

Seroprevalence of *Toxocariasis* among children 5-15 years-old in Bandar Abbas, South of Iran

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Abstract

Introduction: Human *Toxocariasis* is a zoonotic helminthic infection caused by migration of larval stage of *Toxocara canis* and *Toxocara catti* (*T.canis* and *T.catti*) that mainly affects children. The purpose of this study was to evaluate the frequency of anti-*Toxocara* antibody IgG in serums of 5-15-years-old children referred to Bandar Abbas and rural parts of nearby health centers. Along with Antibody detection, complete blood count (CBC) performed for hallmark of migratory parasites, eosinophil cells.

Methods: This study was designed to detect the anti-*Toxocara* antibodies in children in Bandar Abbas, Iran. In this study, ELISA (IBL kit), method on serum of 5-15 years old children who had already been examined by physicians to record signs and symptoms relevant to *Toxocariasis* was performed.

Results: The frequency of anti-*Toxocara* antibody was 0.9% (6.650 cases) with no significant gender differences. Eosinophilia (blood eosinophil count higher than 600/mm³) was significantly related to the presence of a positive ELISA results.

Conclusion: Bandar Abbas has a warm and humid tropical climate. Transmission of zoonotic parasite can be halted or diminished in these conditions. Low frequency of infected cases and rare positive serology results, along with other studies in other tropical regions confirm the effects of environmental conditions on parasite life cycle.

Key words: *Toxocara Canis*, *Toxocariasis*, *Toxocara* Infection, Visceral Larva Migrans

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Introduction:

Human *Toxocariasis* is one of the important children disease caused by the nematodes belong to the genus of *Toxocara*. This parasite is ubiquitous and may involve humans and animals. The prevalence rate varies amongst locations and regions (1). The disease is zoonotic and most frequent species include *Toxocara canis* and

Toxocara cati (2). Dogs and other canids are definitive host for *T.canis* and shed large numbers of unembryonated eggs that are infective after development in appropriate humidity and temperature. In dogs, *Toxocara* migrates to lungs and moves downward to intestinal tract and completes the life cycle (3). Human becomes infected by ingestion of eggs excreted in feces of

dogs. The aberrant third stage larva in unsuitable host including humans can cause variety forms of clinical aspects (4). Liver, lung and central nervous system (CNS) are most common tissues invaded by ectopic lodgment of parasites. In humans, migration of *T.canis* larvae to viscera and other organs produces visceral larva migrans syndrome, sometimes ocular larva migrans and neuro-toxocariasis (3,5). A wide range of vertebrates act as paratenic hosts. Ingestion of mature eggs lead to hematogenously dissemination of larva in soft tissues of hosts (6).

VLM (Visceral larvae migrans) is a severe systemic form of *toxocariasis*, characterized by high eosinophilia, hyper-gamma-globulinemia, fever, hepato-splenomegaly, and lung involvement and affects mainly children (7). Serology tests are implicated to determine the prevalence of disease in humans. Anti-Toxocara IgG antibody evaluation by commercial Enzyme-Linked Immunosorbent Assay (ELISA) kit (IBL, Germany, ELISA assay, 96 test, cut off index, 10 μ serum, regulatory status: EU: CU) is a useful method in determination of *Toxocara* sero-prevalence (8). Our study included main rural areas (Chahoo, Tazian, GHale-ghazi, Siahoo and fin) of Bandar Abbas and large urban medical centers to evaluate people facing *Toxocariasis*.

Study was conducted on children of 5-15 years-old referred to Bandar Abbas and rural parts of nearby health centers. Serum samples have been taken and stored in -20 C before ELISA tests. Previously, routine laboratory tests including complete blood count (CBC) for detecting eosinophilia, performed for all patients.

Methods:

Bandar Abbas (27°12'N, 56°22'E) is the capital of Hormozgan province, Iran and has a subtropical desert low attitude arid climate. The average annual temperature is 27.2 C°. Average annual humidity is more than 45% (9).

This cross sectional study was carried out from May to February of 2016, a total population of 650 children examined in Bandar Abbas and nearby rural health centers. Out of 650 cases, 311 were male and 339 were female. Average mean of

children age was 8.8 \pm 2.80. All participant children interviewed previously by questionnaire and demographic information recorded. Informed consent obtained from children, parents or protectors.

About 4ml blood sample was taken by expert laboratory personnel under physician supervision and sterile conditions. Samples divided in two parts, 3ml for serum isolation and 1ml for CBC testing in EDTA. Serum samples measured for IgG anti *Toxocara* antibody ELISA test. IBL kit (Germany) intended for IgG antibody of *Toxocara spp.* Manufacturer's instructions executed in this study. According to kit catalog, sensitivity of test is higher than 95%. Lipemic and icteric serums excluded to avoid any false results.

For statistical analysis, descriptive statistics, t-test and Chi-square test by means of SPSS ver.19 were used and P<0.05 was considered significant.

Results:

Totally, 650 cases included in study. Out of these participants, 311 were male (47.5%) and 339 were female (52.5%). Mean age of cases was 8.7yr. No significant differences detected between male and female groups. Nearly 50% of participants live in Bandar Abbas and 50% in nearby rural parts outside the city.

Overall, 6.650 cases (0.9%) were positive for IgG anti *Toxocara* antibody in our study, 3 male and 3 female. Mean antibody titer was 3.2 IU (minimum 0.2 and maximum 13 IU) in our population.

About 29 cases had dog in house as pet or as keeper of the sheep flocks. Totally 66 cases had history of dog exposure. Out of 650 cases, 24 had skin rashes. History of prolonged coughs was seen in 21 patients. Decreased vision ability (or loss of vision) reported in 58 cases (Table 1).

