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Original Article

High Seroprevalence of *Toxoplasma gondii* Antibody in HIV/AIDS Individuals from North of Iran

Mohammad Taghi RAHIMI¹, *Seif Ali MAHDAVI², Behzad JAVADIAN², Rozita REZAEI³, Mahmood MOOSAZADEH⁴, Mehri KHADEMLOU⁵, Seyed Hosein SEYEDPOUR⁵, Abolghasem SYADATPANAH⁶

1. Toxoplasmosis Research Center, Mazandaran University of Medical Sciences, Sari, Iran
2. Amol faculty of Paramedics, Mazandaran University of Medical Sciences, Sari, Iran
3. Amol Faculty of Nursing and Midwifery, Mazandaran University of Medical Sciences, Sari, Iran
4. Health Sciences Research Center, School of Health, Mazandaran University of Medical Sciences, Sari, Iran
5. Health Center Province, Mazandaran University of Medical Sciences, Sari, Iran
6. Dep. of Medical Parasitology and Mycology, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

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***Correspondence**

Email:

sa.mahdavi@mazums.ac.ir

Abstract

Background: Toxoplasmosis in immunocompetent people is generally asymptomatic but in immunocompromised patients including HIV/AIDS, cancer patients, and organ transplant recipients, etc. it can lead to serious pathological problems. The objective of current study was to determine the seroprevalence of *T. gondii* IgG and IgM antibodies in HIV/AIDS patients using ELISA technique in Mazandaran Province, northern Iran.

Methods: Overall, 82 serum samples (61 males and 21 females) were collected from HIV/AIDS patients in Mazandaran Provinces, in 2013. Sera were surveyed employing ELISA assay. Data were analyzed using Chi-Square or Fisher exact test. In addition, before sampling a questionnaire was filled out for each subject.

Results: Overall seroprevalence of examined sera was 96.3% for IgG antibody but none of the sera shown IgM antibody against *T. gondii*. The seroprevalence of toxoplasmosis in males and females was 96.7% and 95.2%, respectively. An antibody titer of >1 IU/ml was considered as positive. Furthermore, none of the included variables statistically was significant.

Conclusions: Seroprevalence of chronic (latent) toxoplasmosis in HIV/AIDS patients in Mazandaran Province is high compared to toxoplasmosis in general population. Consequently, the risk of acquiring *Toxoplasma* encephalitis in examined seropositive HIV/AIDS patients of *Toxoplasma* is high.

Introduction

Toxoplasma gondii, the causative agent of toxoplasmosis is an obligate zoonotic parasite, distributed throughout the world, and can infect all warm-blooded vertebrates (1). The parasite imposes a major burden both on human and animal health. It is estimated that one-third of world population are considered as seropositive sera (2). The worldwide seroprevalence of *T. gondii* in general population was reported 46.1% (3). “The overall seroprevalence rate of toxoplasmosis among the general population in Iran was estimated 39.3% ” (4).

Even though infection with *Toxoplasma* in immunocompetent individuals normally is asymptomatic, it can lead to serious pathological effects in both immunodeficient patients and congenital cases (5). Considering increasing number of immunocompromised patients including HIV positive patients, cancer patients, and organ transplant recipients, the parasite can lead to life threatening conditions for those individuals due to being as an opportunistic parasite (6).

For appropriate diagnosis, treatment, and control of infections caused by *T. gondii*, it is necessary to provide comprehensive information regarding the seroprevalence rate of *Toxoplasma* antibodies in special groups. Diagnosis based on serology tools such as ELISA is commonly performed in many medical centers also, it is considered as the gold standard for *Toxoplasma*-specific antibodies (IgG or IgM) (7).

There are limited data on *Toxoplasma* infection in immunocompromised patients particularly in HIV/AIDS people in Iran. Therefore, the objective of this study was to determine the seroprevalence of *T. gondii* IgG and IgM antibodies in HIV/AIDS patients using ELISA technique in Mazandaran Province, north of Iran, 2013.

Materials and Methods

Study area

Mazandaran Province (36°33'56"N 53°03'32"E) is located at the northern part of Iran and on the southern coast of the Caspian Sea.

