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Evaluating correlation between serum liver enzymes and toxocariasis: a case control study

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ABSTRACT

Objective: To evaluate the prevalence of toxocariasis in individuals with the normal and abnormal level of liver enzymes.

Methods: In this case-control study, the serum samples were collected in the individuals referred to diagnostic laboratories of Arak in Iran. A total of 144 sera with abnormal level of liver enzymes were selected as cases and the same numbers of sera with the normal level of liver enzymes also were selected as controls. The sera were examined for anti-*Toxocara* IgG.

Results: Twelve (4.2%) sera contained anti-*Toxocara* antibody and all of them were in the case group. Although the mean of all liver enzymes was significantly different in the two groups ($P < 0.05$), statistical test showed no relationship between the level of liver enzymes and toxocariasis.

Conclusions: It was concluded that the liver enzyme alteration is not the valid indicator for predicting toxocariasis. Because the kind of liver dysfunction, that is caused by the larvae of *Toxocara*, is unspecified, and it seems factors such as the number of larvae can play a basic role for the emergence of alterations.

1. Introduction

Toxocariasis is a parasitic infection caused by *Toxocara* which can affect human. The larvae of this parasite can not be developed in human, but if the eggs of this worm were ingested accidentally, its larvae will be able to migrate to different organs like liver, lung and eye, then causes signs and symptoms of this disease[1]. In recent years, keeping dogs and cats as pets and the number of stray animals are increasing in our cities. Therefore, the soil contaminated with animal feces and embryonated eggs can be transmitted to humans. Thus, nowadays toxocariasis is a potential health hazard in our country[1]. The last studies have shown that the prevalence of toxocariasis is different in various regions of Iran. For example, the prevalence of the disease was 19.0% in Ahwaz[2], 29.4% in East Azerbaijan[3], 25.6% in Shiraz[4], 8.8% in Hamadan[5], 16.0% in Arak[6] and 25.0% in Sari[7]. The results

of a systematic review showed that the mean prevalence of toxocariasis in Iran is 21.6%[8].

The main clinical syndromes of toxocariasis are visceral larva migrans and ocular larva migrans[1]. In patients with visceral larva migrans, liver is the most affected organ. The deployment of *Toxocara* larvae in the human liver is the cause of hepatic enlargement and dysfunction in organ[9,10]. Although in Iran, some studies investigated the relationship between hypereosinophilia and toxocariasis, but so far the relationship between alteration of liver enzymes and this disease has not been evaluated. Therefore, in this study the prevalence of toxocariasis in the individuals who have had an alteration in the level of liver enzymes, was examined and the possibility of the relationship between this disease and changes in liver functional enzyme was studied.

2. Materials and methods

In this case-control study, the serum samples were collected from the individuals referred to diagnostic laboratories of Arak in Iran. Firstly, informed written consent was obtained from all the individuals under study. Also they completed demographic questionnaire. Demographic questionnaire including age, sex and history of disease and medications. Then, 5 mL of blood samples was taken and sera were separated by centrifuge at

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room temperature. These sera were analyzed for liver enzymes. The measurement of liver enzymes was performed by automatic analyzer BT3000 (Biotechnica Instruments, Italy). Next 144 sera with the abnormal level of liver enzymes were selected as cases and the same numbers of sera (144) with the normal level of liver enzymes also were selected as controls. Sera were stored at -20°C until tested for detection of anti-*Toxocara* antibody. Diagnosis of toxocariasis was performed by *Toxocara* IgG ELISA kit (IBL international GmbH, Germany) according to the manufacturer's instruction. The sera from patients with fatty liver, hepatitis and liver disease were excluded. Moreover, sera of people consumed phenytoin, barbiturates, non-steroidal anti-inflammatory drugs, antibiotics, antihyperlipidemic, antifungal and antidepressants were excluded. Statistical analyses were carried out using SPSS software version 13 (SPSS/PC Inc., Chicago, USA). The quantitative data were presented as mean \pm SD. Comparison of these variables between two groups was evaluated by student *t*-test. Correlation analysis was evaluated by Pearson correlation test and $P < 0.05$ was considered statistically significant.

3. Results

The results showed that from 288 sera that were analyzed for level of liver enzymes, 122 and 166 samples belonged to men and women, respectively. The most samples belonged to 20 to 60 years old (Table 1).

Table 1
Demographic characteristics in case and control groups. *n* (%).

Variable	No. of case group	No. of control group
Age (years)		
< 1	3 (2.1)	0 (0.0)
1–20	7 (4.9)	5 (3.5)
21–40	58 (40.3)	44 (30.6)
41–60	53 (36.7)	53 (36.7)
61–80	22 (15.3)	40 (27.8)
> 80	1 (0.7)	2 (1.4)
Total	144 (100.0)	144 (100.0)
Sex		
Male	73 (50.7)	49 (34.0)
Female	71 (49.3)	95 (66.0)
Total	144 (100.0)	144 (100.0)

Twelve (4.2%) sera contained anti-*Toxocara* antibody and all of them were in the case group (Table 2). The mean of aspartate aminotransferase, alanine transaminase, alkaline phosphatase and gamma-glutamyl transpeptidase in the case and control groups were shown in Table 3. Although the mean of all liver enzymes was significantly different in the two groups ($P < 0.001$), the Pearson correlation test showed no relationship between the level of liver enzymes and toxocariasis. The comparison of eosinophilia in two groups showed the percent of eosinophil in the case and control groups were (2.41%) and (1.98%), respectively. The difference was statistically significant ($P < 0.05$).

