

Original Article

Seroprevalence of Toxoplasmosis among Women Referring to Shahid Beheshti Hospital, Hamadan, Iran

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Abstract

Background: Toxoplasmosis is a parasitic disease caused by the protozoan *Toxoplasma gondii*. The aim of this study was investigate the prevalence of toxoplasmosis among young women who referred to check up for toxoplasmosis attended in Shahid Beheshti hospital, Hamadan during 2013-2014.

Materials and Methods: This study was performed on 2523 pregnant women who referred to laboratory of Shahid Beheshti hospital in Hamadan province (western of Iran) during 2013-2014. Age, level of education and place of residence were recorded in the relevant forms. Antibodies serum levels for all samples were examined by ELISA. IgG titer equals and more than 1:200 was presumed as seropositive. Data were analyzed using by SPSS version 19.0 software.

Results: 26.1% of IgG seropositive persons were city residents while 32.3% of them lived at village and suburb of city. 1.4% and 1.1% of at risk persons (based on IgG titration) were city and village residents, respectively. 1.3% and 1.9% of IgM seropositives were city and village residents, respectively. The percentage of at risk persons of city and village (based on IgM titration) were 0.3% and 0.6%, in a row. 29.7% of IgG seropositives did not have academic education while 30.4% of them graduated from high school, at least. The seropositive IgM percentage of non-academic educated persons and graduated/academic ones were 1.7% and 1.4%, respectively.

Conclusion: Our funding indicates the association between age of women and their level of education with percentage of contamination and prevalence. IgM seropositive is lesser than IgG. It means that toxoplasmosis is chronic or there is previous contact. To avoid the risk of toxoplasmosis infection particularly in pregnant women should be examined and the necessary preventive measures and training for young women should be presented.

Keywords: Toxoplasmosis, Pregnant women, Hamadan

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Introduction

Toxoplasmosis is a zoonosis disease caused by *Toxoplasma gondi*. The most infected individuals are asymptomatic; when these individuals in period of their lives suffer from immune deficiency (such as: AIDS, cancer and chemotherapy, etc.), they will have a recurrence of the disease. Cat is primary host of the parasite and developmental cycle of the parasite is processed in the cat's body. Domestic mammals such as cows and calves are also the reservoir of the parasite and after during the developmental phases, parasite remains in form of the cysts in the meat of these animals¹⁻⁹. Consumption of raw meat or medium undercooked beef is one of the main transmission route⁹. The prevalence of infection is varies in different countries. For example, in USA its prevalence is 15.8%¹⁰, but in France were about 80% in the early 1960s, and 44% in 2003¹¹. The exact statistical details of seroprevalence of toxoplasmosis in Iran is not available but according to one study in 12 provinces of Iran, the highest prevalence of *Toxoplasma* antibody titer has been reported from Mazandaran province (20.5%) in the north of the country, while the lowest prevalence was detected in Hormozgan (2.9%)¹².

In most cases, the clinical course of the disease is self-limiting and will improve spontaneously after a period of time (several weeks to several months). In rare cases, the disease appears to be more severe and may lead to involvement pneumonia, liver, brain, and eyes. Infection in pregnant women is created after ingestion of food or water contaminated to parasites oocyte. Infection transmission to fetus through the placenta takes over and probability of transmission to fetus during pregnancy should be increased¹³⁻¹⁵.

Infection during the first trimester of pregnancy comes with severe clinical symptoms in fetus and may be lead to abortion. The prevalence of severe congenital disease is mentioned in different study for first trimester 11%, in the second trimester 4%, and the third trimester 0%. Most infants with congenital toxoplasmosis are asymptomatic at birth (70-90%), although in some infants clinical symptoms such as fever, rash, hepatosplenomegaly, microcephaly, convulsion, jaundice, enlarged lymph nodes in form of dispersion is rarely seen¹⁶⁻²⁰.

