



Contamination of soils public places and children's playgrounds by *Toxocara canis* and *Toxocara cati* eggs in Saladdin province

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Received date : 6 / 4 / 2015

Accepted date : 14 / 9 / 2015

ABSTRACT

*To determine the prevalence of *Toxocara canis* and *T. cati* eggs in public places and children playgrounds, 783 soil samples were collected from 15 different regions in Saladdin provinces during July 2012 to June 2013 . *Toxocara* species eggs are found in 192 samples 24.52% . The Contamination with these eggs is observed in all sites like Tikrit & Baiji & Samaraa & Al-Dujail district , Al-Alam & Amerli & Al-Senia & Al-Ouja region , the village of Abu-Ajil . The soils of Gardens have more contaminated than bare soils . Higher contamination rate noticed in February 55.71% and March 52.30% while it decreased to lower level in June 2013 14.75%*

Keywords : *Toxocaras canis* , *Toxocara cati* , Soil Contaminated , Toxocariasis .

تلوث ترب الأماكن العامة وملاعب الأطفال ببيض السهمية

القطبية والكلبية في محافظة صلاح الدين

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تاريخ قبول البحث: ٢٠١٥ / ٩ / ١٤

تاريخ استلام البحث: ٢٠١٥ / ٤ / ٦

الملخص

تم في الدراسة الحالية الكشف عن وجود التلوث وتحديد نسب انتشار بيوض السهمية الكلبية والسهمية القطبية العائدة الى الجنس *Toxocara* في الأماكن العامة وملاعب الأطفال ، حيث جمع ٧٨٣ نموذج تربة من ١٥ موقعا مختلفا في محافظة صلاح الدين خلال المدة من تموز ٢٠١٢ ولغاية حزيران ٢٠١٣ . أظهرت النتائج تلوث جميع المناطق المشمولة بالدراسة بنسب مختلفة ببيض الديدان السهمية (قضاء تكريت وبيجي وسامراء والدجيل ، ومنطقة العلم وآمرلي والصينية والعوجة ، وقرية البوعجيل) ، إذ كشف عن وجود تلك البيوض في ١٩٢ عينة بنسبة ٢٤.٥٢% . كانت نسبة تلوث المناطق المزروعة تزيد عما هي عليه في المناطق العارية من الغطاء النباتي. كشفت الدراسة عن وجود علاقة بين معدلات انتشار البيوض وأشهر السنة ، وسجلت أعلى مستوى للانتشار في شهري شباط ٥٥.٧١ % وآذار ٥٢.٣٠%، ثم أخذت بالانخفاض خلال شهر حزيران ٢٠١٣ إلى ١٤.٧٥%.

الكلمات الدالة: السهمية الكلبية ، السهمية القطبية ، تلوث التربة ، داء السهميات .

1. Introduction

Toxocara canis and *T. cati* are round worm from ascaridae family that are a common intestinal parasite of dogs and cats [1 , 2]. The presence of *Toxocara* sp. eggs in the soil is considered as a risky factor for public health [3]. These eggs may be remain in the soil around months or even years [4]. Childrens' habits and their hobbies to play with pets put them to the higher risk of infection [5,6]. When the eggs are accidentally ingested by people from contaminated soil with the feces of infected animalis. They hatch in the intestine and the larvae migrate from intestine to the human liver, lungs and other organs where they cause damage and allergic reaction [7,8]. Saladdin province is city with a large stray dogs and cats population. This fact led to survey of the presence of *Toxocara* sp. eggs in the soil of public places in this province. The current study aims to investigate the prevalence of *Toxocar*as pp. eggs in the soil in Saladdin province in Iraq.

2. Materials & Methods

From July 2012 to June 2013, about 783 soil samples were collected from many regions in Saladdin province :

1- Public gardens as follow:

A-Tikrit district, B-Baiji district, C-Samaraa district, D- Al –Dujail district, E- Al-Alam region, F- The village of Albu-Ajil, J- Amerli region, H- Al-Senia region, R- Al-Ouja region.

2- Children's playground as follow :

I-Tikrit district, L- Baiji district, M- Sammaraa district, N- Al-Dour district, O- Yangieja villege, P- Al- Senia region, Q- Al-Dujail district.

The samples were taken randomly from different points from uppermost inch of soil. The samples stored in screw capped plastic containers.

