Prevalence of *Toxocara* spp. Eggs in the Soil of Marand Parks: A Local Report

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**Abstract**

**Background:** Toxocariasis caused by *Toxocara canis* and *Toxocara cati* is a worldwide zoonotic parasitic infection that can be acquired from contaminated soil. The soil contamination of public places and parks is one of the effective factors in human pollution.

**Objectives:** The current study was designed and implemented to investigate the prevalence of *Toxocara* species eggs in the soil of Marand parks (in the northwest of Iran).

**Materials and Methods:** Present cross-sectional study was conducted between September and December 2021. Overall, 160 samples were collected from 10 large parks with high traffic and then analyzed by parasitological techniques (sucrose flotation).

**Results:** The overall prevalence was assessed at 27.2% in Marand public parks; the highest and lowest prevalence rates were related to Besat park and Shahr park, respectively (39.6% vs. 19.3%). The maximum number of recovered eggs from 100 grams of soil was seven eggs.

**Conclusion:** Considering the remarkable prevalence of *Toxocara* spp. in the Marand parks, control and preventive measures seem necessary.

**Keywords:** *Toxocara* spp. eggs, Soil contamination, Public parks, Marand

**Background**

Soil is considered an important non-living resource of protozoan and helminthic parasites (geohelminths) since ingestion of contaminated soil leads to human infections, especially in children who are more exposed to it.1 Resistant and infectious forms of zoonotic parasites can remain in the soil under suitable temperature and humidity conditions.2 Soil-borne parasitic infections are a health problem worldwide, especially in tropical regions. Zoonotic *Toxocara* spp., hookworms, *Acaris lumbricoides*, and the like as parasitic worms and *Toxoplasma gondii* as a protozoa parasitic are the potential soil-transmitted parasites.3

The acquisition of infection can occur directly from the soil (swallowing or skin) or forms of the parasite that enter the human body through the ingestion of contaminated paratenic host, and continue to mature in the human body. The clinical manifestations of toxocariasis can be covert or overt, which is often asymptomatic, but visceral larva migrans and ocular larva migrans are among the most common symptomatic forms of human infections.5 Public parks and children’s playgrounds are potential places for the contamination of children and even adults. As animals close to humans, cats and dogs (domestic or stray) are the most abundant animals near human habitations; on the other hand, *Toxocara cati* and *Toxocara canis* species are specific parasites of the cats and dogs, respectively, which have been isolated and reported in abundance from soil sources.6

Up to now, several investigations have been conducted in the field of soil contamination of parks with *Toxocara* spp. worldwide and in Iran.7-10 The global prevalence *Toxocara* spp. was estimated at 21%.11 There are many reports on parasitic soil contamination in different parts of Iran; however, due to the climatic conditions of Iran, which has a wide range of tropical, temperate, and cold mountainous climates, the information about soil contamination is still not complete. The purpose of the present study was to estimate the prevalence of *Toxocara* spp. isolated from the soils of a part of northwestern Iran, Marand.

**Materials and Methods**

**Study Area**

It is located in the most northwestern part of Iran (Latitude: 38° 25’ 18.25” N Longitude: 45° 46’ 6.40” E),...
which has a population of over 200 thousand people. Marand is a neighbor of Tabriz and is one of the largest cities in the province, which is of strategic importance due to its proximity to the borders (Figure 1). Gardens and green spaces form a significant part of this city. Natural and man-made gardens and green spaces form a significant part of this city. The number of parks and children’s playgrounds is more than fifteen.

This cross-sectional study was conducted between September and December 2021. A random sampling method was used to collect data from 10 main and frequented parks of the city, and each sample contained about 10 g of soil from a depth of three centimeters per four-square meter. The samples were well mixed and homogenized and then transported to the laboratory in plastic bags with specifications labels. They were dried overnight at room temperature, crushed, and sifted with a 150 µm mesh sieve. The method of the previous study was used to search and find *Toxocara* spp. eggs.

**Statistical Analysis**

The chi-square test was employed to analyze the obtained data, and statistically significant values were considered less than 0.05 ($P < 0.05$).

**Results**

In total, out of 160 samples taken from 10 main parks for the *Toxocara* spp. egg examination, the overall prevalence was estimated at 27.2%, and the highest and lowest prevalence rates were related to Besat park and Shahr park, respectively (39.6% vs. 19.3%). The park size and prevalence rate association were not statistically significant (Table 1). The highest number of recovered eggs from 100 grams of soil was seven eggs. The prevalence distribution in the parks was not highly heterogeneous, and the average eggs isolated from each park were almost close to each other.

**Discussion**

Soil contamination of public parks and children’s playgrounds with the eggs of zoonotic parasites such as *Toxocara* spp. is highly important. The findings of the present study represented a significant and relatively high prevalence of soil contamination in Marand with *Toxocara* species.

