



Original Article

Seroprevalence of *Toxocara* in Children from Urban and Rural Areas of Ilam Province, West Iran

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ABSTRACT

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Objectives: The present study was performed to determine the seroprevalence of *Toxocara* in children \leq 10 years old, from rural and urban areas of Ilam.

Methods: Serum samples from 383 children \leq 10 years old, were selected randomly from rural and urban areas of Ilam province and surveyed using enzyme-linked immunosorbent assays.

Results: The total rate of infection with *Toxocara* was 22% (31% with a history of contact with dogs and cats, and 14% without a history of contact). Of those infected, 23% were male and 18% were female, 36% lived a rural life and 20% had an urban life. A significant correlation was found between the incidence of disease, and urban and rural life, as well as exposure to dogs and cats. There was no correlation between prevalence and gender or age.

Conclusion: Given the high prevalence of infection with *Toxocara* amongst children in Ilam province, preventive work in the community such as education in risk management and periodic treatment with anti-parasitic drugs and elimination of stray dogs and cats is an appropriate measure.

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Introduction

Toxocariasis is an infection of a human by the larvae of *Toxocara canis* (dog roundworm) or *Toxocara cati* (cat roundworm) [1]. Adult worms of *Toxocara* parasite live in the small intestine of dogs or cats. Exposure to an infected hosts' feces, typically by ingestion of contaminated soil, allows transmission of *Toxocara* to humans. *T canis* is the main cause of toxocariasis, and syndromes such as ocular larva migrans, cerebral larva migrans, cutaneous larva migrans and visceral larva migrans (mainly liver and lungs) arise [2, 3].

In 1952, Beaver et al [4] reported blood eosinophilia in 3 children at a level that is associated with chronic granulomatous lesions of the liver, and for the first time *T canis* larvae were found in the liver, this new disease was

named visceral larvemigrans. Beaver came to the conclusion that humans serve as a paratenic host; larvae development is arrested. He believed that others *Toxocara* species could also cause visceral larva migrans in humans [4].

Epidemiology studies show that humans become infected with *Toxocara* by eating soil containing embryonated eggs [5] classifying toxocariasis as a soil transmitted disease. However, eating *Toxocara*-infected meat of a paratenic host (small animals and domestic animals) causes toxocariasis, thus the infection is a food transmissible disease too [6]. Eating raw or undercooked *Toxocara*-infected meat of birds and mammals causes toxocariasis [7-9].

Epidemiological studies have shown that toxocariasis is 1 of the most common helminthic diseases in the world [3, 10, 11]. The worldwide prevalence of toxocariasis has been reported as

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2-5% in urban areas, 15-20% in semi-rural areas and 35-42% in rural areas [2].

Low socioeconomic status and poor living standards are contributing factors in the spread of disease [12]. Most infections have no clinical symptoms although many *Toxocara* larvae are released in the body and may cause dangerous side effects including; weight loss, fever with cough and shortness of breath, generalized lymphadenopathy and hepatomegaly [8, 13, 14]. Diagnosis of toxocariasis by hematology involves an eosinophil cell count and serology [15].

Despite the global spread of *Toxocara*, the prevalence of toxocariasis in Ilam has not been comprehensively studied in children, though highly prevalent. Ilam has a high frequency of stray dogs and cats that are definitive hosts for *Toxocara*, and a low level of sanitary conditions especially in rural areas. The purpose of this study was to evaluate the prevalence of *Toxocara* in children aged 10 years and younger, in urban and rural areas in Ilam province.

Materials and Methods

Approval for this study was granted by the Ethics Committee of Ilam, University of Medical Sciences (No. 679).

1. Demographics

This study was a cross-sectional study performed on children ≤ 10 years old from rural or urban areas of Ilam province, west Iran. This area covers 19,086 square kilometers and includes 8 cities: Ilam, Mehran, Dehloran, DarrehShahr, Sarable, Eyvan, Abdanan and Arkwaz.

Ilam province shares its borders with 3 neighboring Iranian provinces: Khuzestan province in the south, Lorestan province in the east, Kermanshah province in the north, and Iraq in the west. There are 425 km of common border. The population of Ilam province is approximately 600,000 people (2015 estimate).

2. Detection of *Toxocara*

383 children were randomly selected and blood samples were taken, and transferred to the laboratory of Parasitology, Ilam University of Medical Sciences for laboratory investigation. Blood samples were separated by centrifugation at 5000 rpm for 5 minutes and the serum was removed and stored at -20°C . Detection of *Toxocara* antibody in the serum was performed using an enzyme-linked immunosorbent assay (ELISA) kit (IBL Hamburg in Germany). A positive result was determined by a value more than 0.5 (100 ng/mL) and a negative result was defined by a value less than 0.5.

