

Seroprevalence of Toxoplasmosis among Pregnant Women Referring to the Reference Laboratory of Zahedan, Iran

Adel Ebrahimzadeh,^{*1} Saeed Mohammadi,² Alireza Salimi-Khorashad,¹ Ali Jamshidi¹

1. Department of Parasitology and Mycology, Infectious Diseases and Tropical Medicine Research Center, Zahedan University of Medical Sciences, Zahedan, Iran
2. Faculty of Advanced Medical Technology, Golestan University of Medical Sciences, Gorgan, Iran

Article information	Abstract
<p>Article history: Received: 31 Jan 2013 Accepted: 22 Mar 2013 Available online: 17 May 2013 ZJRMS 2013; 15(12): 32-35</p> <p>Keywords: Toxoplasmosis IgM anti-Toxoplasma IgG anti-Toxoplasma Pregnancy Risk Factors</p>	<p>Background: Zahedan is a tropical region in southeast of Iran. Due to importance of congenital Toxoplasmosis and absence of study evidences in this field in Zahedan, this research was accomplished.</p> <p>Materials and Methods: 221 serum samples were collected from pregnant women referring to reference laboratory of Zahedan. The IgG and IgM antibody levels against were examined using ELISA method.</p> <p>Results: 30.8% cases out of all samples were IgG positive and in 1.4% cases IgG and IgM were both positive for toxoplasmosis.</p> <p>Conclusion: 69.2% of pregnant women were serologically negative against toxoplasmosis; therefore hygiene education to eliminate risk factors especially during pregnancy period seems to be imperative.</p>

Copyright © 2013 Zahedan University of Medical Sciences. All rights reserved.

Introduction

Toxoplasmosis, caused by an intracellular protozoan parasite, *Toxoplasma gondii* (*T. gondii*), is a widespread zoonotic disease throughout the world [1]. Members of Felidae family, including domestic cat act as definitive hosts. Various warm-blooded animals including humans, birds and rodents can serve as an intermediate host [2]. The disease is of major medical and veterinary importance, being a cause of congenital disease and abortion in humans and in domestic animals [3]. The general routes of *T. gondii* transmission are well-known with infection usually occurring following ingestion of viable cysts in raw or undercooked meat, or of oocysts shed in cat feces; thus, eating habits and poor hygiene are risk-factors for toxoplasma infection [4]. Most pregnant women with acute acquired infection do not experience obvious symptoms or signs. A minority may experience malaise, low-grade fever, and lymphadenopathy [5]. Severe clinical signs in the infected infant are more commonly observed in offspring of women whose infection was acquired early in gestation [6]. Specific antibodies against the parasite appear soon after primary infection. It has been estimated that up to one third of the world's population has been infected with endemicity from around 10% to 70% [7].

During the last few decades, a remarkable decrease in the prevalence has been observed. Since raw meat is probably one of the major sources of *T. gondii*, the decrease in prevalence is probably related to improvements in health education and meat processing. Prevention of congenital toxoplasmosis in pregnant women has been based on serological test for toxoplasma antibodies. There have been several reports regarding the screening of *T. gondii* antibodies among Iranians. The rate

of toxoplasmosis in Iranian cities in 2008 were accordingly 40.7% for Isfahan, 44.2% for Lorestan, and 34.2% for Bandar-e-Abbas [8]. In a serologic study in Zahedan among 337 individual samples of pregnant women using indirect IFAT method the prevalence of specific antibodies were 49.8% in 1999 [9]. In order to plan a strategic approach for the prevention of congenital toxoplasmosis, it is necessary to know the frequency of infection among pregnant women. However the infection should be diagnosed at the early acute stage, when treatment is more effective. Zahedan is a tropical region in southeast of Iran. There is scarce information about the epidemiology of *T. gondii* infection in pregnant women in Zahedan. This study performed in order to determine the toxoplasma antibodies in pregnant women in Zahedan, South-East of Iran using ELISA method.

