

# Assessment Seroprevalence of Toxocara Canis Antibodies among Children's Outpatient with the Wheezing in Urban Public of Tehran

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## ABSTRACT

**Background:** Toxocariasis is a zoonotic helminthes infection, occurring in human by the accidental ingestion of embryonated eggs of *Toxocara canis* (TC) and less frequently, *Toxocara cati* (TCC). Children are on the front line of encounter group. Clinical features may mimic respiratory symptoms as; asthma-like symptoms plus producing bronchial airway hyper-reactivity. The aim of this study was to determine seroprevalence of TC infection among children's outpatient with the wheezing symptom among urban public of Tehran.

**Method:** All of the children with current wheezing symptom that was coming in the chest clinic, sequentially enrolled as sample population. Diagnosis of known diseases associated with the wheezing was made possible. Anti TC Ig G antibodies in serum were measured based upon the recommendation commercial kit.

**Results:** A total 89 children meet the study criteria. Mean age was  $9.7 \pm 3.8$  SD years, ranged 2-15 years. Boy/girl ratio was 1.2. Seropositive for TC antibody was 16%. TC infection was noticeable in boys subgroup 53%.

**Conclusion:** Seroconversion of TC infection was meaningful among children, 2-15 years in Tehran. School-aged group had been higher rated infection than other groups. Toxocariasis among children of target population was associated with eosinophilia and allergic reaction.

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► *Implication for health policy/practice/research/medical education:*  
Eosinophilia and allergic reaction in toxocariasis

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## 1. Introduction:

Toxocariasis is an animal helminthes infection. Larvae canine ascarid *Toxocara canis* (TC) and less frequency *Toxocara cati* (TCC) are the causal agents of toxocariasis. Humans are non-compatible host of infestation, and accidentally is

involved (1). Dog and cat are the most common source of infection in the environment. Toxocariasis produces asthma-like symptoms or induced bronchial hyperresponsiveness in children (2). It may be linked with allergic sensitization (3). Frequency of TC infection had been higher in rural than urban areas (4).

Wheezing is the popular symptom in the children, and has different etiological causes. The most common approach to the detection of TC antibody among children was miscellaneous in the studies. It includes ever asthma disease, hypereosinophilic syndrome (HES), based-aged, environmental factors and more less with the wheezing symptoms. Current and on exercise wheeze as ever, was the more prevalent symptom (overall 20.6%) in the preschool and school-aged asthmatic children groups (5). Investigations on the prevalence of TC infection in children with the wheezing symptoms were limited among urban children in the database searching. Current knowledge is motivated designing of the study in Tehran.

The aim of this study was to determine seroprevalence of TC infection among outpatient children with the wheezing symptom in urban public of Tehran.

## 2. Materials and Methods:

We designed a cross-sectional descriptive study. It conducted in Shahide Beheshti University of medical sciences (SBUMS), Logman Hakeem general teaching hospital, pulmonary & heart division, Tehran-Iran, in 2009.

Samples enrolled among outpatient chest clinics. Chest clinic was a tertiary referral treatment center in respiratory diseases. The Logman hospital was placed at the south of Tehran. Population resident around the hospital often had low or moderate socioeconomic status. Hospital setting has been covered the healthy services up to 1,500,000 residents. Migration of the rural publics is increasing volume in size in recently years.

All patients less than 15 years-old age who had been generalized wheezing in a clinical examination sequentially enrolled as new cases. The purpose of the survey has been explained for the parents. All the patients visited by the physician for etiologic evaluation. Chest x-ray, complete blood count, sedimentation and pulmonary function test were performed.

Patients were evaluated for bronchial asthma as a more common disease via protocol and/or self-administered questionnaires given to parents. The diagnosis of asthma was followed via protocol. It was based on the suggested asthma symptoms, post-bronchodilator test resulting, physician confirmation. Suggestive asthma symptoms include an episode of repeated dry, productive cough, or the cough propagated with environmental irritant conditions. It smells, foods, etc, or night cough that eventuate to be awake; additionally, wheezing or wheeze was reported by parents at rest or after exercise, shortness of breath and chest tightness. However, bronchial asthma disease symptoms should be presented within the last 12 months. Accepted post-bronchodilator test and spirometric parameters in asthma disease were defined by "the Global Initiative for Asthma" (GINA) (6, 7). It was applied only for children can to follow the performance of the pulmonary function testing (PFT).