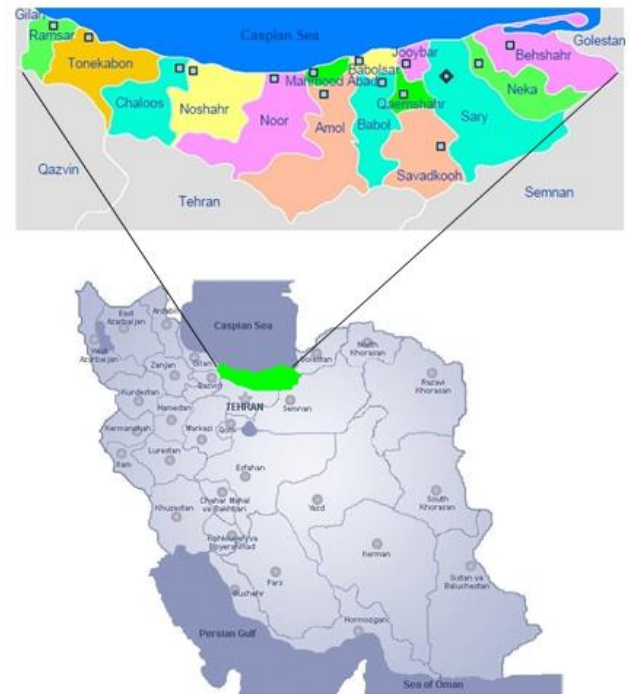


Fig. 1: Map of Iran. Mazandaran Province is indicated by green and cities are shown with different colors

It is bordered clockwise by Golestan, Semnan, Tehran, Qazvin and Gilan Provinces. This Province covers an area of 23,842 km² and its population is composed by 2, 922, 432 inhabitants. Mazandaran is divided into 15 cities and 102 rural districts. Figure 1 shows the respective positions of the cities. This province has a particular geographical condition with moderate and subtropical climate with an average temperature of 25 °C in summer and about 8 °C in winter, 70%-100% rela-

tive humidity and 800-1200 mm annual rainfall in which all mentioned climate conditions are favorable to survival of *Toxoplasma* oocyst and appropriate for supporting the life cycle of *T. gondii*. This province is geographically divided into the coastal plains and the mountainous areas of Alborz Mountains Range. It has diverse ecosystems including many plains, prairies and forests (8).

Sampling

A cross-sectional study was conducted on 82 HIV/AIDS patients (61 male and 21 female) in Mazandaran Province, north of Iran, 2013.

An informed consent document was taken from every participant. A questionnaire was filled out for each individual to obtain information including the different factors associated with the disease. Afterwards, the blood sample was taken from each individual and transferred to the laboratory of Shaheid Babaei, Sari for examination with ELISA. This study was previously approved by the Ethics Committee (No.: 92171) at the Mazandaran University of Medical Sciences.

Serological Examination

Five mL of blood samples were collected from each person. The serum separated from blood samples and was stored at -20 °C until examination. The presence of IgG and IgM antibodies of *T. gondii* was determined using conventional ELISA technique, based on the manufacturer's instructions (PISHTAZTEB DIAGNOSTICS Co., Tehran, Iran). The optical density of IgG and IgM antibodies was read at 450 nm after 15 min using an automatic microplate reader (State Fax® 2100, Awareness, USA). Furthermore, cut off value for ELISA test for IgG and IgM anti-*T. gondii* antibodies was determined 1.

Statistical analysis

The data analysis was performed by Chi-Square test using SPSS 11.5 (Chicago, IL, USA). Chi-Square or Fisher exact test, was used to analyze the associations between sero-

prevalence and influence of risk factors including gender, age, etc. The differences were considered statistically significant when $P < 0.05$ was considered.

Results

From 82 examined sera, 96.3% (79) were seropositive for IgG antibody and none of the sera shown IgM antibody against *T. gondii*. The seroprevalence of toxoplasmosis was 96.7% in males and 95.2% in females. Different risk factors of examined individuals for detection of seroprevalence of toxoplasmosis in immunocompromised patients in Mazandaran Province are shown in Table 1.

In addition, serological examination for diagnosis of *Toxoplasma*-specific antibodies (IgG or IgM) using ELISA test were repeated for more accuracy on all of the sera. Furthermore, none of the included variables in Table 1 statistically was significant.

