

Prevalence of *Toxocara* spp. Eggs in Soil Samples of Public Parks of Ilam City, Iran

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ABSTRACT

Introduction: Toxocariasis, also known as Visceral Larva Migrants (VLM) syndrome, is a parasitic disease caused by the ascaris larva migrans of dogs and cats, especially *Toxocara canis*. The eggs of this parasite enter the human body through contaminated food, water, and soil.

Aim: To determine the prevalence of *Toxocara* spp. eggs in the soil of public parks in Ilam city, Iran.

Materials and Methods: In this descriptive cross-sectional study, 40 soil samples (100 grams per sample from the depth of 3 to 5 cm) were randomly collected from 10 public parks of Ilam city in the summer season of 2018. After washing, grinding, and separating large particles from the samples, parasitic eggs were isolated using 150-micron filters and

sucrose flotation method. The data was analysed using SPSS 20 software.

Results: Five of ten parks (50%) were contaminated with *Toxocara* spp. eggs. From 40 soil samples collected from the public parks, 16 (40%) were contaminated with *Toxocara* spp. eggs. Most of the contaminated samples were collected from walking and flowering areas in all the parks. Microscopic studies showed an average of 1-4 *Toxocara* spp. eggs per microscopic field in each sample indicating 4 to 16 eggs per 100 grams of soil in each contaminated park.

Conclusion: Due to the high level of contamination with *Toxocara* spp. eggs in Ilam city parks, it is necessary to prevent dogs and cats from entering to lawns and playgrounds in public parks by fencing.

Keywords: Control, Epidemiology, Public health, Visceral larva migrans, Zoonosis

INTRODUCTION

Toxocariasis, also called VLM syndrome, is a globally distributed parasitic disease caused by entering of *Toxocara* spp. larva into the human body. The adult worms of this parasite live in the intestine of hosts such as dogs and cats and expel large numbers of eggs daily [1-5]. Humans are also affected through food and water contaminated with the parasite eggs [4,6]. Considering that the eggs hatched from the intestine of dogs and cats require at least 2 to 3 weeks to reach the infectious stage; the possibility of *Toxocara* spp. transmission through direct human-animal contact is not significant. Therefore, contaminated soil is considered to be the source for spread of *Toxocara canis* and *Toxocara cati* parasites [2,5,7]. After entering of eggs into the human's gastrointestinal tract, larvae exit from the eggs and penetrate into the wall of the small intestine and then to liver, lung, heart, brain, eyes, and other tissues through the blood and intestinal lymphatic vessels. Afterwards, granuloma foci are developed around the larvae separating them from host's tissues [2,7,8]. The signs and symptoms of the disease depend on the number and location of the granulomas and the host's immune responses. There are generally three clinical forms of larva migrans syndrome: VLM, Ocular Larva Migrans (OLM) and Common Toxocariasis (CT). Each of these disease presents with its specific clinical manifestations [2,5,6,8,9].

There are different methods including saturated sucrose method for estimating the prevalence of *Toxocara* spp. eggs, particularly in soil. Several reports have shown raising prevalence of *Toxocara canis* and *Toxocara cati* eggs in soil samples in different regions of Iran [1,10,11]. The oral route is the main path of toxocariasis transmission to human. The disease is common among humans and animals. Dogs and cats are the main sources of contamination in soil. Therefore, close contact with dogs and cats increases the risk of toxocariasis [1,6]. Due to the impact of this disease on public and personal hygiene, it is necessary to accurately estimate the prevalence of this parasite eggs in the environment. So, the present study, thus, aimed to investigate the prevalence of *Toxocara* spp. eggs in the soil of public parks in Ilam city, West of Iran, in 2018.

MATERIALS AND METHODS

Study Population

This was a descriptive cross-sectional study conducted in Ilam University of Medical Sciences, Iran. Institutional Ethics code was obtained from the university (Code: 978049/1135). Total of 40 soil samples were collected randomly from 10 public parks of Ilam during the months July to September 2018. These chosen parks were some of the largest and most crowded in the city, and the sample size was obtained using the Cochran formula. Samples without *Toxocara* spp. eggs or contaminated with other parasites were excluded from the study.

Study Area

This study was conducted in public parks of Ilam city including ChoghSabz, Kosar, Mellat, Arqavan, Koudak, Golha, Bam-e-Ilam, Kanoon, Moallem and Shaghayegh. Ilam city is the capital of Ilam province located in the West of Iran. The province covers an area of about 19086 Km² in a mountainous area bounded from North to Kermanshah, from South to parts of Khuzestan and Iraq, from East to Lorestan and from West to Iraq. It has three climate zones including cold mountainous, temperate mountainous, warm and arid.

