

Presence of *Toxocara* spp. and Other Zoonotic parasites Ova in Children's Playground in Karaman, Turkey

Türkiye'nin Karaman İlinde Çocuk Oyun Parklarında Toxocara spp. ve Diğer Zoonoz Parazitlerin Yumurtalarının Varlığı

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ABSTRACT

Objective: Human toxocarosis (HT) is a widespread and neglected parasitic disease around the world and it is caused by *Toxocara canis* and *Toxocara cati*, a common nematode found in dogs and cats. Children are caught to HT after ingestion of embryonated *Toxocara* spp. eggs via contaminated materials such as soil, hair and etc. The aim of this study is to investigate *Toxocara* spp. and other zoonotic parasites in children's playgrounds in Karaman province of Turkey.

Methods: In total, 103 samples (68 sand soil, 26 soil and 9 stool) from 20 randomly selected children's playgrounds in May 2018 in Karaman province, were investigated. Samples were examined by flotation in saturated NaCl solution and parasite ova were diagnosed under the light microscope morphologically.

Results: Of the 20 screened playgrounds, 11 [55%, confidence interval (CI=33.6-75.2)] and 27 analyzed sample (26.2%, CI=18.4-35.2) were positive one or more parasite species. While *Toxocara* spp. eggs were the most common species in total (19.4%, CI=12.6-27.8), taeniid (*Taenia* spp., *Echinococcus* spp.) eggs and *Ancylostoma* spp. eggs were found in seven (6.8%, CI=2.97-12.7) and one (0.97%, CI=0.05-4.21) samples respectively. Also, one soil sample was found to be contaminated with both *Toxocara* and taeniid eggs.

Conclusion: These results demonstrate that children's playgrounds in Karaman may be a source for HT and other zoonotic infections. We advise to be fenced children's playgrounds in order to prevent pet animal's accessibility.

Keywords: *Toxocara*, soil, playground, Karaman, Turkey

ÖZ

Amaç: İnsan toksokariosisi (İT) köpek ve kedilerde yaygın olarak bulunan nematod *Toxocara canis* ve *Toxocara cati*'den kaynaklanan, dünya çapında yaygın ve ihmal edilen paraziter bir hastalıktır. Çocuklar İT'ye toprak, saç vb. gibi kirli malzemelerle embriyonlu *Toxocara* spp. yumurtalarını alarak yakalanırlar. Bu çalışmanın amacı Türkiye'nin Karaman ilindeki çocuk oyun alanlarındaki *Toxocara* spp. ve diğer zoonotik parazitleri araştırmaktır.

Yöntemler: Rastgele seçilen 20 çocuk oyun alanından toplamda 103 (68 kumlu toprak, 26 toprak ve 9 dışkı) örnek 2018 yılı mayıs ayında alınmıştır. Örnekler doymuş NaCl çözeltisi içinde yüzdürme metodu ile incelenmiş ve parazit yumurtaları ışık mikroskobu altında morfolojik olarak teşhis edilmiştir.

Bulgular: Taranan 20 oyun alanından 11'i (%55, CI=3,6-75,2) ve 27 numune (%26,2, CI=18,4-35,2) bir veya daha fazla parazit türü olarak pozitif. *Toxocara* spp. yumurtaları belirlenen en yaygın türler iken (%19,4, CI=12,6-27,8), taeniid (*Taenia* spp., *Echinococcus* spp.) ve *Ancylostoma* spp. yumurtaları sırasıyla yedi (%6,8, CI 2,97-12,7) ve bir (%0,97, CI=0,05-4,21) numunedey bulundu. Ayrıca, bir toprak örneğinin hem *Toxocara* hem de taeniid yumurtaları ile kirlenmiş olduğu bulundu.

Sonuç: Bu sonuçlar, Karaman'daki çocuk oyun alanlarının İT ve diğer zoonotik enfeksiyonlar için bir kaynak olabileceğini göstermektedir. Evcil hayvanların erişimini engellemek için çocuk oyun alanlarının çitle çevrilmesini tavsiye ediyoruz.