All the selected children were sequentially referred to unique laboratory. Venous samples were obtained in the morning. Total serum immunoglobulin E concentrations were measured by ELISA (Padtan Elm), and Anti-immunoglobulin G antibody *Toxocara canis* carried out by commercial kit (Immuno-biological Laboratories-Hamburg). Accepted cutoff points of allergic, eosinophilia and seropositive TC were total IgE >200 Iu/dl, > 500 and >12 u.

Additionally, complete blood count, chest x-ray and pulmonary function test were performed in all patients.

**Table 1:** It shows characterization of seropositive toxocara subgroup.

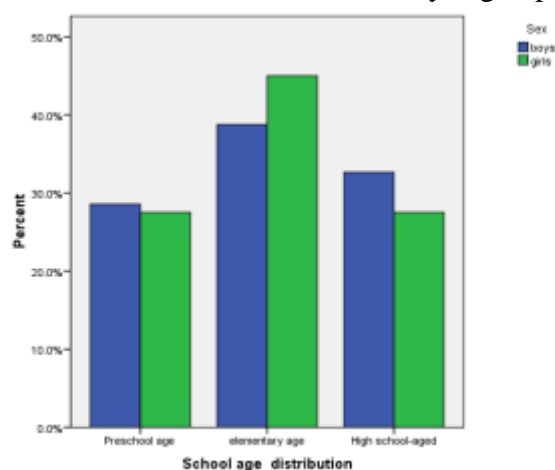
Allergic state		Sex		School age	
Allergic	5	Boys	8	High school	8
Non-allergic	9	Girls	6	elementary	5

Data analyzed with SPSS Version 16. Variables summarized with mean±SD and percent. Comparison of means was performed with independent-samples T test and Pearson Chi-square used as association test. Pearson's correlation was applied between variables.  $P < 0.05$  was set through the study (Tow tailed).

### 3. Results:

A total of 89 children who presented with wheezing completed criteria of the designed study. Mean age±SD was 9.7±3.8 years. It ranged between 2-15 years; Mod and median was 10. Fig. 1 reveals age and sex frequency distribution of children with wheezing. Sex distribution was boys 55% (49) and girls 45% (40); boy girl ratio being 1.2. All subjects were categorized based upon the school class: preschool 28%, elementary 42% and school-aged 30%. The etiologic evaluation of patients detected asthma disease in 35%, respiratory infection in 55% and undiagnosed cause 10%.

Table 1 represented characteristics of the seropositive TC antibody subgroups. Seroconversion of TC antibody was positive in 16% (14) of children, of them 57% was detected in the boys group.



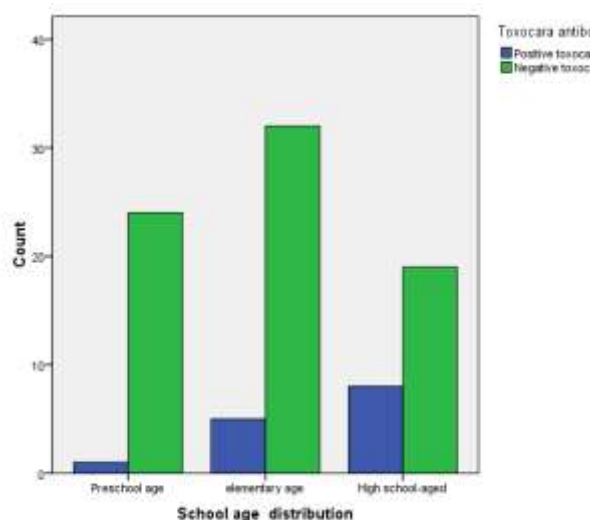
**Fig. 1.** It reveals school age and sex frequency distribution in children with the wheezing.

Seropositivity of TC infection was detected among asthmatic children and respiratory infection 21% and 64% respectively. Fig. 2 presents frequency distribution of school age and seroconversion of toxocara antibody in children with wheezing. Rate of infection rose with increasing of age classes. There were significant association between school age and seroconverting of TC antibody ( $P = 0.04$ ).