The best practices for prevention of infection are

pregnant women education in the ground of parasite transmission and alarm her to avoiding of risky actions and do something such as: washing fruits and vegetables before eating, meat should be cooked at a temperature of 66°C or more, or at least a day before serving should be kept in the freezer and finally, to extent possible to reduce contact with cats¹⁴⁻²¹.

Due to the variation of the prevalence of toxoplasmosis in pregnant women and its side effects, this study was conducted among pregnant women who were referred to Shahid Beheshti hospital in Hamadan (western of Iran) during 2013-2014, in order to determine the acute and chronic infection, and also the rate of antibodies titer against *Toxoplasma gondii*.

Methods

This study as a descriptive study carried out on pregnant women who were referred to the laboratory of Shahid Beheshti hospital in Hamadan, to check up for toxoplasmosis. Samples were all women referring to Shahid Beheshti Hospital during 2013 to 2014. Data about age, level of education and place of residence were recorded in the relevant forms.

Antibodies serum level was evaluated by ELISA kit (VIRO-IMMUN, Germany) and sera were positive that titer of it was 1:200 and/or higher for IgG and IgM antibodies. The criterion for determining of infectious was titers of 1:20 and 1:400 values. Data were analyzed by Chi-square test using SPSS software (version 19).

Results

In this study, data related to 2523 samples were analyzed that among the 732 samples (29.01%) reported positive antibody that 681 samples (26.99%) antibody IgG, and 30 samples (1.2%) of this antibody, exposure risk were detected. Also, 51 samples (2.02%) had IgM antibody and those at risk of this antibody was 32 samples (1.26%) (Figure 1).

Table 1: The frequency distribution of specific anti-Toxoplasma IgG and IgM antibodies among pregnant women according to place of residence in Hamadan, western of Iran, 2013-2014.

Antibody	Rural		Urban		Overall	
	Border	Positive	Border	Positive	Border	Positive
IgG	1.1	32.3	1.4	26.1	1.2	29.6
IgM	0.6	1.9	0.3	1.3	0.6	2

Table 2: Age distribution of specific anti-Toxoplasma IgG and IgM antibodies among pregnant women in Hamadan, western of Iran, 2013-2014.

Antibody	Mean age	Age range
IgG positive	24.85± 6.028	13-79
The border of IgG	23.10 ± 5.139	17-35
IgM positive	23.86 ± 4.381	16-34
The border of IgM	23.33 ± 4.292	15-30

44.1% of antibody-positive individuals have been settled in rural area and 55.9% in urban. Table 1 shows the frequency of IgG and IgM antibodies based on the place of residence.

In this study, the target population, in terms of age were also studied that mean age of them was 22.39±5.839. The highest prevalence was observed in the age group of 18 to 30 years that was associated with positive IgG antibody. Distribution of frequency of IgG and IgM antibodies by age is presented in table 2. Also incidence of positive cases for toxoplasmosis among pregnant women according to education level shown in figure 2.

Discussion

Toxoplasmosis, rubella, herpes viruses (1 and 2), cytomegalovirus and other several diseases as torch syndrome, is important from the view of congenital transmission. Congenital toxoplasmosis occurs when mother during pregnancy encounter with the parasite for first time. Congenital toxoplasmosis is one of the most important diseases that limit the fetus health condition. Active form of parasite (tachyzoite) can pass from placenta barrier in first trimester because placental layers are thinner in this period of time so the parasite is able to infect placenta and fetus²⁻⁴.

For reliable study researcher have to know start time of pregnancy. For positive women two other samples were taken to recheck again. If the antibody scale is indicative of a chronic infection usually the mother, has no problem for her baby and safe and secure

delivery of *T. gondii* is predictable. But if a new infection is suspected, a test to measure IgM should be done; if a negative IgM was seen there is no problem, but if IgM is positive new infection arises. In such cases, serologic retest for at least 3 weeks, maternal infection greatly indicated¹⁻⁷.