Anahtar Kelimeler: *Toxocara*, toprak, oyun alanı, Karaman, Türkiye

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INTRODUCTION

Children are exposed to a wide range of zoonotic parasitic diseases while playing in public parks or playgrounds (1,2). *Toxocara canis* (*T. canis*) and *Toxocara cati* (*T. cati*), a common nematode found in dogs and cats (3,4), cause human toxocarosis (HT) or visceral larva migrans in general population (5). The disease is occurring after ingestion of embryonated *Toxocara* spp. eggs via contaminated soils with pup feces and unwashed vegetables (6). Consumption of raw or semi-cooked meat containing larvae, contact with dogs, soil eating or pica and drinking unboiled water are among risk factors for HT (1,5,7).

Because of the public importance, more research was conducted to determine presence and frequency of *Toxocara* spp. and other parasites found in public areas worldwide (8-11). The purpose of this research is to determine *Toxocara* spp. and other potential parasites likely to be in children's playgrounds in Karaman province of Turkey, where no study was conducted for this aim.

METHODS

This study was conducted in Karaman province, located at (37° 10' 51.632" N 33° 13' 20.075" E) coordinates in south of the Central Anatolia Region of Turkey. The province is about 1033 meters above sea level and has a surface area of 8869 km². While town-wide show continental climate features, southern parts can show temperate climate characteristics. The average annual percentage of relative humidity is 58% in Karaman.

Overall, 103 samples (68 sand soil, 26 soil and 9 stool) were collected from 20 children's playgrounds during May of 2018. Five samples were taken from each playground at least. For soil sampling, 250 gram specimen was taken from the 7 cm of ground in to plastic bags and examined within that day or on the following day. Soil samples were examined by flotation in saturated NaCl solution (12). In a big beaker 250 gr soil samples were homogenized with saturated NaCl solution (25 °C is 1.2 g/m). Then it was filtered in to a small glass, in order to remove coarse particles. Saturated NaCl solution was again added on to homogenized sample and coverglass was placed on to mix. After 20 min incubation cover glass was taken attentively and examined under the light microscope (objective: 40x). *Toxocara* spp. eggs

were diagnosed according to spherical shape, serrated surface and thick dark shell morphological properties.

Statistical Analysis

For statistical analysis Statistical Package for the Social Science (SPSS) version 16.0 (SPSS Inc., Chicago, IL, USA) package programme was used. Pearson's chi-square test was used to evaluate qualitative data. Statistical significance was evaluated at levels of 0.05 and 0.01. Maximum likelihood estimation with 95% confidence intervals (CI) of contamination rates was also calculated.

RESULTS

As seen in Table 1, 11 of 20 playgrounds (55%, CI=33.6-75.2) and 27 of 103 samples (26.2%, CI=18.4-35.2) were found to be contaminated one or more parasite species eggs. While *Toxocara* spp. eggs were the most common species in total (19.4%, CI=12.6-27.8), taeniid (*Taenia* spp., *Echinococcus* spp.) and *Ancylostoma* spp. eggs were found in seven (6.8%, CI=2.97-12.7) and one (0.97%, CI 0.05-4.21) sample respectively. Also, one soil samples was found to be contaminated both *Toxocara* and taeniid eggs.

DISCUSSION

Soil transmitted diseases are rapidly increasing worldwide due to the out-of-controlled pet animals, failures in antiparasitic treatment in animals and etc. (2,13). According to a recent meta-analysis, global prevalence of *Toxocara* spp. eggs in the world was 21% (14). This rate was reported as 16% for Turkey in the same study. Also high longitude and humidity was associated with high prevalence of *Toxocara* in environment (14). *Toxocara* egg prevalence in children's playground was 19.4% in this study. In spite of this rate was higher than the prevalence for Turkey (16.0%), it is in accordance with the global prevalence reported by Fakhriet et al. (14). This finding be correlated with humidity rates and large population of stray dogs in the province. *Toxocara* spp. eggs in different provinces of Turkey vary from 4.16% to 64.28%. *Toxocara* eggs prevalence in soil samples was 4.16% in Konya (15), 7.3% in Kayseri (16), 8.33% in Istanbul (8), 10% in Kütahya (17), 15.05% in Ankara (18), 15.6% in Kırıkkale (19),

Table 1. Distribution of *Toxocara*, *Taenia* and *Ancylostoma* eggs in the samples