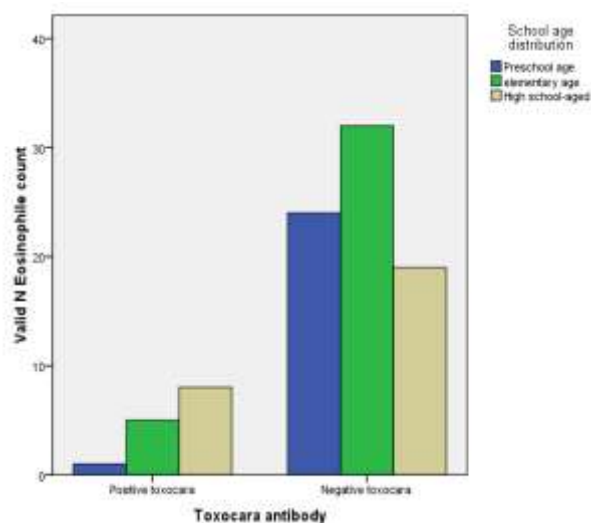
Eosinophilia was detected in 6% of children, which found in the boys group. Means of eosinophilia was 239.5±201.5 SD (range:43-1078). There were no significant differences between eosinophilia with seroconverting of TC antibody ( $P > 0.05$ ). Means of eosinophilia was lower in seropositive TC than seronegative subgroup (793.5±216.5 SD). Eosinophilia was associated with increasing of age, and detected noticeable in the high school age than others. Fig 3 disclosed frequency distribution of eosinophilia, seroconverting of TC and school age in children with wheezing.

34% of children had IgE levels up to the allergic set point. Of them 15% contributes with seropositive TC group, and boys group had a higher marker of allergic state than girls (59% respect to 41%). The mean serum IgE levels were 222.6±252.2 SD (range: 5-900 Iu/dl). The mean of IgE concentrations was higher in eosinophilia than the normal eosinophilic count subgroup (318.5±304.8 respect 215.7±247.5). Only a weakly positive correlation was found between the IgE antibody and eosinophil count ( $r = 0.23$ ,  $P = 0.03$ ).

Fig. 4 represents the number of allergic children in seroconverting TC and school age. Number of allergic children increased with rising of age among seropositive TC subgroup. However, mean of IgE antibody concentrations was higher in the preschool children in both subgroups of study than



**Fig. 2.** It shows frequency distribution of school age and seroconverting toxocara antibody in children with the wheezing.



**Fig. 3.** It disclosed frequency distribution of eosinophilia, seroconverting toxocara antibody and school age in children with the wheezing.

others. Fig. 5 shows frequency distribution means of the allergic state in the seroconverting TC and school age.

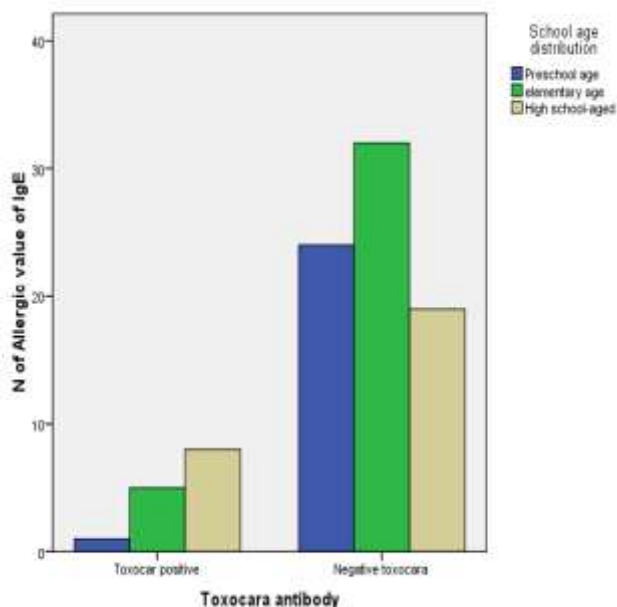
#### 4. Discussion:

TC infection is a health problem in general population and children are target population at-risk. Our finding indicated statistically significant seropositive cover TC infections among children with wheezing in Tehran. Children and

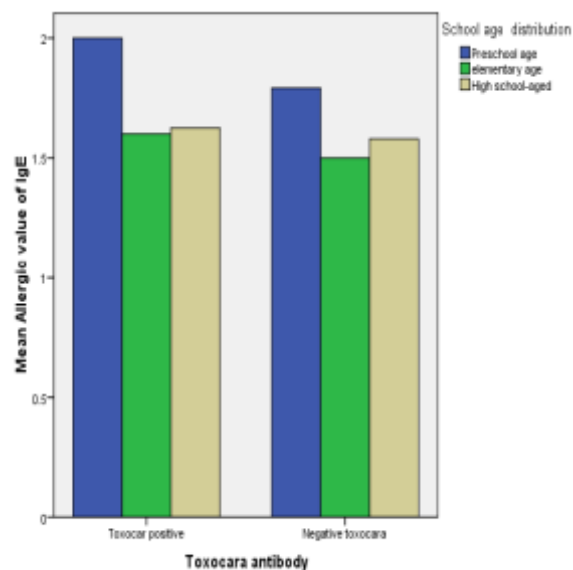
adolescents are more susceptible to ingestion of infectious materials. Prevalence of TC infection has been reported various among children, and is dependent to geographical area and sources of infection. It is different between countries (3-86%) (8). Prevalence of TC infection has been reported from Iranian's children, including; (2.7% (9) -25.6% (10)). This prevalence is higher than the reports of western (3.5%) (11), northwest (2.7%), and less than of northern Iran (25%) (12).

