

Contamination of the soil of public parks to *Toxocara* spp. eggs and its relation to toxocariasis in man in Tabriz (Iran)

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Summary

Toxocariasis is a zoonotic disease caused by larvae of *Toxocara cati* and *Toxocara canis*. Human can be infected by ingestion of eggs of these parasites resulting in Visceral Larval Migrant Syndrome (VLMS). Human infection is occurring by the eggs of helminthes shed in faces of infected animals through the soil of public parks. In the present study, 540 soil samples were taken from 60 public parks in Tabriz (Northwest of Iran). Two hundred seventy samples were taken from 30 parks during warm seasons and 270 samples were taken from another 30 parks during the cold seasons of the year. Samples were tested by the Clayton–lane method. From a total of 60 examined parks, 46 parks (76.66%) were contaminated with *Toxocara* spp. eggs and among 540 soil samples, 186 (34.44%) cases were contaminated with *Toxocara* spp. eggs. The level of contamination during cold the seasons were significantly higher than the warm seasons ($P < 0.01$) and the level of contamination around the trashes were higher than other areas in the parks, though the differences were not statistically significant. As the soil of public parks are highly contaminated with *Toxocara* spp. eggs, the people particularly children are exposed to the high risk of contamination. To prevent contamination of public areas by larval migrant agent, measures should be taken to control the stray dogs and cats.

Keywords: *Toxocara*, Soil contamination, Park, Tabriz.

Introduction

Toxocariasis is an illness of human caused by larvae (immature worms) of either the dog roundworm (*Toxocara canis*), the cat roundworm (*Toxocara cati*) or the fox (*Toxocara canis*). *Toxocara canis* is the main causative agent of larval migrants in human. Human beings become infected by ingesting infective eggs and the infective larvae, which hatch in the intestine, and migrate through the tissues and organs causing a syndrome known as Visceral Larva Migrants (VLM)

(Overgaauw and Knapen, 2013). Common symptoms of these syndromes include; asthma, fever, coughing, hepatomegaly, eosinophilic granuloma, cerebral lesions, behavioral disorders, epileptic attacks and abdominal pain but in some cases visual impairment or even blindness can occur. It is reported that VLM occurs mostly in children (Magnaval et al., 2001). Among children, the age groups most affected by severe clinical symptoms of larva migrant's syndrome are toddlers 1-3 years. Children are most

commonly infected when they eat soil contaminated with eggs or put objects contaminated with eggs in their mouth (Fisher, 2003). Several studies have been performed in different countries with varied environmental conditions. They have revealed different contamination rate of *T.canis* eggs (5.71-68.8%) in the ground of public parks, playgrounds, school yards, house yards and sandpits increasing the risk for children to become infected (Taylor, 2006). It has been established that among patients with toxocariasis, only about half of them have owned either a dog or cat. But the large number of stray dog in Tabriz city necessitates the study of the contamination of public areas with *Toxocara* spp. eggs which was the objective of the present study.

Materials and Methods

The study was conducted in Tabriz (Northwest Iran). Tabriz is located in the East-Azarbaijan province (36°43'– 39°25'N and 45°3'–48°19'E). The region is mountainous with altitudes of 1351.4 m. The climate is temperate. Summers are relatively hot and dry while winters are cold. In a period of one year from 2013 to 2014, a total of 540 samples were collected from the superficial layer of soil from 60 public parks (270 samples in warm seasons and 270 samples in cold seasons). The samples were collected randomly from 3 different parts of each park including park pathways, playgrounds and rubbish dumps. The samples were transported to laboratory in plastic bags and washed with 50 ml saline and poured in individual glass jars and refrigerated for a period of up to 72 hours. The number of eggs per gram of feces was determined by the Clayton-Lane

technique: 15 ml of these samples was submitted to a fluctuation process in a saturated solution (Magnaval et al., 2001). Cover slips were placed on the tubes in centrifuge and after 5 min the samples were examined for the presence of eggs at 100x and 400x magnifications under the light microscope. Analysis of data was performed using SPSS version 16 packages. Significant difference between seasons and different parts of each park was evaluated by Chi square test.

Result

Results are presented in Tables 1 to 3. As seen in Table 1, *Toxocara* spp. eggs soil contamination was revealed in 46 of the 60 parks with egg counts ranging from 5 to 20 eggs per soil samples. The eggs were identified in 186 (34.44%) of the 540 samples.

Table 1. The percent contamination of the public parks soil by *Toxocara* eggs in Tabriz.