Materials and Methods

In this cross sectional study the sample size was calculated as 221. The samples were pregnant women referring to the reference laboratory of Zahedan for routine pregnancy tests. Inclusion criteria for the study subjects were pregnant women, of all ages and at any stage of pregnancy, residing in Zahedan. Epidemiological data, including socio-demographic and behavioral characteristics, were obtained from all pregnant women. Socio-demographic characteristics included age, place of residency, and educational and socio-economic levels. Behavioral characteristics included cat contacts, consumption of raw or undercooked meat, contaminated water, and unwashed raw vegetable or fruit consumption. Clinical characteristics encompassed of pregnancies and

abortions. Clinical data were obtained during a direct interview with the participants. A total of 221 serum samples were tested at the Department of Parasitology, School of Medicine, and Zahedan University of Medical Sciences, Iran. Blood samples were collected and sera separated and frozen at -20°C until use.

Sera of all pregnant women were assayed for *T. gondii* antibodies using commercially available enzyme immunoassay kits. IgG antibodies were assayed using a "Pishtaz Teb Toxoplasma IgG, Iran" kit. Positive sera for *T. gondii* IgG antibodies were further tested for *T. gondii* IgM antibodies with a "Pishtaz Teb Toxoplasma IgM, Iran" kit. Both tests were accomplished according to the manufacturer's manual procedures. The statistical analysis was performed using SPSS-18. We used the chi-square and the Fisher's exact test for comparison of frequencies among groups.

Results

In total, 221 pregnant women consented to be included in this project. Of these women 142 individuals (64.3%) resided in urban regions and the rest of them were rural residents between the ages of 15 years to 44 years. There was no significant association between the areas of residency and seropositivity of toxoplasma. The biggest age group to be included in this study was 25-29 years age group (46.6%) and the least one was 35-39 years age group (1.8%). 39 individuals (17.6%) were uneducated, 105 individuals (47.5%) were educated to the diploma level and 77 individuals (34.8%) were educated academically but there was no significant association between educational status and seroprevalence of toxoplasma antibody. 65 samples (30.8%) were

seropositive and 153 cases (69.2%) were seronegative for Toxoplasma specific IgG antibody and 3 samples (1.4%) were seropositive and 218 samples (98.6%) were seronegative for toxoplasma specific IgM antibody (Table 1).

Table 1. The correlation between IgG and IgM levels among studied individuals

		IgM	
		Positive	Negative
IgG Negative Individuals	Cases	0	153
	Percent	0	100
IgG Positive Individuals	Cases	3	65
	Percent	4.4	95.6
All Studied	Cases	3	218
	Percent	1.4	98.6

The most prevalent seropositivity demonstrated among 40-44 age group (60%) and the least prevalent seropositivity was among 35-39 age group (25%). Although there were notable differences in seroprevalence of toxoplasma antibodies between different age groups but the differences were not significant using statistical tests.

Of all cases, 68 had history of contact with cat which 35 cases of them were detected as IgG positive and there was no significant association between the history of contact with cat or presence of cat in/or around the house and seropositivity of anti-toxoplasma antibody, also statistical analysis demonstrate that no association could be found between raw meat consumption, drinking water habits, using disinfectants in washing vegetables and fruits, consuming raw vegetables and *T. gondii* IgG seropositivity (Table 2).

Table 2. The Frequency Distribution of Specific anti-Toxoplasma IgG Positive among Pregnant Women According to Examined Variables