Frequency of TC infection among target population was 21%, and noticeable frequency was related to respiratory infection 64%. Most cases of Toxocara infection are asymptomatic. The clinical features appear while the second stage of larva migration occurs through the body. Our finding reflected toxocariasis in children was most frequently asymptomatic infection. Reported seropositive TC infection among asthmatic children was varied, and different between countries. Low prevalence was found in western countries 8% (13) except in Portuguese where it is high up to 54.8% (14). These findings reveal close contact of the host with causal risk factors in the environments, and elevated rate of TC infection among children with asthma. The survey was performed only on the wheezing population of children related to less than five years old-age, and its prevalence was 8.5% (15).

Etiology of toxocariasis is linked to accidentally swallowing the infective Toxocara eggs by at-risk children. Soil contaminated by eggs can remain infective for years and eggs can adapt to changing environmental conditions. High risk conditions are including geophagia (pica), poor personal hygiene, contact with infected dog (puppies) and soil contaminated in the king garden, playground or Public Park (16). Only less than 5% of all samples had close contact with dogs, and indirect contact was markedly etiologic causes. Therefore, the main source of TC infection in the target



**Fig. 4.** It represents the number of allergic children in seroconverting TC and school age.



**Fig. 5.** It shows frequency distribution means the allergic state in the seroconverting TC and school age.

population should be coming from outdoor environment. The recent report from Iran indicated that public park contamination in urban area was 42% embryonic egg stages of TC. It can be a serious health problem (17). Keeping household dog is unusual in culture of Iranian, and it may be an impact issue in low relevant for TC infection. Additionally, frequency distribution of TC infection with regard to age category indicated that higher school-aged involved more than other age classes. It may be represented accessibility of contaminated conditions in outdoor environment in the Tehran. It is a serious health problem, and should be considered by the healthy system service.

The concept of TC infection and its ability to induce allergy has been suggested in the early decade (18). Investigation among two most common allergic diseases, asthma and urticaria showed that frequency of TC infection was noticeable in the previous group respect to the healthy control group (19). The current results are a disagreement with the hygiene hypothesis: helminthes infection can suppress allergic inflammation (20). There were not statistically significant

differences between allergic markers (total IgE concentrations and peripheral blood eosinophilia) among subgroups of seropositive and seronegative children with TC infection.

Reaction against TC infection is dependent to the load of the parasite and the host immune responses (21). Mild infection disappears by itself within weeks, and eosinophilia can be remained as a chronic feature (22). Eosinophil cells had a role in the humoral immunity and secretory immune system. Peripheral eosinophilia was a hallmark finding in toxocariasis in the literature review (23). Our results indicated that eosinophilia was achieved with lower frequency in the TC infestation group. It may be reflected a low load of infection status. In addition, there was a positive correlation between eosinophilia and laboratory presentation of allergic threshold levels. Both rose, parallel to increasing age group of study among seropositive children with TC infection. Our study showed toxocariasis in children with wheezing symptoms can be represented clinically to raising eosinophil count and IgE concentrations up to level of allergic state.

In conclusion, seroconversion of TC infection was meaningful among children between 2-15 years in Tehran. School-age class had been higher rated infection than other classes. Toxocariasis in children of target population associated with eosinophilia and allergic state. The rate of their changed occurred in the low-threshold levels of defined set points. It may be due to a low load of TC infection.