Discussion

In the present study, the seroprevalence of anti-*T. gondii* IgG antibody among HIV+/AIDS patients was 96.3%. Daryani et al. reported that 77.4% of HIV/AIDS serum samples were positive for anti-*T. gondii* IgG antibody and 9.7% of HIV+/AIDS patients showed anti-*T. gondii* IgM antibody in samples from north of Iran (9) but in this work anti-*T. gondii* IgM antibody was not detected in examined individuals. This fact should not be neglected that some cases of acute toxoplasmosis may have been considered negative for IgM antibody particularly in the more profoundly immunodeficient subjects (10).

The seroprevalence of toxoplasmosis in HIV-positive patients varied in other parts of Iran including Tehran 49.75%, Kurdistan 46.9% Mashhad 38.01% and Shiraz 18.2% (10-13).

Seroprevalence of *T. gondii* using ELISA method among general population in Mazandaran Province were 55.5% and 87.5% (4).

Table 1: Demographic and baseline characteristics of 82 HIV/AIDS patients for detection of *T. gondii* IgG antibody

Demographic & baseline characteristics	Total number	<i>Toxoplasma</i> positive number (%)	P-Value
Sex			0.59
Male	61	59 (96.7)	
Female	21	20 (95.2)	
Age group (yr)			0.98
≤20	2	2 (100)	
21-40	49	48 (97.9)	
41-60	29	27 (93.1)	
60<	2	2 (100)	
Mode of HIV transmission			0.79
Sexual	32	31(96.8)	
Injection	42	40(95.2)	
Others	8	8(100)	
Cat owner			0.67
yes	10	10 (100)	
No	72	69 (95.8)	
Under cooked meat consumption			0.67
yes	10	8 (80)	
No	72	71 (98.6)	
Row vegetable consumption			0.50
yes	65	65 (100)	
No	17	14 (82.3)	
Taking immunosuppressant drugs			0.29
yes	9	8 (88.8)	
No	73	71 (97.2)	
Duration of HIV/AIDS infection (yr)			0.83
<1	13	12 (92.3)	
1-5	35	34 (97.1)	
5-10	29	28 (96.5)	
>10	5	5 (100)	
History of <i>Toxoplasma</i> test			0.13
yes	20	20 (100)	
No	62	59 (95.1)	

The high seroprevalence of latent toxoplasmosis among examined subjects of Mazandaran Province may due to some important factors including either consumption of raw or under cooked meat, high humidity that is essential for survival of the oocyst of *T. gondii* and abundance of cats as final host that contaminates the environment.

In contrast, the lower prevalence might be associated to climatic conditions in cold, warm, and dry weather.

There is wide geographic variation in the prevalence of latent *T. gondii* infection. Investigations on prevalence of latent *T. gondii* infection from different continents including

Europe, Latin America, Africa, and Asia have a range of 30%-75%, while prevalence from USA studies have a range of 3%-42% (14). It is estimated that 20% to 47% of all patients with HIV develop encephalitis due to toxoplasmosis in USA (15-17) and this range for Europe and Africa is estimated 25% to 50% (18, 19).

Our result is in agreement with Mahroz et al. findings because no significant relationship was observed between seroprevalence of toxoplasmosis and demographic and baseline characteristics of the patients and HIV transmission risk factors.

This fact is noteworthy to mention that reactivation of latent infection in immunocompromised people including HIV/AIDS individuals, and receiving chemotherapy (cancerous or organ transplant patients) can be fatal and is considered as one of the most rigorous clinical demonstrations of toxoplasmosis (20, 21). *Toxoplasma* has a prominent tendency to locating in the brain and eye due to neurotropism, which results in the formation of the cyst in the relevant target organs. In addition, *T. gondii* can cause frequent attacks of encephalitis in HIV/AIDS patients and in some immunocompromised patients lead to severe brain damage, long-term neurological defects and even death (19, 22).

In the current study, none of the included variables statistically was significant. This fact maybe originate from our low sample size that this issue was one of the limitation of the present study.

Conclusion

Seroprevalence of chronic (latent) toxoplasmosis in HIV/AIDS patients in Mazandaran Province is high compared to toxoplasmosis in general population. All HIV+/AIDS patients have to be screened and monitored for *T. gondii* antibodies in the Province. Administration of primary chemoprophylactic regimens with co-trimoxazole against *Toxoplasma* to all HIV+/AIDS patients seems to be necessary in these areas owing to being at high risk of encephalitis caused by *Toxoplasma*.

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