No. of examine d parks	No. of positiv e parks	No. of examine d soil samples	No. of positive soil samples (%)
60	46	540	186(34.44%)

In this study, 540 soil samples in one year (270 samples in warm seasons and 270 samples in cold seasons) were investigated for infestation of *Toxocara* spp. eggs. The results showed that the infestation of soil of public parks in Tabriz with *Toxocara* spp. eggs in winter was significantly higher than the other seasons. The results of infestation of *Toxocara* eggs are shown in Table 2.

Table 2. The prevalence of *Toxocara* eggs in different seasons in the soil of public parks of Tabriz.

Seasons	No. of examined	No. of positive	% of positive
Spring & Summer	270	64	23.7
Autumn & Winter	270	122	45.18

The results of this study showed that the contamination of *Toxocara* eggs in rubbish dumps of parks is higher than other sites but this difference was not significant. The results of infestation of *Toxocara* eggs are shown in Table 3.

Table 3. The contamination of sites of parks in Tabriz to *Toxocara* eggs.

Site of examined in each park	No. of examined	No. of positive	% of positive
Park pathways	180	60	33.33
Playgrounds	180	60	33.33
Rubbish dumps	180	66	36.6

Discussion

The contamination of the soil of public parks in Tabriz in this study was %34.44. The eggs were isolated from 46 of the parks. The contamination of public places in Iran was first reported by Motazedian *et al.* They reported a contamination value of 6.3 % for public places in Shiraz (Motazedian *et al.*, 2006). The contamination rate in our study was higher than other reports in Iran such as Urmia (7.8%), Tehran (10%), Abadan (29.2%) and Gazvin (5.8 %) (Tavassoli *et al.*, 2008; Khazan *et al.*, 2012; Maraghi *et al.*,

2014; Saraei *et al.*, 2012). Only the contamination rate of soil to *Toxocara* eggs in Khorramabad (63.3%) (Zibaei *et al.*, 2010) was higher than the value in the present study. *Toxocara* eggs have been found in sand or soil samples in Turkey (63.0%), Brazil (53.0%), Italy (64.0%), Spain (67.0%), Japan (92.0%), Thailand (6.0%) and Czech Republic (23%) (Aydinizoz *et al.*, 2006; Coelho *et al.*, 2001; Giacometti *et al.*, 2000; Ruiz *et al.*, 2001; Zibaie and Uga, 2008; Wiwanitkit and Waenlor, 2004; Dubra *et al.*, 2007). These results are not exactly comparable because the difference of the contamination rate depends on the culture, geographical parameters, climates, methodology of examination and sample collection. These rates might be the consequence of a relatively higher number of stray cats and dogs in this region and the physical characteristics of public parks. The results of this study revealed that the public parks were not fenced therefore the animals can freely hang aground. This fact can eclipse the rate of contamination of public parks. The high prevalence of *Toxocara* spp. infections among candies and contamination of environment by eggs of *Toxocara* spp. may increase the risk of infection for native people. In other investigations in Tabriz, toxocariasis was considered as public health problem in northwest Iran (Momeni *et al.*, 2016). In addition, they postulated that the risk of contamination by the soil is higher than the direct contact with cats or dogs. This is because eggs need a period to be incubated in soil to be ineffective (Magnaval *et al.*, 2001). Although, the prevalence of toxocariasis in dogs and cats was not considered in this study, the high rate of

contamination of the soil of parks with *Toxocara* spp. eggs might be indicator of high level of contamination in stray dogs and cats in this city. These results indicated a high risk of contamination of humans, especially children by the soil of the public parks in Tabriz. But unlike this prospect there is not any report on visceral larval migrant (VLM) in human in Tabriz. Some factors that might be related to the soil contamination were examined in this study. Contamination of the soil by *Toxocara* eggs was affected to a considerable degree by seasons. The results of this study showed that infestation of soil of public parks in Tabriz to *Toxocara* spp. eggs in winter were significantly higher than the other seasons.

Climatic conditions represent as an important factor for transmission of human toxocariasis. Humid and warm climates are probably the best ecosystems for embryonation and survival of *Toxocara* eggs in the soil (Magnaval et al., 2001). Considering this point, toxocariasis is not a high risk disease in Tabriz, because the climate condition is not accorded by the biology of parasite. In this study, the contamination of *Toxocara* eggs in the rubbish dumps of parks was higher than the other sites but this difference was not significant. This can be arisen from the fact that the dog walking in public parks are very uncommon practice in Tabriz due to some cultural reasons. On the other hand, stray dogs and cats hang around of rubbish dumps for food residue in public parks.