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#### References

1. Woodruff AW. Toxocariasis. *Br Med J*. 1970;3(5724):663-9.
2. Sharghi N, Schantz PM, Caramico L, Ballas K, Teague BA, Hotez PJ. Environmental exposure to Toxocara as a possible risk factor for asthma: a clinic-based case-control study. *Clin Infect Dis*. 2001;32(7): 111-6.
3. Oteifa NM, Moustafa MA, Elgozamy BM. Toxocariasis as a possible cause of allergic diseases in children. *J Egypt Soc Parasitol*. 1998;28(2):365-72.
4. Zarnowska H, Borecka A, Gawor J, Marczyńska M, Dobosz S, Basiak W. A serological and epidemiological evaluation of risk factors for toxocariasis in children in central Poland. *Journal of Helminthology* . 2008;82:123–127.
5. Zobeiri M. Prevalence, risk factors and severity of asthma symptoms in children of Kermanshah, IRAN: ISAAC phase I, II. *Acta Med Iran*. 2011;49(3):184-8.
6. Guarnaccia S, Lombardi A, Gaffurini A, Chiarini M, Domenighini S, D'Agata E, Schumacher RF, Spiazzi R, Notarangelo LD. Application and implementation of the GINA asthma guidelines by specialist and primary care physicians: a longitudinal follow-up study on 264 children. *Prim Care Respir J*. 2007;16(6):357-62.
7. Global Strategy for Asthma Management and Prevention: Revised 2006.
8. Alderete JM, Jacob CM, Pastorino AC, Elefant GR, Castro AP, Fomin AB, Chieffi PP. Prevalence of Toxocara infection in schoolchildren from the Butantã region, São Paulo, Brazil. *Mem Inst Oswaldo Cruz*. 2003;98(5):593-7.
9. Nourian AA, Amiri M, Ataiean A, Haniloo A, Mosavinasab SN, Badali H. Seroepidemiological study for toxocariasis among children in Zanjan-northwest of Iran. *Pak J Biol Sci*. 2008 Jul 15;11(14):1844-7.
10. Sadjjadi SM, Khosravi M, Mehrabani D, Orya A. Seroprevalence of toxocara infection in school children in Shiraz, southern Iran. *J Trop Pediatr*. 2000;46(6):327-30.
11. Fallah M, Azimi A, Taherkhani H. Seroprevalence of toxocariasis in children aged 1-9 years in western Islamic Republic of Iran, 2003. *East Mediterr Health J*. 2007;13(5):1073-7.
12. Sharif M, Daryani A, Barzegar G, Nasrolahei M, Khalilian A. Seroprevalence of toxocariasis in schoolchildren in Northern Iran. *Pak J Biol Sci*. 2010;13(4):180-4.
13. Buijs J, Borsboom G, Renting M, Hilgersom WJ, van Wieringen JC, Jansen G, Neijens J. Relationship between allergic manifestations and Toxocara seropositivity: a cross-sectional study among elementary school children. *Eur Respir J*. 1997;10(7):1467-75.
14. Tonelli E. Toxocariasis and asthma: a relevant association. *J Pediatr (Rio J)*. 2005;81(2):95-6.
15. Ferreira MU, Rubinsky-Elefant G, de Castro TG, Hoffmann EH, da Silva-Nunes M, Cardoso MA, Muniz PT. Bottle feeding and exposure to Toxocara as risk factors for wheezing illness among under-five Amazonian children: a population-based cross-sectional study. 3. *J Trop Pediatr*. 2007;53(2):119-24.
16. Schantz PM, Glickman LT. Toxocaral visceral larva migrans. *N Engl J Med*. 1978;298(8):436-9.
17. Zibaei M, Abdollahpour F, Birjandi M, Firoozeh F. Soil contamination with Toxocara spp. eggs in the public parks from three areas of Khorram Abad, Iran. *Nepal Med Coll J*. 2010;12(2):63-5.
18. Yarıktas M, Demirci M, Aynali G, Kaya S, Doner F. Relationship between Toxocara seropositivity and allergic rhinitis. *Am J Rhinol*. 2007;21(2):248-50.
19. Oteifa NM, Moustafa MA, Elgozamy BM. Toxocariasis as a possible cause of

- allergic diseases in children. *J Egypt Soc Parasitol.* 1998;28(2):365-72
20. Cooper PJ. Interactions between helminth parasites and allergy. *Curr Opin Allergy Clin Immunol.* 2009;9(1):29-37.
21. Despommier D. Toxocariasis: clinical aspects, epidemiology, medical ecology, and molecular aspects. *Clin Microbiol Rev.* 2003;16(2):265-72.
22. Arango CA. Visceral larva migrans and the hypereosinophilia syndrome. *South Med J.* 1998;91(9):882-3.
23. Karadam SY, Ertug S, Ertabaklar H, Okyay P. The comparison of IgG antibodies specific to *Toxocara* spp. among eosinophilic and non-eosinophilic groups. *New Microbiol.* 2008;31(1):113-6.