One of the main factors assessed in this study, was eosinophilia that can be categorized into mild (600-1500 cells/ml), moderate (1500-5000 cells/ml) and severe (more than 5000 cells/ml) (10). In our study, 461 (70.8%) were normal, 171 (26.3%) were moderate and 18 (2.8%) had severe eosinophilia (Table 2).

Table 1. Demographic information and medical complaints of 5-15 yrs children in Bandar Abbas for *Toxocara* sero-epidemiology study

| | N= 650 | positive cases | Urban (Bandar Abbas) | Rural (suburb) | Pet keepers | History of dog exposure | Skin rash | Prolonged cough | Loss of vision |
|--------|-------------|----------------|----------------------|----------------|-------------|-------------------------|-----------|-----------------|----------------|
| Male | 311 (47.5%) | 3 (0.45%) | 215 (49.2%) | 96 (40%) | 18 (5.7%) | 36 (11.5%) | 10 (3.2%) | 13 (4.1%) | 35 (11.2%) |
| Female | 339(52.5%) | 3 (0.45%) | 208 (50.2%) | 141 (60%) | 11 (3.2%) | 30 (8.8%) | 14 (4.1%) | 8 (2.3%) | 23 (6.7%) |
| Total | 650 (100%) | 6 (0.9%) | 423 (100%) | 237 (100%) | 29 (4.5%) | 66 (10.1%) | 24 (3.6%) | 21 (3.2%) | 58 (8.9%) |

Distribution of 5-15 enrolled children according to gender and living place (Table 3).

Mean of population age in our study population showed in (Table 4).

Table 2. Classification of patients, according to levels of blood eosinophil in 5-15 yrs children of Bandar Abbas for *Toxocara* sero-epidemiology study

| Classification | Normal Eosinophil count | Moderate Eosinophil count | Hyper Eosinophilia |
|----------------|-------------------------|---------------------------|--------------------|
| Number | 461 | 171 | 18 |
| Percent | 70.8% | 26.3% | 2.8 % |

Table 3. Population distribution for gender and living place of 5-15 yrs children in Bandar Abbas for *Toxocara* sero-epidemiology study

| Living place | Gender | | Total |
|--------------|--------|------|-------|
| | Female | Male | |
| Bandar Abbas | 208 | 215 | 423 |
| Fin | 46 | 19 | 65 |
| Tazian | 31 | 24 | 55 |
| Chahoo | 19 | 17 | 36 |
| Ghale-ghazi | 20 | 25 | 45 |
| Siahoo | 15 | 11 | 26 |
| Total | 349 | 311 | 650 |

Table 4. Mean age of enrolled 5-15 yrs children of Bandar Abbas for *Toxocara* sero-epidemiology study

| Gender/Age | Number | Mean of age | Standard deviation |
|------------|--------|-------------|--------------------|
| Male | 311 | 8.70 yrs | 2.74 |
| Female | 338 | 8.92 yrs | 2.84 |
| Total | 650 | 8.81yrs | 2.80 |

Conclusion:

In this study we examined 650 children 5-15 years old of Bandar Abbas city and nearby rural parts for human IgG antibody by ELISA test. This zoonotic parasite can cause moderate to severe disturbances in human because of the migratory character of worm (11). *Toxocara canis*

accomplishes its life cycle in dogs, with human as accidental host, thus serological test should be used for diagnosis (3,9,12). ELISA test based on human IgG detection performed in this study.

Our data showed that less than 1 percent of participants had history of exposure to parasite that can be related to high environment temperature. According to literatures, environmental contamination is main root of human infection. The range of temperature, humidity and direct sunlight affect infection ability of *Toxocara* eggs to contaminate other hosts likewise human (13-15).

In Hormozgan province, south of Iran, the exposure of eggs to direct and prolonged sunlight and high temperature in most months of year may kill the eggs and decrease risk of infection. Study of antibody frequency in Ahwaz is similar to our results (16). Out of 30 people that had history of exposure to dog 4 had high anti *Toxocara* antibody titers that has significant association ($P < 0.05$).

Some studies didn't get any relationship between keeping or raising cats and dogs with *toxocariasis* (17-19). All positive patients were negative for skin rashes, but 3 patients had history of prolonged cough and 4 cases had loss of vision ability. Data showed significant correlation between antibody titer and prolonged cough ($P < 0.01$) and loss of vision ability ($P < 0.02$). Hematologic changes including eosinophil cells can indicate parasitic infection (18). There was a significant correlation between eosinophilia and titers of anti *Toxocara* antibody ($P < 0.001$). Some studies deny this relation (17). No cross reaction was observed between *Toxocara* and other protozoan and helminthes, because our protocol uses secretory-excretory antigens of *Toxocara*.

It seems that *Toxocara* transmission has different patterns in various countries. In developing countries, poor hygiene, pica or soil eating habits especially in infants and children (because of anemia or other parasitic infections) and keeping

dogs as pet can be considered as main roots of transmission. In Hormozgan province direct and long sunlight and high mean of annually temperature may interfere with life cycle of parasite and eggs can't be stay for long time to transmit. In conclusion, this study emphasizes the importance of comparing different socioeconomic groups in the same geographic region. The data show also how parental education is important to prevent toxocariasis. Thus, educative programs should be focused both for pediatric and adult individuals. In Hormozgan, poor sanitation can be the main root of transmission. Although the number of positive cases is low, but the disease is important and shouldn't be neglected.

Nowadays, all research studies face to financial shortages. Besides, working with children as enrolled cases in studies, has its own problems. Rural regions suffer from cultural issues that sometimes prohibit people referring to medical centers.

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