The rate of soil contamination and the recovery of parasite eggs depend on various factors; in the former, the number of stray and/or domestic animals, the infection rate of animals in that area, the humidity, temperature,

<table>
<thead>
<tr>
<th>Parks</th>
<th>Prevalence (%)</th>
<th>No. of Recovered Eggs</th>
<th>Embryonated Eggs</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laleh</td>
<td>32.1</td>
<td>11</td>
<td>3</td>
<td>0.51</td>
</tr>
<tr>
<td>Janbazan</td>
<td>28.0</td>
<td>8</td>
<td>1</td>
<td>0.77</td>
</tr>
<tr>
<td>Imam-Hossein</td>
<td>21.7</td>
<td>7</td>
<td>1</td>
<td>1.02</td>
</tr>
<tr>
<td>Besat</td>
<td>39.6</td>
<td>15</td>
<td>2</td>
<td>0.69</td>
</tr>
<tr>
<td>Shahr</td>
<td>19.3</td>
<td>9</td>
<td>1</td>
<td>0.90</td>
</tr>
<tr>
<td>Daneshjoo</td>
<td>30.2</td>
<td>13</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>Gonaghlar</td>
<td>20.7</td>
<td>7</td>
<td>0</td>
<td>0.72</td>
</tr>
<tr>
<td>Misho baghi</td>
<td>23.9</td>
<td>12</td>
<td>4</td>
<td>0.85</td>
</tr>
<tr>
<td>Traffic</td>
<td>31.0</td>
<td>9</td>
<td>0</td>
<td>1.14</td>
</tr>
<tr>
<td>Tarbiat</td>
<td>25.5</td>
<td>6</td>
<td>1</td>
<td>0.68</td>
</tr>
<tr>
<td>Overall</td>
<td><strong>27.2</strong></td>
<td><strong>97</strong></td>
<td><strong>14</strong></td>
<td><strong>0.79</strong></td>
</tr>
</tbody>
</table>

**Figure 1.** The Geographical Location of the Marand.
sunlight, and the like are the determining factors; in the latter, the sampling type and method, the sampling season, the parasite egg isolating technique (in the case of *Toxocara*), and the examining technician’s skill are involved in this regard.\(^6\)\(^7\)\(^8\) Scattered studies have been reported from diverse regions of Iran. Zibaei et al estimated the prevalence of *Toxocara* spp. eggs in the soil of the public parks of Karaj at 36.4%,\(^4\) which was extremely higher compared to the results of the present study; this significant difference could be due to the difference in geographical, climatic, and cultural conditions, along with the infection rate of animals in that region. According to the results of a meta-analysis study by Fakhri et al, the global prevalence of *Toxocara* spp. in the soil was estimated at 21%,\(^11\) which is close to our findings. The rate of soil contamination can be an indicator of animal contamination or even the seroprevalence in the human population of that region.\(^13\) It is worth mentioning that some religious (Muslim) and cultural beliefs in the geography of Iran, especially in Marand, have caused contact with animals such as dogs and cats and their commuting areas should be less. According to previous reports, the prevalence varied in different regions of the world such that it was 53.3%, 64%, and 38%-53% in Brazil, Italy, and Poland, respectively.\(^5\)\(^6\)\(^7\) The isolation of *Toxocara* spp. eggs from soil samples depends on various factors such as the sampling (soil depth), the amount and/or number of examined samples, the detection method, and the sampling season. Later, Raissi et al investigated the changes in the prevalence of *Toxocara* spp. eggs in different seasons and reported a significant relationship between the prevalence and average temperature and rainfall.\(^17\) Marand is one of the cold cities of East Azerbaijan province, which has a higher annual rainfall than the national average. Similarly, Nematollahi et al estimated the prevalence of soil contamination in the Tabriz metropolis (a city adjacent to Marand) to be about 34.4%,\(^18\) which is relatively close to the prevalence of the present study.

The prevalence in the present study was measured with parasitological techniques, which, while having high specificity, had low sensitivity for diagnosis and could not be distinguished between species. It is impossible to distinguish the eggs of *T. canis* and *T. cati* with a light microscope, and it is necessary to use molecular-based techniques to identify the eggs of parasites at the species level. The current study was designed and implemented as a piece of the puzzle of the Iranian soil contamination with the eggs of *Toxocara* spp., and future studies from regions with a larger population and area and with more specific techniques are suggested in this respect.

**Conclusion**

The findings of this study revealed that the prevalence of *Toxocara* spp. eggs in the soils of the public parks of Marand was relatively high, indicating the importance of preventive and control measures for the movement of infected animals in public parks and close to human populations. Education and increasing the level of health awareness of people, especially children, to avoid contact with contaminated soil are also a priority.