In laboratory, all soils samples were examined for *Toxocara* spp. eggs according to standardized recovery technique [9] as fallow :

Each sample of soil (50g) was placed in a 250 ml glass beaker, topped with water to a final volum of 200 ml. The mixture was thoroughly homogenized with glass stick , then it was left to decant for 20 seconds before doing the filtering through the coarse sieve [pore size 0.1 mm) to remove large size debris .The mixture was homogenized again and transferred into two 100 ml centrifuge tubes which were centrifuged at 150 G for 5 minutes .One of the tubes was randomly selected, The supernatant liquid was discarded while the precipitation was suspended again in 60 ml of flotation fluid (magnesium sulfate 1.20 specific gravity) .This suspension was divided into four (15 ml) tubes which were filled to the brim . The mouth of the tube was covered by 18 x 18 mm cover slip in contact with the fluid meniscus . The four tubes were centrifuged at 150 G for 5 minutes .The four covers slips are removed and placed on a slide, also examined microscopically, a cover slip was considered positive if at least one egg was detected .

Toxocara eggs were distinguished according to their morphological aspects [10] . The chi squared test was used for statistical analysis [11] .

3. Results

The results show were that all the 15 regions in this study were contaminated by *Toxocara* eggs. These eggs recovered by 192 are (24.52%) samples of the 783 samples were examined . A highest contamination rate observed in Amerli region it was (42%) and Al-Senia region (42.22%) and the lowest in Al-Ouja region (2.56%), as shown by [Table \(1\)](#) . The prevalence was significantly higher in public gardens ($p < 0.05$) . We noticed that there was a relationship between *Toxocara* eggs prevalence in that tested soils and months of year, from July 2012 to June 2013 , contamination rate in November 2012 was 14.06 % increased gradually until reached the peak in February and March (55.71 % , 52.30 % respectively) , than decreased until reached to lowest level (14.75 %) in June 2013 , [Table \(2\)](#) . Contamination rate was significantly higher in winter and spring from July 2012 to June 2013 ($p < 0.05$) .

Table (1): Distribution of positive soil samples with *Toxocara* eggs according to region

Region	Number of Sample tested	Number of positive samples	Prevalence of infection(%)
Public gardens:			
Tikrit district (A)	46	3	6.52
Baiji district (B)	59	24	40.67
Samaraa district (C)	48	5	10.41
Al-Dujail district (D)	46	11	23.91
Al-Alam region (E)	53	18	33.96
The village of Albu-Ajil (F)	47	16	34.04
Amerli region (J)	50	21	42
Al-Senia region (H)	45	19	42.22
Al-Ouja region (R)	39	1	2.56
Childrens playground:			
Tikrit district (I)	44	6	13.63
Baiji district (L)	49	13	26.53
Samaraa district (M)	48	5	10.41
Al-Dour district (N)	61	11	18.03
Yangieja villege (O)	47	8	17.02
Al-Senia region (P)	55	19	34.54
Al-Dujail district (Q)	46	13	28.26
Total	783	192	24.52

Table (2) : Distribution of positive soil samples with *Toxocara* eggs according to months of year.

Month	Number of samples tested	Number of positive samples	Prevalence of infection (%)	Temperature*		Relative* humidity %
				maximum temperature	Minimum temperature	
July 2012	66	4	6.06	٤٢.٤	٢٥.٨	٥٩
August	69	4	5.79	٤٣.١	٢٣.٨	٥٥
September	63	6	9.52	٤١	٢٠.٢	٦٧
October	58	5	8.62	٣٣.٥	١٥.١	٧٤
November	64	9	14.06	٢٤.١	٩.٢	١٠٠
December	67	23	34.32	١٧.٢	٤.٣	100
January 2013	63	18	28.57	١٥.٩	٤.٢	٩٠
February	70	39	55.71	١٩	٥.٧	٩٦
March	65	34	52.30	٢٤	٩.٣	٨٥
April	68	25	36.76	٢٩.٣	١٥.٣	٨١
May	69	16	23.18	٣٦.٢	٢٠.٣	٩٢
June	61	9	14.75	٤١	٢٤.١	٨٠
Total	783	192	24.52			

*Represents the heat rates and relative humidity for each month.

4. Discussion

Many studies have noted about the presence of *Toxocara* sp. infection in stray dogs and cats [12,13] which may indicate that there is possibility of human infection from the environment of public places . There were many studies undertaken in public places to estimate the contamination rate of *Txocara* eggs . Contamination rate were recorded in Basrah in Iraq was 12.2 % [14] . In Northern and central of Jordan *Toxocara* eggs were found in 15.45% it were collected from schools' playgrounds and public places [15] . Contamination rate reached in some area of Shiraz in Iran to 12.22% during wet season [16]. There are 8.25% , 60.9% of public gardens in Turkey was contaminated [17,18]. Contamination rate of playgrounds in Japan ranged between 41.9% , 63.3% [19,20]. while In Malaysia 54.5% of public gardens and playgrounds

