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journal homepage: www.elsevier.com/locate/apjtbEpidemiological investigation <http://dx.doi.org/10.1016/j.apjtb.2015.09.016>Seroepidemiology of *Toxoplasma* infection in blood donors in Jahrom District, Southern Iran

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ABSTRACT

Objective: To identify the anti-*Toxoplasma* antibodies from blood donors who referred to blood transfusion bases of Jahrom County, using ELISA method.

Methods: Based on the prevalence and characteristics method, 400 serum samples were collected from blood donors referred to Jahrom blood transfusion bases, Southern Iran, during 2010–2011, designed at testing by ELISA. IgM and IgG antibodies against *Toxoplasma gondii* were tested using ELISA kits (Dia-Pro) on serums. The data were analysed by SPSS 19 software.

Results: Review of 400 cases, 54 of them were IgG positive for parasites (13.5%) and 346 of those with negative IgG (86.5%). In IgM examination, 1.75% of them have been positive IgM (7 cases) and 98.25% of them were IgM negative (393 cases). By comparing the different group ages, 40–50 year age group had the highest prevalence of IgG positive (17.9%) and the age group of 30–40 years had the highest incidence of IgM negative (2.5%).

Conclusions: Due to the serological infection rate of toxoplasmosis obtained from this study, toxoplasmosis should be considered as a significant transfusion risk factor in Jahrom and also in any region with similar situations.

1. Introduction

Toxoplasmosis is one of the most common parasitic infections between human and animals [1,2]. This infection has a worldwide distribution and cats, birds and domestic animals are the most important reservoirs of the parasite [3]. Eating of infected undercooked meat, vegetables and fruits, transmission

through the placenta, blood transfusion and transplantation are the main route of transmission to humans [4–6].

Most people infected with toxoplasmosis are asymptomatic and the infection can persist for years in the body [5]. The main symptoms of this disease include severe brain and ocular complications of abortion [2]. The highest prevalence has been reported among Paris residents (in France) (up to 93%) [2]. The lowest prevalence has been reported from Northern Mexico (7.4%) [7,8]. In Iran, the rate of infection is also remarkable (Tehran 82%, Shiraz 77%, and Isfahan 57%) [9–12]. However, in a recent study done by Sarkari *et al.*, it seems that the infection is reduced in Shiraz (19.3%) [13].

Latent *Toxoplasma gondii* (*T. gondii*) infection in blood donors could be one of the modes of transmission of infection to recipients of blood [7,14]. Due to the high risks of transfusion transmitted infection in healthy and asymptomatic donors, the

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use of these bloods in surgical transplants such as kidney, bone marrow, and blood bags, which require several different donors, is important to clean the screen for *Toxoplasma* infection in the donors. Moreover, all transplant recipients and children with different types of blood diseases such as leukemia, aplastic anaemia, and thalassemia will have a reduced immune system to prevent infection, and these blood transfusions will create a lot of problems to their safety [15].

Seroprevalence of *Toxoplasma* infection was studied in blood donors in Jahrom District, Southern Iran. This cross-sectional study was conducted to identify the anti-*Toxoplasma* antibodies from blood donors who referred to blood transfusion bases of Jahrom County, using ELISA method.

2. Materials and methods

2.1. Study area

Fars Province placed in south of Iran covers an area of about 122400 km². Jahrom County is located in the southeast of province and situated at 30°4'45" North, 51°43'29" East, and 1050 m above the sea level (Figure 1) [16].

2.2. Sampling

In this investigation, according to the prevalence and characteristics formula, sample size was calculated to be about 400 cases for the prevalence, reliability and error of 15%, 95%, and 0.04, respectively. Samples were prepared aimed at testing by ELISA for *Toxoplasma* from donors referred to donate blood transfusion bases of Jahrom County after filling out the questionnaire forms during 2010–2011. The blood donor questionnaire contains: 1) What were the age, gender and occupation of blood donors; 2) How was their level of exposure to cats? (high, to some extent, or rarely); 3) How was the washing hand and time? (with/without soap, before/after meal); 4) How to wash vegetable consumption? (with/without disinfectants); 5) How was the meat consumption? (using boiled broth/barbecued); 6) What was the amount of direct contact with the soil? (high, rare, or none); 7) Living place (town/village); 8) What were the results of each serology test? (IgM and IgG positive/negative); and 9) Which of the following clinical signs in the last three months had? (swollen lymph nodes, ocular discomfort, and/or troubled brain).



Figure 1. Map of Iran.

2.3. Serological assay

Prevalence of anti-*Toxoplasma* antibodies in blood donors was done according to the immunoglobulin class, sex, age and different locations of Jahrom County. After centrifugation, serum samples were separated. They were maintained at -70 °C in the freezer temperature before assessment. After collecting all samples, IgM and IgG antibodies against *T. gondii* were tested using ELISA. Kits and materials used in this study were prepared from Italy (Dia-Pro, Milan, Italy). During the test, the whole kit was used according to the instructions given in the brochure ahead. In this assay, there was a 96-well (holes) plate, which made it possible to perform 96 tests simultaneously [17].

Samples were added to the plate and incubated for 30 min, and then plates were washed three times to remove excess molecules. After further washing and incubation, chromotogen was added to the cavity containing the substrate material. After 5–10 min, a colorless substrate is converted to a colored end product in the presence of peroxidase. The color changes were measured and recorded by spectrophotometer at a wavelength of 450 nm [17].

2.4. Data analysis

Statistical analyses of tables and graphs were performed using SPSS 19 statistical software (SPSS Inc., Chicago, USA). Descriptive statistics were shown in either mean standard deviation note or as frequency tables. Relationships between the categorical variables were evaluated by *Chi-square* assay. *P*-values less than 0.05 were considered as statistical significant.

3. Results

Review of 400 cases, 13.5% of them were IgG positive for parasites that are equal to 54 and 86.5% of those with negative IgG were equivalent to 346 cases. In IgM examination, 1.75% of them have been positive IgM against 7 people and 98.25% of subjects were negative for IgM against 393 individuals. By grouping together people of different ages and comparing them, 40–50 year age group had the highest prevalence of positive IgG (equivalent to 17.9%). The highest incidence of IgM was in the age group 30–40 years (2.5%) (Table 1).

In terms of gender, the prevalence of IgM in men and women were 1.7% and 0%, respectively. Moreover, IgG prevalence in male and female were 13.6% and 9.1%, but these differences were not statistically significant (*P* > 0.05). Also, no significant correlation was found between positive serology and a chance encounter with a cat against parasites. In people who had washed their hands with soap, IgG and IgM positive rates were 13.9% and 1.8% separately. But these rates were zero percent in those who washed their hands without soap; consequently, the relationship was not significant according to the statistical test (*P* > 0.05). IgG and IgM-positive rates were 11.7% and 0.6% respectively in people who had washed their hands before meals. These rates were 12.3% and 0% among people who washed their hands after meals. These amounts were 15.3% and 2.2% in the people who washed their hands before and after meals. Statistically, results indicated that there was not statistically significant relationship between toxoplasmosis rates and washing hands before and/or after meals. In the people who washed the vegetables with disinfectant, IgG and IgM-positive rates were 12% and 1.7% respectively, but these amounts were 12.4% and 1.6% in those

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