Collection and Microscopic Examination of Samples

Four specimens (one from each of seating, walking, flowering and playing areas) were collected from each park. Each sample contained 100 g of soil collected from a depth of 2-5 cm. The samples were transferred to the parasitology laboratory and were rinsed with a syringe containing 50 ml of normal saline. After that, each specimen was stored separately in glass containers at a temperature of 4°C in the refrigerator for 96 hours [3,7]. Then the soil samples were dried at temperature 25°C for 24 hours and filtered using 150-micron mesh sieves. The concentration technique was performed on the obtained soil sample using a two-step sucrose gradient method [2,4]. In the sucrose flotation procedure, almost one gram of each sample was placed into a tube mixed with 0.5% tween 20 solution and was shaken and centrifuged at 1500 rpm for 10 minutes. The

supernatant was discarded. The precipitate was re-suspended in 8 mL water and was again centrifuged under the same conditions. The supernatant was again removed and sediment was suspended in sucrose solution with a specific gravity of 1.200 to 1 cm from the top. The suspension was mixed well on vortex and centrifuged at 1500 rpm for 10 minutes. Then tubes containing the suspension were filled to the brim with additional sucrose solution and covered with a clean coverslip. After a final centrifugation of the tube together with coverslip at 600 rpm for 5 minutes, the coverslip was transferred to a glass slide and tested at the magnifications of 40X and 100X for parasitic elements, especially *Toxocara* spp. eggs by light Microscopy [1,3,4,7].

Five slides were prepared from each sample and examined under the light microscope. To find the number of eggs in each place, it was divided by the total number of eggs seen with the total number of fields, and thus obtained the average number of eggs in every 100 grams of soil [1,4].

Data Analysis

The data was statistically analysed by SPSS 20 software.

RESULTS

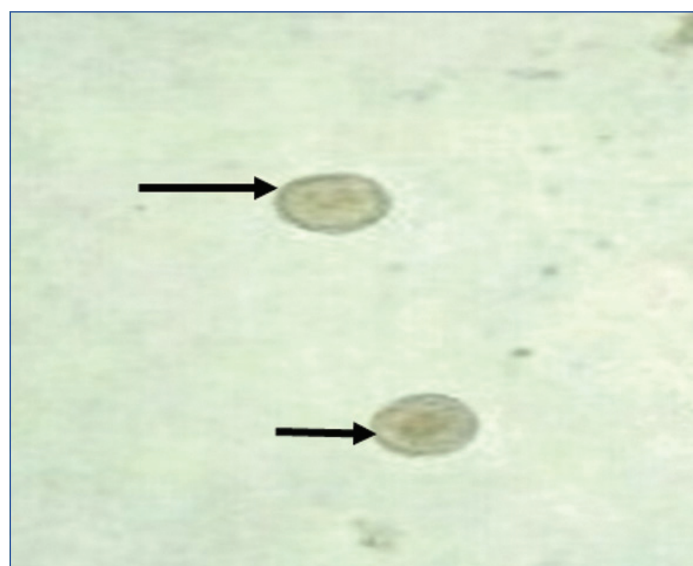
In this study, 10 parks were studied (ChoghaSabz, Kosar, Mellat, Arqavan, Koudak, Golha, Bam-e-Ilam, Kanoon, Moallem and Shaghayegh). Out of these, *Toxocara* spp. eggs were detected in five (ChoghaSabz, Kosar, Arqavan, Bam-e-Ilam, and Moallem). Among the contaminated parks, the highest levels of contamination were observed in the ChoghaSabz and Kosar parks, both of which are located in the South of Ilam city [Table/Fig-1].

| Frequency N(%) | Region | | | | | | | | | | Total |
|------------------|------------|----------|-----------|-----------|------------|--------|-------|--------|------------|--------|-----------|
| | ChoghaSabz | Kosar | Arqavan | Moallem | Bam-e-Ilam | Mellat | Golha | Kanoon | Shaghayegh | Koudak | |
| Positive samples | 4 (25.0) | 4 (25.0) | 3 (18.75) | 3 (18.75) | 2 (12.5) | - | - | - | - | - | 16 (100%) |

[Table/Fig-1]: Prevalence of *Toxocara* spp. eggs in the soil samples.

| Variables | Positive frequency percentage |
|--------------------------|-------------------------------|
| Number of parks surveyed | 5 (50.0) |
| 1. Seating area | 4 (40.0) |
| 2. Walking area | 5 (50.0) |
| 3. Flower bed | 5 (50.0) |
| 4. Playground | 2 (20.0) |
| Total | 16 (40.0) |

[Table/Fig-2]: The prevalence of *Toxocara* spp. eggs in four different locations in public parks in Ilam city in 2018.



[Table/Fig-3]: *Toxocara* spp. eggs in the soil (Floating method).

