



Original Article

Seroprevalence of *Toxoplasma gondii* Infection and Related Risk Factors in Tabriz City, Iran, 2008

Rasool Jafari (MSc)^{a*}, Mohammad Sadaghian (PhD)^b, Marzieh Safari (MSc)^c

^a Department of Medical Parasitology, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

^b Department of Pathobiology, School of Veterinary Medicine, Shabestar Branch, Islamic Azad University, Shabestar, Iran

^c Department of Medical Microbiology, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

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* Correspondence

Rasool Jafari (MSc)

Tel: +98 914 3084002

E-mail1: rasooljafariiii@gmail.com

ABSTRACT

Background: *Toxoplasma gondii* is a worldwide obligate intercellular parasite. Felids are its definitive host and warm-blooded animals including humans are its intermediate host. The aim of this seroepidemiological study was to investigate the frequency of human infection using ELISA method and related risk factors in Tabriz City, northwestern Iran.

Methods: In this cross sectional study, 171 blood samples were collected randomly from clients referred to Alinasab Hospital diagnostic laboratory, Tabriz, Iran in 2008. Simultaneously data about risk factors such as having soil related jobs (for example: building construction workers and farmers), cat contact, eating raw vegetables at restaurants, the method of washing vegetables, eating undercooked game meat and the quantity of red meat consumption (undercooked) were collected by questionnaires. Anti-*Toxoplasma* IgG titers were determined in samples using ELISA method. Data were analyzed by Chi-square, One Way ANOVA and *t*-test using SPSS v.16 Software.

Results: Sixty (35.1%) out of 171 serum samples were anti-*Toxoplasma* IgG positive. There was statistically significant difference about seropositivity between soil related jobs and others ($P=0.007$, OR=2.43; 95% CI: 1.27, 4.66). In addition there was significant relationship between seropositivity and eating vegetables at restaurants ($P=0.039$, OR=1.94; 95% CI: 1.02, 1.68). No significant statistical differences were observed about seropositivity considering the other mentioned risk factors.

Conclusion: The prevalence rate of *Toxoplasma* chronic infection was relatively high in the studied people. However, having soil related jobs and eating vegetables at restaurants increases the probability of acquiring the infection.

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Introduction

T*oxoplasma gondii* is a cosmopolitan obligate intercellular protozoan parasite belonging to the phylum Apicomplexa which causes the most frequent parasitic infection of animals and human being. During infection of felids as definitive hosts, millions of oval shaped oocysts (10×12 μm in size) spread out in the faeces for up to 3 weeks¹. After a short sporulation period, oocysts become infective then the intermediate hosts which consisting of even felids, can be infected by ingesting of food and water contaminated with infective oocysts. In addition, ingesting raw or undercooked meat can be infective when containing tissue cyst^{2,3}. Human infection is usually asymptomatic in cases that have normal immune system, but it makes serious disease in immunocompromised/suppressed hosts. For example, it can cause severe toxoplasmic encephalitis in patients of immunodeficiency such as HIV positive individuals^{3,4}. In order to control the infection and its consequences, it is necessary to have updated information about prevalence rate and responsible risk factors in each geographical region.

In Iran like other countries, epidemiological studies have been done and reported different prevalence in different regions throughout the country, as in northern Iran 55.7%⁵, in Ilam Province 44.8% in pregnant women⁶, in Isfahan Province 41.4%⁷ and 63.9% in Babol⁸.

We conducted a cross-sectional study to determine the prevalence of anti-*Toxoplasma* IgG using ELISA method, on subjects referred to one of the main laboratories in Tabriz, northwest Iran.

Methods

In a cross sectional study, 171 blood samples were collected from clients referred to a main diagnostic laboratory during March 2008 in Tabriz City, northwestern Iran. All cases were in range of 18 to 40 year old. Data were collected about their sex, cat contact, the method of washing vegetables, eating undercooked red meat, consuming vegetables at restaurants and having soil related jobs such as: building construction workers and farmers. The separated sera were kept in -20 °C

until examination. After ending the sampling, sera were thawed at room temperature and anti-*Toxoplasma* IgG concentrations in the sera were determined using ELISA kits (Euroimmun®, Germany).

Titers higher than 11 IU/ml regarded as positive, 9-11 IU/ml borderline and lower than 9 IU/ml considered negative. ELISA kits applied in ELISA microplate washer (Anthos fluido®, Austria) for washing the microplate with 450 µl washing buffer per well 3 times and ELISA microplate reader (anthos® 2020, Austria) for photometric measurement at a wavelength of 450 nm following the instruction of manufacturer.

Data were analyzed by Chi-square, One Way ANOVA and *t*-test using SPSS v.16 Software.