In Iran various studies have been shown that we have high prevalence of toxoplasmosis in different parts of the country²²⁻²⁵. In a study conducted in 1997 according to age in the Lahijan city (northern of Iran) by Katayon Dastan and colleagues more frequent was seen in the 21-30 years age group. In this seroepidemiological survey, in both populations, there was no significant relationship between profession and toxoplasmosis. Among those attending in both urban and rural areas, there was no significant difference²². In another study in Sari (northern of Iran) on 612 pregnant women, M.J Saffar showed that 435 people serologically were positive for toxoplasmosis. The subjects were between 16-36 years and the highest prevalence rate of age was among 20-30. Also this study showed that the prevalence of disease was high in that city and raises probability of infection with aging²³. Mostafavi et al. reviewed the epidemiology of toxoplasmosis in Iran in 2012 and he showed that the prevalence of *T. gondii* in humid and cold climates was more, and its prevalence is higher in women, especially housewives. Mostafavi study showed that in half of the studies, there isn't significant relationship between academic level and prevalence of toxoplasmosis²⁴. In a study on nulliparous pregnant women in Hamadan, prevalence of toxoplasmosis was 33.5% while 61.5% of patients were illiterate and 28.4% were diploma and we showed that prevalence of the disease in the current study was 26.9%. Lower educated people typically have lower socioeconomic status and disregarded hygienic principles and infection in these individuals is more than educated people²⁵. In another study by Cheraghpour et al. on

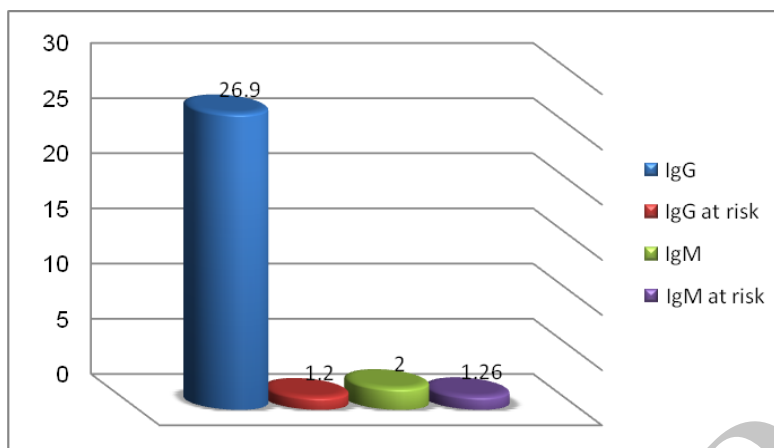


Figure 1. Serological prevalence of *T. gondii* antibodies among pregnant women in Hamadan, western of Islamic Republic of Iran, 2013-2014

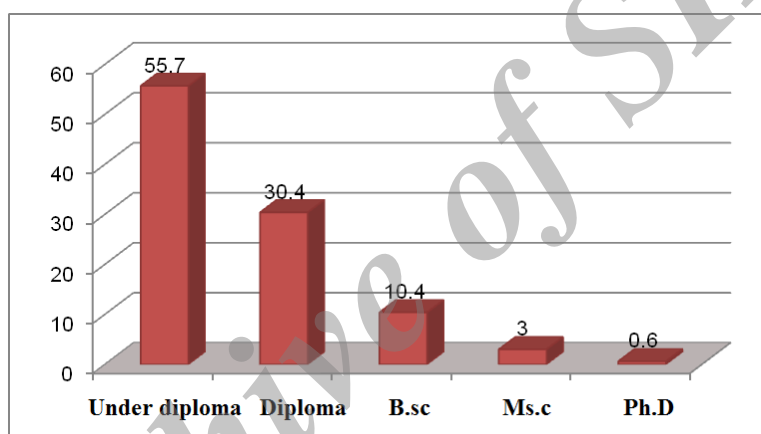


Figure 2. Incidence of Positive cases for toxoplasmosis among pregnant women according to education level in Hamadan, western of Islamic Republic of Iran, 2013-2014

