of 4% with saturated sucrose (sheathers) method, which is lower than that of this study (10). In 2018, Ebrahimzadeh et al, studied the contamination rate of parks in Larstan. They reported a contamination rate of 31.25% with saturated sucrose (sheathers) method, which is lower than that of this study (20). The high contamination rate may be due to climatic conditions, seasonal changes, soil types, population type of cats and dogs, people's attitudes toward pets, raising stray dogs, sample collection, the methodology of examination, and diagnostic techniques. Thus, various factors affect the increase in the number of *Toxocara* spp. eggs.

Conclusions

The great number of eggs observed in this research is related to the extent of Toxocariasis in people, especially children who are exposed to the disease due to direct contact with the soil in playgrounds of parks. It is necessary to establish rules and regulations for not entering the dogs

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into the lawns and parks of the children's playground.

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Conflict of Interests

The authors announce no conflict of interest.

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مقاله پژوهشی

بررسی آلودگی خاک پارک های شهر فسا به تخم توکسوکارا، جنوب ایران طی فروردین ماه تا آذر ماه ۱۳۹۷

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چکیده

زمینه و هدف: توکسوکاریازیس یک بیماری انگلی می باشد که توسط توکسوکارای سگ و گربه ایجاد می شود. افزایش حیوانات خانگی خصوصا سگ وگربه بخشی از زندگی مدرن شده و این باعث افزایش الودگی خاک پارک ها می شود. تماس مستقیم با خاک آلوده مخزن اصلی آلودگی انسان به توکسوکارا می باشد. این مطالعه با هدف بررسی وضعیت الودگی خاک ها به تخم توکسو کارا انجام گردیده است.

مواد و روش ها: بررسی آلودگی خاک پارکهای شهر فسا به تخم توکسوکارا، طی فروردین ماه تا آذر ماه ۱۳۹۷ انجام شد. در این تحقیق ۵۶ نمونه خاک از ۱۰ پارک فسا جمع آوری شد. نمونه ها با روش شناورسازی و با میکروسکوپ مورد بررسی قرار گرفتند .

نتایج: نتایج بیانگر آلودگی ۶ تا از ۱۰ پارک مورد بررسی به تخم توکسوکارا بود. از ۵۶ نمونه مورد بررسی ۵۴ تخم توکسوکارا یافت شد.

نتیجه گیری: شیوع بالای تخم توکسوکارا در این تحقیق می تواند حاکی از افزایش سگ و گربه های ولگرد باشد. که این خود سبب می شود کرم های بالغ در خاک تشکیل شوند و مخزن آلودگی باشند.

کلمات کلیدی: توکسوکارا، فسا، خاک، آلودگی

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