Sample	NCS/ NAS	NPS	MLE (%)	95% CI	<i>Toxocara</i> spp. egg	<i>Taenia</i> spp. egg	<i>Toxocara</i> + <i>Taenia</i> spp. egg	<i>Anclostoma</i> spp. egg
Playground	20/20	11	55	33.6-75.2	6/20 (30%)* CI 13.2-51.7	6/20 (30%) CI 13.2-51.7	1/20 (5%) CI 0.29-20.2	1/20 (5%) CI 0.29-20.2
Sandy soil	68/68	17	25	15.8-36.1	12/68 (17.7%) CI 9.86-27.8	5/68 (7.35%) CI 2.7-15.2	0/68	0/68
Soil	26/26	7	26.9	12.6-45.6	6/26 (23.1%) CI 9.88-41.3	2/26(7.69%) CI 1.32-21.9	1/26(3.85%) CI 0.22-15.9	0/26
Stool	9/9	3	33.3	9.54-65.5	2/9 (22.2%) CI 4.08-54.2	0/9	0/9	1/9 (11.1%) CI 0.66-40.5
Total	103/103	27	26.2	18.4-35.2	20/103 (19.4%) CI 12.6-27.8	7/103 (6.8%) CI 2.97-12.7	1/103 (0.97%) CI 0.05-4.21	1/103 (0.97%) CI 0.05-4.21

NCS: Number of collected sample, NAS: Number of analyzed sample, NPS: Number of positive sample, MLE: Maximum likelihood estimation, CI: Confidence intervals
*The rate (...%) shows the MLE result

18.91% in Aydın (20), 23% in Elazığ (12), 25.97% in Van (21), and 64.28% in Erzurum (9), respectively. In this study *Toxocara* spp. egg prevalence was 19.4% (20/103, CI=12.6-27.8). The *Toxocara* eggs prevalence we found in this study was higher than the study conducted in Konya Province (15), a metropolis neighbor to Karaman. This may be due to its being a metropolis, having more financial opportunities of its municipality and being easy of street animal rehabilitation. Also parasite egg contamination was found lower than Erzurum. This may originate from differences in prevalence of risk factors between Erzurum and Karaman.

Taeniid (*Taenia* spp., *Echinococcus* spp.) eggs were found in 7 of 103 samples (6.8%) and also it was remarkable that 6 of 20 playgrounds (30%) were contaminated with this parasite. However, *Ancylostoma* spp. egg was determined in one stool sample (1/103, 0.97%). Taeniid and *Ancylostoma* eggs were determined in soil samples in Kayseri province of Turkey with rates of 0.8% and 0.4% respectively (16). While prevalence of taeniid eggs with combination of *Toxascaris leonina* in soil was 0.38% in Ankara (18), taeniid ova was detected with the rates of 3.12% and 1.0% in soils in Erzurum and Kırıkkale (9,19), respectively. Since *Ancylostoma* spp. eggs are not as resistant to external conditions as taeniid eggs, their prevalence may be lower.

Since cheapness, easy practice and satisfactory results, flotation technique is one of the most preferred methods for detection of *Toxocara* spp. eggs in soil specimens (10,18,22,23). In addition, Caldwell (24), modified Baermann (25) and polymerase chain reaction (11,16) methods were used for this purpose. In this study we found high prevalence for *Toxocara* spp. eggs in playgrounds (6/20, 30%) and samples (27/103, 26.2%) with the flotation method. It was evaluated that this technique is still appropriate for detection of soil contamination.

Human toxocariasis is a widespread and neglected parasitic disease due to lack of personal hygiene, increase of uncontrolled stray dog population and places have suitable environmental conditions around the world including Turkey (1,5,6,23,26). We found high contamination (19.4%) with *Toxocara* spp. eggs in this study. This probably will result in high *Toxocara* spp. infection in the province and we propose prevalence studies concerning HT and to determine risk factors for the disease.

CONCLUSION

55% of playgrounds in Karaman were found to be contaminated with zoonotic parasite eggs. *Toxocara* spp., taeniid (*Taenia* spp., *Echinococcus* spp.) and *Ancylostoma* spp. ova prevalence were determined as 19.4%, 6.8% and 0.97% respectively. It is foreseen that these results may induce high human infection in the province. We also recommend children's playgrounds to be fenced to prevent pet animal's accessibility. It is also important that to improve public awareness with training programs.

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* Ethics

Ethics Committee Approval: Ethics committee approval was not received due to working with soil, sand and stool samples in playgrounds.

Informed Consent: No patients were used in the study. Because of working with soil, sand and fecal samples in the playgrounds, patient consent was not obtained.

Peer-review: Internally peer reviewed.

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