390 pregnant women, prevalence of toxoplasmosis was reported in urban 30.8% (our study: 55.9%) and in the rural 31.4% (our study: 44.1%). 23.6% of urban women and 23.5% of rural women had chronic infection, and 7.2% of urban women and 7.9% of rural women were acute infection. However, in our study, 26.1% urban and 32.3% rural had chronic infection that these differences may result from variations in climate, food habits and other factors affect²⁶. The IgG serological frequency has a correlation with age and place of residence, so that 32.3% of positive IgG were rural and mean age of people was 24.85%. This indicates that the chronic form of the disease or previous contact to it (the presence of serum IgG), with aging and place of residence are correlated. Also, the percentage of

frequency of serum positive IgG in people under diploma was 55.7%, which may indicate a relationship between poor hygienic and low academic level and with considering the hygienic principles associated with this disease; for example washing vegetables and cooking all meat and reducing contact with an infected cat, the spread of the disease can to be substantially limited. We have a higher frequency in presence of serum IgM and active infection in the rural population and under diploma individuals.

Conclusion

The results of this study showed that the percentage of people with acute toxoplasmosis (IgM) compared with chronic disease or who have had previous contact, is very low (2% vs. 26.9%) and according to high

statistics of women with negative antibody (70%) and the importance of this disease during pregnancy and its effects on the fetus, it is recommended to evaluate the anti-*Toxoplasma* antibodies in women during pregnancy and marriage counseling until if being test negative re-track during pregnancy and also good training to prevent infection in pregnancy is done.