		IgG Positive Individuals	IgG Negative Individuals
		N(%)	N(%)
Cat contact history	Yes	35(15.5)	75(49)
	No	33(48.5)	78(51)
Raw vegetable consumption	Yes	62(91.2)	144(94.1)
	No	6(8.8)	9(5.9)
Half-cooked meat consumption	Yes	42(61.8)	88(57.5)
	No	26(38.2)	65(42.5)
Age Groups	14-19	3(4.4)	6(3.9)
	20-24	21(30.9)	41(26.8)
	25-29	27(39.7)	76(49.7)
	30-34	13(19.1)	25(16.3)
	35-39	1(1.5)	3(2)
	40-44	3(4.4)	2(1.3)
Abortion history in former pregnancies	0	51(75)	99(64.7)
	1	14(20.6)	48(31.4)
	2 or more	3(4.4)	6(3.9)
Washing vegetables using disinfectants	Yes	15(4.4)	49(32)
	No	53(77.9)	104(68)
Drinking water habits	Piped water	42(61.8)	99(64.7)
	Well water	18(26.5)	27(17.6)
	Mineral water	8(11.8)	27(17.6)
Education level	Not educated	13(19.1)	26(17)
	Below diploma level	31(45.6)	74(48.4)
	Academic education	24(35.3)	53(34.6)

The history of abortion in former gestations and the probable number of these abortions in seropositive individuals was analyzed against women with no history of abortion or the women in their first gestational period. Regarding this factor we divided the statistical population of pregnant women into three different groups with; no history of abortion, one abortion and 2 or more abortions. Although the prevalence rate of seropositivity among these three groups were accordingly 34%, 22.6% and 33.4% but no significant differences in seroprevalence of toxoplasma antibody between these different groups was not observed using statistical analysis. The results show that among IgG positive individuals the prevalence rate of risky habits were 91.2% for consuming raw vegetables, 61.8% for consuming half-cooked meat, 77.9% for not using disinfectants in washing vegetables, 51.5% for contacting cats and 26.5% consuming water from wells.

Discussion

Congenital toxoplasmosis is a major problem in most communities with a high prevalence of *T. gondii* infection and study of the seroepidemiology of this infection among women of childbearing age could provide appropriate approaches to design the preventive measures [10].

The present study showed a seroprevalence of 30.8% among 221 pregnant women. Therefore these pregnant women were not at risk for toxoplasmosis. The results show a dramatical decrease in the prevalence of seropositive individuals in comparison to Zangi-Abadi results using IFAT method in 1999 among pregnant women in Zahedan [9].

Most studies in Iran have been focused on childbearing age and pregnant women and wide range of prevalence rate of toxoplasma antibodies have been reported as follows: Sari 74.6%, Tehran 31%, Kerman 29.4% [11, 12], Sanandaj 28.2% and Hamedan 33.5% [8]. Several studies in different countries and cities around the world have indicated that seroprevalence rate of toxoplasma antibodies have a wide range as follow: India 49.52% [13], Turkey 49.4 [14], and France 43.8% [15].

This study was performed on pregnant women to distinguish previously infected women from women who had not been previously infected and to identify the prevalence rate of pregnant women at risk of toxoplasmosis. This study showed a moderate seroprevalence (30.8%) of *T. gondii* IgG antibody compared to other parts of the Islamic Republic of Iran [8, 11, 12]. Results of this study indicate that the prevalence of toxoplasma antibodies in Zahedan is lower than some other parts of Iran. Although, Zahedan climate is warm and arid but the mean temperature of Zahedan during the

year is higher than other area such as the central, north and the west parts of Iran and this temperature is not optimum for sporulation of toxoplasma oocysts. Although, there was no association between seropositivity of toxoplasma antibody and different age groups in our study, but the seropositivity rate in 25-29 age group was obviously higher than other groups. This result is in accordance with the results of some studies [7, 11, 12]. Although, some studies have indicated the association between seropositivity of toxoplasma and contact with cat, yet in this study this association was not established. Statistical analysis also did not show a significant association between seropositivity of Toxoplasma and area of residency, educational status, availability of drinking water and half-cooked meat consumption habit. It seems that most probable factors which affect the Toxoplasma infection are unpeeled vegetables and contaminated water. Zahedan is a tropical region in southeast of Iran and the drinking water is supplied from 200 kilometer away from Zabol City by pipelines. Almost all households in Zahedan City have a metallic reservoir for reserving the water, which can increase the chance of contamination of drinking water. Vegetables are also provided from other cities and can be contaminated during transportation.