3. Characteristics

A questionnaire was designed to capture personal characteristics, residence location, dog ownership in the family or extended family, history of eating or playing with dirt and anti-parasitic drug history.

4. Statistical analysis

The sample size was calculated using the formula Cochran 383. Chi-square test, *t* test and Mann-Whitney nonparametric test were used to determine risk factors and outbreaks. The level of statistical significance was set at $p < 0.05$ (SPSS17 software was used for data analysis).

Results

From the total number of 383 children ≤ 10 years old that were selected for this study, 205 were males and 178 were females. There were 154 children that were from a rural environment and 229 that were from an urban environment. Only 78 children stated a history of contact with dogs and cats, and 11 children had a history of pica.

In this study the prevalence rate of toxocariasis was 23% in males, 18% in females. Rural children accounted for 36% of toxocariasis cases and urban children accounted for 20%. Overall, 22% of all children had toxocariasis; 31% in children who had dogs, and 14% in children who did not own a dog or a cat.

A significant association was found between the risk of toxocariasis and, urban life, rural life, and history of contact with dogs and cats ($p < 0.05$). No significant association was observed between toxocariasis and, a history of pica, gender or age.

Discussion

The results from this study can inform pediatricians and be used by health centers to educate and help reduce the risk of toxocariasis in children. When children present with a chronic cough, the medical notes may reflect a diagnosis of asthma and corticosteroid treatment, whilst parasitic infections such as *Toxocara* should also be noted in the incidence of these diseases.

The results of this study show that exposure to *Toxocara* in children 10 years and younger in Ilam is sizable; regardless of whether they are symptomatic or asymptomatic, or with or without significant eosinophilia. Toxocariasis in Ilam province can be classified as hyper-endemic.

Climate, geographical condition, owing a pet dog or cat (kept inside the home), owning a working dog (in rural area) and the

presence of stray dogs and cats in public parks all contribute to the spread of *Toxocara* [16].

It has been reported that only 2% of urban and rural school children (6 to 15 years) in Ahvaz had IgG antibodies against *Toxocara*. Although, Ahvaz is part of the tropics, where favorable conditions increase the prevalence of infectious diseases, the author questioned these results suggesting that there may have been an issue with the serology tests [17]. It may be that hot and dry weather conditions caused the loss or inactivation of the *Toxocara* eggs.

In a study carried out in the city of Babol (northern Iran), the prevalence of infection with *Toxocara* in adults with eosinophilia, was 23.5%. A significant difference was reported between residence and work place with toxocariasis. In this study, the prevalence of *Toxocara* was significantly associated with the location [10]. In a study performed by Malla et al in northern India, 6.4% of asymptomatic rural people, and 23.3% of symptomatic rural people had anti-*Toxocara* antibody (18). In study by Fan et al [19], Hei-dong and Yen-ping districts in Taitung County of eastern Taiwan, showed that overall seroprevalence of *Toxocara* was 76% using ELISA among students aged 7 to 12, that is higher than of the results of the present study.

The amount of contact with dogs and cats for religious reasons as well as race-dependent susceptibility to *Toxocara* are some theories that may explain these differences [20]. Of course, other factors such as cut-off points used for testing and the sensitivity and specificity of the serologic tests can affect the results [21]. Sajadi et al [22] conducted a study on serum samples of 516 children aged 6-13 years using ELISA and the overall prevalence of anti-*Toxocara* antibody was 25.6%. This result is in concordance with the results of this present study. Ajayi et al [23] reported that 30.4% of adults and 29.6% of children in Nigeria had anti-*Toxocara* antibodies. In studies that were conducted on symptomatic, eosinophilic people, the prevalence rate of toxocariasis was reported to be higher than in the general public and in most of the aforementioned papers there was no reporting on an association between age and gender with seroprevalence of *Toxocara* [12, 13, 24, 25].

Most of the reported studies of toxocariasis were conducted in children because in their early years they exhibit pica and could be exposed to *Toxocara* from infected dogs and cats, and asymptomatic adults. In the present study no association was found between owning dogs and prevalence of toxocariasis, however, a study conducted by Ebrahimifard et al [10], found an association between exposure to (rather than owning) dogs and cats, and toxocariasis.

In Ilam province, because of religious and social conditions, the dog is viewed as "unclean" and people do not have direct or close contact with them, but dogs and cats do roam freely.

The results of this study showed that *Toxocara* infection is

high amongst the children of Ilam and preventive work such as risk management and treatment/elimination of stray dogs and cats is necessary. Larger studies to determine seroprevalence of infection with *Toxocara* in children and adults needs to be performed.

Conflicts of Interest

No potential conflicts of interest relevant to this article was reported.

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