In the present study, from 40 soil samples collected from the public park, 16 (40%) samples were positive for *Toxocara* spp. The highest contamination rates were seen in walking (50%), flowering (50%), seating (40%) and children's playing (20%) areas, respectively [Table/Fig-2]. An average of 1 to 4 *Toxocara* spp. eggs were observed in each microscopic field indicating an average of 4 to 16 eggs per 100 gram samples [Table/Fig-3].

DISCUSSION

This study showed significant and noticeable results. Identification of *Toxocara* spp. eggs in soil samples from 50% of Ilam's parks can predict an epidemic of VLM syndrome in the region, especially among children. Different results have been reported by various studies carried out on soil samples of public parks in different regions of the country regarding the rate of this zoonotic infection with *Toxocara* spp. eggs [Table/Fig-4] [1,3,4,7,11-16]. According to these studies, the prevalence of *Toxocara* eggs varies in parks from different regions of Iran. The prevalence *Toxocara* spp. may be influenced by several factors including geographic location, climate, local culture and customs, the number of strayed dogs and cats, the efficiency of health and hygiene networks in controlling the disease, the sampling season, and finally the accuracy of diagnostic methods [1,3,4]. In the aforementioned studies, those in Zanjan (77.7%) [1] and Urmia (3.9%) [13] reported the highest and lowest soil contamination rates in the country, respectively. The present study had the third highest rate of contamination among similar studies after Zanjan [1] and Abadan [11].

In the present study, the highest level of contamination was observed in the ChoghaSabz and Kosar parks located in the South of Ilam

| Authors | Year of study | City or province | The prevalence of <i>Toxocara</i> spp. eggs in soil samples of public parks (%) |
|---------------------------------------|---------------|------------------|---|
| Tavasouli M et al., [13] | 2003-2004 | Urmia | 3.9 |
| Garedaghi Y and Shabestari-Asl S [7] | 2008 | Tabriz | 9.3 |
| Khazan H et al., [15] | 2008 | Tehran | 10.0 |
| Zibaei M et al., [12] | 2009 | Khorramabad | 22.2 |
| Ghorbani Ranjibary A et al., [3] | 2012 | Shiraz | 15 |
| Maraghi S et al., [11] | 2012 | Abadan | 61.2 |
| Yakhchali M and Ebn-Adamnezhad A [14] | 2012-2013 | Piranshahr | 8.0 |
| Mohamadi S et al., [4] | 2015 | Arak | 26.6 |
| Jafari S et al., [1] | 2017 | Zanjan | 77.7 |
| Ebrahimizadeh F et al., [16] | 2018 | Larestan | 31.25 |

[Table/Fig-4]: Prevalence of *Toxocara* spp. eggs in soil samples of public parks in different parts of Iran.

city. The city of Ilam is one of the main gateways to the holy shrines in Iraq, and most Iranian choose this city to leave the country for pilgrimage. On the other hand, South of Ilam is the main entrance gate to the city providing travelers, pilgrims and tourists with these parks for resting and leisure. These two parks are the main parks of Ilam, and most indigenous people also spend their holidays and leisure time in these parks. Another probable reason for the high prevalence of *Toxocara* spp. eggs in these parks may be the high number of strayed dogs and cats.

According to the results of the present study, the highest contamination rates were observed in the walking and flowering

areas. Besides, the least contamination rate was seen in the children's playgrounds which may be due to the lack of food wastes and the absence of strayed dogs and cats in these parts of public parks. Nevertheless, present study results are in accordance with the study conducted by Jafari S et al., on the soil samples of public parks in Zanjan in 2018 in which the highest and lowest levels of contamination were related to the walking and children's playground areas [1].

Limitation(s)

Toxocara spp. identification was not done in this study due to lack of facilities.

CONCLUSION(S)

Now-a-days, public parks are popular hubs for recreation, and it should be paid special attention to the hygiene and safety of these areas. Among those strategies to control and prevent VLM syndrome, the most effective one is to prevent strayed dogs and cats from entering into parks by fencing, because it reduces the parasite's egg burden. However, it may not be entirely successful. Thus other ways could be helpful to control the infection such as personal hygiene and no contact with contaminated soil, dogs, and cats are best and most important ways to control the infection. It is recommended for sero-epidemiology determination infection in Ilam's population, especially among children due to the high contamination rate of public parks with *Toxocara* spp. eggs in Ilam city of Iran.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Mar 02, 2020
- Manual Googling: May 07, 2020
- iThenticate Software: Jun 25, 2020 (17%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Feb 15, 2020**

Date of Peer Review: **Mar 31, 2020**

Date of Acceptance: **May 14, 2020**

Date of Publishing: **Jul 01, 2020**