were contaminated [21] . Kandy Tea plantations, gardens in Sri Lanka reported 7.8%, 21.6% the contamination rate about [22]. Also, 87.1% of playgrounds in Frankfurt, Germany was contaminated [23]. *Toxocara* eggs were found in 24.4% of soil samples which were collected from public places in Britain [24] . while in Greece 97.5% of public parks were contaminated by *Toxocara* eggs approximately [25] . In Spain , Madrid the contamination rate of public gardens were 47.3% [26] .Argentina , Buenos Aires contamination rate of public gardens was 7.2% [27] .The recovery rate of *Toxocara* eggs from soil samples in united states differ from 20.6% in Kansas [28] to 10.2% in Philadelphia [1] to 0.35 in Newjersy[29]. The contamination in Havana, Cuba the prevalence of *Toxocara* eggs in soil samples was 42.2 % [30]. The contamination of public places with *Toxocara* eggs in Brazil was 60 % [31].

Toxocara eggs detected from 106 (16.43 %) of 645 soil samples .It was seen that a range of the results is quiet wide .It is not possible to make an accurate comparison between the results of all these studies .The recovery of parasites eggs as different locales will obviously differ depending on environmental condition, soil types, choice of sampling sites, the number of animals defection in those area,recovery methods and the prevalence of patent *Toxocara* infections in those animals [32,33].Contamination rate in our study may be result of poor environmental sanitation specially the presence of large stray dogs and cats population .

The contamination rate of the gardens was found in [Site J, H, B & P] as highest the bare places (Site E&F) .This paper amid similar study show that the soil samples obtained from gardens more frequency contaminated by *Toxocara* eggs than samples removed from bare places [33] .The cause of that may be return to the preference of these places by stray dogs & cats. In addition to that these areas were always has humidity and *Toxocara* eggs can remain viable at least months in humid soil [34].While prolonged exposure to the sun in poor vegetation and dry soil may be cause quick disintegration of the *Toxocara* eggs [32] . The development of larvae in the environment depends upon temperature . In most tropical and sub-tropical countries, temperatures are permanently favorable for larval development in the environment, and the ideal temperature for larval development of many species in the microclimate of the tuft of grass or vegetation is between 22 and 26 °C [36]. Some parasite species will continue to develop at temperatures as low as 5 °C, but at a much slower rate, Development can also occur at high temperatures, even over 30 °C, but larval mortality is very high at these temperatures [37] .



In the first month (July 2012) of our survey, 6.6 % of soil samples were tested to show positive result. This percentage increased gradually during the latter months until reached peak at February 55.71% and March 52.30%. Then it reached to lowest level in June 14.75%. This is consistent with another studies [16,35] which was recorded a highest contamination rate during wet or raining seasons. In public parks soil of Tokushima Japan, a higher frequency of *Toxocara* eggs recovered at Autumn , Spring and beginning of summer [19]. While in a survey carried out in Brazil along 18 months (from February 2004 to July 2005) observed the occurrence of two peaks of high frequency of *Toxocara canis* Eggs in public parks soil ,one in 2004 from February to May and the other in 2005 from April to July [36]. Climate conditions (specially temperature, humidity and rain) were important factors for nematode eggs [37], therefore; the differences in climate conditions from place to place and from year to year in the same place may lead to differences in even in the same place during different years. Additionally, some studies on the prevalence of *Toxocara* spp. egg in soil of parks in Iran show that 5.8% , 63.3% of soils were contaminated with *Toxocara* spp. egg [38,39]. Blaszkowska *et al.* (2013) indicated that 73.5% of soils of childrens' playgrounds in Lodz of Poland were contaminated with *Toxocara* spp. . The eggs of *Toxocara* spp. are resistant to environmental conditions and can remain infectious for years in a favorable environment, therefore young children who play in location are the main population at risk of toxocariasis due to geophagia, onychophagia and poor individual hygiene [40] .

Climate conditions are important factor for prevalence and vitality Nematode eggs, which includes (specially temperature , humidity and rain) (37) . Therefore; the differences in climate conditions between places and years in the same place may lead to differences in the rate of contamination, which are recorded along the months of year in different places or even in the same place during different years .

In Iraq a good conditions (mild temperatures, humidity and rain) for maintenance and dispersion *Toxocara* eggs may be found in winter and spring therefore highest contamination rate obtained during the months of these seasons in our study .



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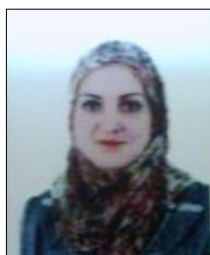
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