In conclusions, the results of the present study showed that some public parks of Tabriz were contaminated with feces of animals and *Toxocara* eggs, indicating that

control measure as well as education of people is necessary for protection from zoonotic infection. In addition, the examination of dog faces contaminating urban areas can provide useful data on the risk of environmental occurrence of toxocariasis which is potential causative agents of human diseases. The resent results suggest that the contamination with dog faces represents a negligible source of exposure to *Toxocara* spp. eggs in the urban environment of Tabriz. In spite of this, it must be kept in mind that humans, mostly children are at the risk of serious infection following accidental ingestion of infectious eggs. Therefore, it is still mandatory that stray dogs are excluded from urban areas such as public parks particularly from the playground areas.

References

- Aydenizoz M. (2006). Soil contamination with ascarids eggs in playgrounds in Kirikkale, Turkey. *Journal of Helminthology*, 80, pp.15-8.
- Coelho L.M., Dini C.Y. and Milman M.H. (2001). *Toxocara* spp. eggs in public squares of Sorocaba, Sao Paulo state, Brazil. *Review Institute Medicene Tropical São Paulo*, 43, pp. 189-91.
- Dubna I., Langrova I., Jankovska J., Vadlejch S., Peká praveen J. and Fechtner .(2007). Contamination of soil with *Toxocara* eggs in urban (Prague) and rural areas in the Czech Republic. *Veterinary Parasitology*, 144, pp. 81–86.
- Fisher M. (2003). *Toxocara cati*: an underestimated zoonotic agent. *Trends Parasitology*, 19, pp. 167–170.
- Giacometti A., Cirioni O. and Fortuna M. (2000). Environmental and serological

- evidence for the presence of toxocariasis in the urban area of Ancona, Italy. *European Journal of Epidemiology*, 16, pp. 1023-6.
- Khazan H., Khazaei M., Seyyed Tabae S.J. and Mehrabi A. (2012). Prevalence of *Toxocara* spp. eggs in Public Parks in Tehran, City, Iran. *Iranian Journal of Parasitology*, 7, pp. 38-42.
- Magnaval J.F., Glickman L.T., Dorchie P. and Morassin B. (2001). Highlights of human toxocariasis. *Korean journal Parasitology*, 3, pp.1-11.
- Maraghi S., Mazhab K., Sadjjadi S.M., Latifi S.M. and Zibaei M. (2014). Study on the contamination of Abadan public parks soil with *Toxocara* spp. Eggs. *Journal of Environment Health Sciences and Engineering*, 12, pp.86.
- Momeni T., Mahami-Oskouei M., Fallah E., Safaiyan A. and Mahami-Oskouei L. (2016). Latent and asymptomatic *Toxocara* infection among young population in Northwest Iran: The necessity of informing people as a potential health risk. *Scientifica*, 28, pp.1-5.
- Motazedian H., Mehrabani D. and Tabatabae A. (2006). Prevalence of helminth ova in soil samples from public places in Shiraz. *East Mediator Health Journal*, 12, pp. 562-565.
- Overgaauw A.M. and Knapen F.W. (2013). Veterinary and public health aspects of *Toxocara* spp. *Veterinary Parasitology*, 193, pp. 398–403.
- Ruiz de Ybanez M.R., Garijo M.M. and Alonso F.D. (2001). Prevalence and viability of eggs of *Toxocara* spp. and *Toxascaris leonina* in public parks in eastern Spain. *Journal of Helminthology*, 75, pp. 169-73.
- Saraei M., Zakilo M., Tavazoei Y., Jahanihashemi H. and Shahnazi M. (2012). Contamination of soil and grass to *Toxocara* spp. eggs in public parks of Qazvin, Iran. *Asian Pacific Journal of Tropical Biomedicine*, 36, pp.1156-1158.
- Tavassoli M., Hadian M. and Charesaz S. (2008). *Toxocara* spp. eggs in public parks of Urmia city, West Azerbaijan province Iran. *Iranian Journal of Parasitology*, 3, pp. 24-29.
- Taylor M.R.H. (2006). Ocular toxocariasis. In: Holland, C.V., Smith, H.V. *Toxocara: The Enigmatic Parasite*. CABI Publishing, CAB International, Wallingford, Oxfordshire, UK, pp. 127–144.
- Wiwanitkit V. and Waenlor W. (2004). The frequency rate of *Toxocara* species contamination in soil samples from public yards in an urban area “Payathai”, Bangkok, Thailand. *Review Institute Medicine Tropical São Paulo*, 46, pp. 113-114.
- Zibaei M. and Uga S. (2008). Contamination by *Toxocara* spp. Eggs in sandpits in Kobe, Japan. *Journal of Environment Control Technics*, 26, pp. 32-27.
- Zibaei M., Abdollahpour F., Birjandi M. and Firoozeh F. (2010). Soil contamination with *Toxocara* spp. eggs in the public parks from three areas of Khorram Abad, Iran. *Nepal Medicine College Journal*, 12, pp. 63-65.