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References

1. Ayatollahi J, Sharifi M, Dehghani R, Melat A. Toxoplasmosis in pregnancy. J Shahid Sadoughi Univ Med Sci. 2011;19:257-65. [Persian]
2. Akbar I. Seroprevalence and Coinfections of *Toxoplasma gondii* in Childbearing Age Women in Turkey. Iran J Public Health. 2011;40:63-7.
3. Ertug S, Okay P, Turkmen M, Yuksel H. Seroprevalence and risk factors for *Toxoplasma* infection among pregnant women in Aydin province, Turkey. BMC Public Health. 2005;5:66.
4. Fallah M, Rabiee S, Matini M, Taherkhani H. Seroprevalence of toxoplasmosis in primigravida women in Hamadan, Islamic Republic of Iran, 2004. East Mediterr Health J. 2008;14:163-71.
5. Vaz RS, Thomaz-Soccol V, Sumikawa E, Guimarães ATB. Serological prevalence of *Toxoplasma gondii* antibodies in pregnant women from Southern Brazil. Parasitol Res. 2010;106:661-5.
6. Kaul R, Chen P, Binder SR. Detection of immunoglobulin M antibodies specific for *Toxoplasma gondii* with increased selectivity for recently acquired infections. J Clin Microbiol. 2004;42:5705-9.
7. Jones JL, Kruszon-Moran D, Wilson M, McQuillan G, Navin T, McAuley JB. *Toxoplasma gondii* infection in the United States: seroprevalence and risk factors. Am J Epidemiol. 2001;153:57-65.
8. Nowakowska D, Stray-Pedersen B, Spiewak E, Sobala W, Malafiej E, Wilczyński J. Prevalence and estimated incidence of *Toxoplasma* infection among pregnant women in Poland: a decreasing trend in the younger population. Clin Microbiol Infect. 2006;12:913-7.
9. Alvarado-Esquivel C, Sifuentes-Alvarez A, Narro-Duarte SG, Estrada-Martínez S, Díaz-García JH, Liesenfeld O, et al. Seroepidemiology of *Toxoplasma gondii* infection in pregnant women in a public hospital in northern Mexico. BMC Infect Dis. 2006;6:113.
10. Jones JL, Kruszon-Moran D, Wilson M. *Toxoplasma gondii* infection in the United States, 1999–2000. Emerg Infect Dis. 2003;9:1371.
11. Robert-Gangneux F, Dardé M-L. Epidemiology of and diagnostic strategies for toxoplasmosis. Clin Microbiol Rev. 2012;25:264-96.
12. Assmar M, Amirkhani A, Piazak N, Hovanesian A, Kooloobandi A, Etesami R. Toxoplasmosis in Iran. Results of a seroepidemiological study. Bull Soc Pathol Exot. 1997;90:19-21.
13. Kasper LH. *Toxoplasma* infections. In: Fauci AS, Braunwald E, Kasper DL, Hauser SL. *Harrison's principles of internal medicine*. 17th ed. New York: McGraw-Hill. 2008.
14. Gratzl R, Hayde M, Kohlhauser C, Herman M, Bwda G, Strobl W, et al. Follow-up of infants with congenital toxoplasmosis detected by polymerase chain reaction analysis of amniotic fluid. Eur J Clin Microbiol Infect Dis. 1998;17:853-8.
15. Foulon W, Pinon J, Stray-Pedersen B. Prenatal diagnosis of congenital toxoplasmosis: a multicenter evaluation of different diagnostic parameters. Am J Obstet Gynecol. 1999;181:843-7.
16. Gilbert RE, Peckham CS. Congenital toxoplasmosis in the United Kingdom: to screen or not to screen? J Med Screen. 2002;9:135-41.
17. Boyer K, Holfels E, Roizen N, Swisher C, Mack D, Remington J, et al. Risk factors for *Toxoplasma gondii* infection in mothers of infants with congenital toxoplasmosis: implications for prenatal management and screening. Am J Obstet Gynecol. 2005;192:564-71.
18. Derouin F, Jacqz-Aigrain E, Thulliez P, Couvreur J, Leport C. Cotrimoxazole for prenatal treatment of congenital toxoplasmosis? Parasitol Today. 2000;16:254-6.
19. The Syrocot (Systematic Review on Congenital Toxoplasmosis) Study Group. Effectiveness of prenatal treatment for congenital toxoplasmosis: a meta-analysis of individual patients' data. Obstet Gynecol Surv. 2007;62:302-4.
20. Gilbert RE, Gras L, Wallon M, Peyron F, Ades AE, Dunn DT. Effect of prenatal treatment on mother to child transmission of *Toxoplasma gondii*: retrospective cohort study of 554 other-child pairs in Lyon, France. Int J Epidemiol. 2001;30:1303-8.
21. Gratzl R, Sodeck G, Platzer P, Jäger W, Graf J, Pollak A, et al. Treatment of toxoplasmosis in pregnancy: concentrations of spiramycin and neospiramycin in maternal serum and amniotic fluid. Eur J Clin Microbiol Infect Dis. 2002;21:12–6.
22. Dastan K, Asmar M, Motavalian A, Jalali J, Massiha A. Comparison of agglutination and indirect immuno-fluorescence methods in the diagnosis of toxoplasmosis. Tashkhis. 2006;47:18-21. [Persian]
23. Saffar M, Ajami A, Moslemi zadeh N. Prevalence of *Toxoplasma gondii* in pregnancy in Sari 1376-1377. J Mazandaran Univ Med Sci. 1999;9:1-5. [Persian]
24. Mostafavi SN, Jalali monfared L. Systematic review of published studies on the epidemiology of toxoplasmosis in Iran. J Isfahan Med School. 2012;30:74-88. [Persian]
25. Fallah M, Matini M, Taherkhani H, Rabiei S, Hajiloei M. Seroepidemiology of toxoplasmosis among Pregnant Women in Hamadan City. Sci J Hamadan Univ Med Sci. 2006;13:33-37. [Persian]
26. Cheraghpoor K, Taherkhani H, Fallah M, Sheikhan A, Srdaryan K, Rostami Nezhad M, et al. Seroprevalence of anti-*Toxoplasma* IgG and IgM antibodies in pregnant women referring to health centers of Khorramabad city. Sci J Hamadan Univ Med Sci. 2010;17:46-51. [Persian]