Table 2
Comparison of case and control groups according to anti-*Toxocara* antibody and eosinophilia. *n* (%).

Variable	No. of case	No. of control	<i>P</i>
Anti- <i>Toxocara</i> IgG			
Positive	12 (8.3)	0 (0.0)	0.001 [*]
Negative	132 (91.7)	144 (100.0)	
Total	144 (100.0)	144 (100.0)	-
Eosinophilia			
Hyper eosinophilia	4 (2.41)	3 (1.93)	0.041 [*]

^{*}: $P < 0.05$ was considered as significant.

Table 3
The level of liver enzymes in case and control groups.

Variable	Case	Control	<i>P</i>
AST (IU/L)	72.24 \pm 7.40	17.76 \pm 5.50	0.0001 [*]
ALT (IU/L)	89.71 \pm 9.90	18.94 \pm 7.19	0.0001 [*]
ALP (IU/L)	331.25 \pm 61.40	186.77 \pm 50.63	0.0001 [*]
GGT (IU/L)	81.39 \pm 19.70	20.79 \pm 9.96	0.0001 [*]

Data were expressed as mean \pm SD; ^{*}: $P < 0.05$ was considered as significant. AST: Aspartate aminotransferase; ALT: Alanine transaminase; ALP: Alkaline phosphatase; GGT: Gamma-glutamyl transpeptidase.

In this study, the prevalence of toxocariasis in the individuals has had an alteration in liver enzymes (8.3%), but there was no correlation between liver enzyme alteration and this disease.

4. Discussion

Toxocariasis is a parasitic disease with worldwide distribution[1]. The definitive diagnosis of toxocariasis was performed by histological examination and identification of the parasite larvae in tissue samples. However, for most patients, obtaining tissue samples for laboratory examination is not practical. So, the serological assessment is the most common method for diagnosis of toxocariasis, but it has to be accompanied with other diagnostic methods[11]. In some countries serodiagnosis kits for toxocariasis are not available or are expensive. So researchers are looking for strategies to use the common clinical signs or hematological and biochemical parameters in order to facilitate diagnosis of the disease. In other words, researchers evaluate the potential of some clinical or medical parameters in the prediction of toxocariasis.

Some researchers focused on the relationship between visceral larva migrans clinical symptoms and prevalence of toxocariasis. Asthma and pulmonary symptoms are important signs in this disease. Kustimur *et al.* reported that *Toxocara* seroprevalence in adults with asthma was 9.7%[12]. Yoon *et al.* recommended in patients with patchy pulmonary infiltrate, serological assessment for toxocariasis should be performed. In his study, the prevalence of toxocariasis among these patients was 66.7%[13]. Moreover, some researchers considered *Toxocara canis* as a hazardous factor for asthma[1]. In Iran, frequency of toxocariasis was 13.9%[14] and 11.25%[15] on children with chronic cough. Considering the results of studies that have been done on patients with respiratory symptoms (for example: asthma), the prevalence of toxocariasis in our country is less than other countries. The reason may be due to food habits and culture.

We know the involvement of liver is the main complication of toxocariasis and can lead to liver dysfunction and finally may alter the functional enzymes of this organ[1,16]. Evaluating of common liver enzymes in the blood is a diagnostic guide for some diseases related to the liver. The most common alterations in serum levels of liver enzymes are hepatocellular and cholestatic that difference between these two types are partly through comparison of enzymes. Generally in hepatocellular type, level of alanine transaminase and aspartate aminotransferase may increase but in cholestatic type, alkaline phosphatase and gamma-glutamyl transpeptidase may increase[17]. Documented study on changes of serum levels of liver enzymes on patients with toxocariasis is not available. In some toxocariasis case reports studies, a blood biochemical test including the measure of the liver enzymes was done. In the most studies, the

level of enzymes were normal[18-21], but in a few studies, level of some liver enzymes, especially alkaline phosphatase and alanine transaminase were increased[22-25]. In one study that was conducted in Kashmir, the seroprevalence of toxocariasis was determined and then blood biochemical parameters were compared on infected and uninfected individuals. The results showed that on infected people, the alkaline phosphatase level was higher than uninfected people. In this study, level of the alkaline phosphatase in serum was proposed as a marker for human toxocariasis[26]. However, in the present case-control study which was conducted between the individuals with the normal and abnormal level of enzyme, the aim was to evaluate the relationship between the level of liver enzymes and toxocariasis. Recent results did not show a correlation between enzyme levels and the disease. Considering the results, the use of liver enzyme alterations as a diagnostic marker of toxocariasis is not recommended.

It can be interpreted from the results of the present study the liver enzyme alteration is not a valid indicator for predicting toxocariasis, since the kind of liver dysfunction that is caused by the larvae of *Toxocara* is unspecified, and it seems factors such as the number of larvae can play a basic role for the emergence of alterations.

Conflict of interest statement

We declare that we have no conflict of interest.

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