Altogether, results of this study indicates that 69.2% of pregnant women in Zahedan City do not have immunity against toxoplasmosis, therefore they are at risk of congenital toxoplasmosis for their fetuses and it is necessary for health policy makers to design the preventive measures against congenital Toxoplasmosis.

Acknowledgements

This study was supported financially by Tropical and Infectious Diseases Research Center, Zahedan University of Medical Sciences and accomplished in Department of Mycology and Parasitology, Faculty of Medicine.

Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

Funding/Support

Zahedan University of Medical Sciences.

*Corresponding author at: Department of Parasitology and Mycology, Tropical and Infectious Diseases Research Center, Zahedan University of Medical Sciences, Zahedan, Iran.
E-mail: ebrahimzadeh@zaums.ac.ir

References

1. Singh S, Pandit AJ. Incidence and prevalence of toxoplasmosis in Indian pregnant women: A prospective study. *Am J Reprod Immunol* 2004; 52(4): 276-83.
2. Dubey JP. Advances in the life cycle of Toxoplasma gondii. *Int J Parasitol* 1998; 28(7): 1019-24.
3. Rollinson D, Hay SI. Advances in parasitology. Preface. *Advances in Parasitology*. 2010; 71: ix.
4. Song KJ, Shin JC, Shin HJ and Nam HW. Seroprevalence of toxoplasmosis in Korean pregnant women. *Korean J Parasitol* 2005; 43(2): 69-71.

5. Lin YL, Liao YS, Liao LR, et al. Seroprevalence and sources of toxoplasma infection among indigenous and immigrant pregnant women in Taiwan. *Parasitol Res* 2008; 103(1): 67-74.
6. Boyer KM, Holfels E, Roizen N, 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(2): 564-71.
7. Alvarado-Esquivel C, Torres-Castorena A, Liesenfeld O, et al. Seroepidemiology of *Toxoplasma gondii* infection in pregnant women in rural Durango, Mexico. *J Parasitol* 2009; 95(2): 271-4.
8. Mohammadi P, Taherpoor A, Mohammadi H. Seroepidemiology of toxoplasmosis among women referring to pre-marriage consulting centers in Sanandaj province in 2006. *Iran J Infect Dis Trop Med* 2008; 40(1): 5.
9. Zangiabadi M, Salehi M, Khazaei HA and Khooshideh M. The serologic study of toxoplasmosis among pregnant women. *Zahedan J Res Med Sci (ZJRMS)* 2001; 13(3): 9-15.
10. Iqbal J, Khalid N. Detection of acute *Toxoplasma gondii* infection in early pregnancy by IgG avidity and PCR analysis. *J Med Microbiol* 2007; 56(Pt 11): 1495-9.
11. Fallah E, Navazesh R, Majidi J, et al. An epidemiological study of toxoplasma infection among high school girls in Jolfa. *J Reprod Infertil* 2005; 15(2): 9.
12. Daryani A, Sagha M. Seroepidemiology of Toxoplasmosis in women referred to medical health laboratory before marriage, Ardebil. *J Ardabil Univ Med Sci* 2004; 4(13): 6.
13. Sarkar MD, Anuradha B, Sharma N and Roy RN. Seropositivity of toxoplasmosis in antenatal women with bad obstetric history in a tertiary-care hospital of Andhra Pradesh, India. *J Health Popul Nutr* 2012; 30(1): 87-92.
14. Al-Mendalawi MD. The investigation of congenital toxoplasmosis in a tertiary care hospital in Turkey. *Saudi Med J* 2010; 31(1): 96.
15. Berger F, Goulet V, Le Strat Y and Desenclos JC. Toxoplasmosis among pregnant women in France: Risk factors and change of prevalence between 1995 and 2003. *Rev Epidemiol Sante Publique* 2009; 57(4): 241-8.

Please cite this article as: Ebrahimzadeh A, Mohammadi S, Salimi-Khorashad A, Jamshidi A. Seroprevalence of toxoplasmosis among pregnant women referring to the reference laboratory of Zahedan, Iran. *Zahedan J Res Med Sci (ZJRMS)* 2013; 15(12): 32-35.