Table 1: The association between *Toxoplasma* seropositivity and potential risk factors in Tabriz City, 2008

Variable	Seronegative	Seropositive	Odds Ratio	95% CI	P value
Cat contact					
No	81	47	1.00	-	-
Yes	29	13	0.77	0.36, 1.63	0.579
Soil related jobs					
No	63	21	1.00	-	-
Yes	48	39	2.43	1.27, 4.66	0.007
Eating vegetables at restaurant					
No	64	25	1.00	-	-
Yes	46	35	1.94	1.02, 1.68	0.039
Eating big amount of undercooked red meat					
No	21	6	1.00	-	-
Yes	89	54	2.12	0.8, 5.59	0.121
Method of washing vegetables					
Water	54	37	1.74	-	-
Detergent/disinfectant	56	22	1.00	0.91, 3.33	0.090

Despite the anti-*Toxoplasma* IgG concentration mean was higher in males comparing to females as well as subjects who had not have constant cat contact, having soil related jobs, having the habit of eating vegetables at restaurants, consump-

Results

Sixty (35.1%) out of 171 serum samples were anti-*Toxoplasma* IgG positive. Among studied risk factors, there was statistical significant difference about seropositivity between soil related jobs ($P=0.007$, OR=2.43; 95% CI: 1.27, 4.66). Moreover there was significant relationship between seropositivity and eating vegetables at restaurants ($P=0.039$, OR=1.94; 95% CI: 1.02, 1.68). Although, seropositivity was quantitatively higher in subjects who washed their consuming vegetables without using detergent/disinfectants comparing to subjects who did so ($P=0.090$, OR=1.74; 95% CI: 0.91, 3.33), but the difference was not significant (Table 1). No significant statistical differences were observed about seropositivity considering the cat contact and the quantity of undercooked red meat consumption.

tion of large amount of undercooked red meat (e.g. kabob) in comparison with others, the differences were not significant statistically (Table 2).

Table 2: Distribution of anti-*Toxoplasma* IgG mean by potential risk factors using *t*-test

Variables	Yes		No		Difference	SD	P value
	Mean	SD	Mean	SD			
Cat contact	85.3	143.5	104.9	172.4	19.60	29.40	0.221
Soil related jobs	115.6	168.2	82.8	161.4	32.82	25.16	0.352
Eating vegetables at restaurants	111.4	150.4	89.7	178.6	21.68	25.30	0.924
Eating big amount of undercooked red meat	105.7	163.3	71.6	176.8	34.10	34.20	0.340
Using detergent/disinfectants for washing vegetables	95.6	178.3	103.1	155.5	7.40	25.60	0.622

Discussion

From total of 171 studied sera, sixty (35.1%) were anti-*Toxoplasma* IgG seropositive that indicates fairly high prevalence. In Iran variety of epidemiological studies have been carried out in different regions, for instance, Jahani et al. performed a similar study in Qazvin Province on unmarried women and found 34% seropositivity⁹. Ghorbani et al. reported 23.2% prevalence rate of toxoplasmosis in neighboring cities which is lower than what we found¹⁰, also in 1987 reported that 55.7% of people living in rural area of northern Iran were *Toxoplasma* seropositive⁵. Highest prevalence as 55.7% and 87% has been reported from Caspian Sea basin, northern parts of Iran^{11, 12}. Assmar et al found that 51.8% of general populations of Iran were infected which is higher than ours¹³. Fallah et al. in 2008 reported 33.5% seroprevalance of toxoplasmosis among primigravida women in Hamadan City

also undercooked meat consumers (barbecue) and daily raw vegetables consumers had the highest prevalence¹².

In our study despite the higher frequency of anti-*Toxoplasma* IgG in humans that consume large amount of undercooked red meat ($P=0.12$, OR=2.12; 95%CI: 0.8-5.59), wash their everyday used vegetables just by water ($P=0.09$, OR=1.74; 95%CI: 0.91-3.33), but were not significant statistically. According to our results, having soil related jobs and eating vegetables at restaurants can significantly increase the probability of infection (Table 1). Our findings showed significant higher prevalence in cases that had soil related jobs than others which might be caused by more exposure to different infected agents during the work.

Given to traditional customs among Iranian people, keeping the cat at home is mostly denounced, but unfortunately there are large populations of stray cats that shed large amount

of their feces around dwellings and farms which considerably increases the possibility of cultured vegetables contamination to *Toxoplasma* oocysts. Our findings revealed a lower frequency of infection of humans in contact with cat comparing to others, which does not support those of Fallah et al. (2005) and Youssefi et al. (2007) that reported significant relationship between infection and cat contact^{8,14}, but the quality of contact and hygienic status of the cats can be important factor. Among the studied cases, 63.8% were washing their vegetables only by water. In our study numerically, the highest rate of IgG seropositivity was recorded in the group that used to wash their vegetables only by water whereas the lowest was in a group that used disinfectants/detergents, but the difference was not significant statistically. In addition no significant relationship between gender and prevalence rate of toxoplasmosis was observed, which is supporting those Assmar et al, reported in 1997¹³.

Conclusion

The prevalence of toxoplasmosis was 35.1% that indicates fairly high prevalence in the residents of Tabriz, but comparing to results of studies in neighboring regions^{5, 11, 12} in the country, it can be concluded that the prevalence is moderate comparing to other regions of country. Moreover based on our results, cat contact, daily washing of consuming vegetables just by water, eating large amount of undercooked red meat and eating undercooked game meat have no significant effect on the rate of seropositivity, whereas having soil related jobs and eating vegetables at restaurants increases the risk of infection.

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Conflict of interest statement

No conflict of interest was to be mentioned.

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