



Original Article

Seroepidemiology and risk factors of Toxoplasmosis in the first trimester among pregnant women

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ABSTRACT

Introduction: The symptoms of infections caused by *Toxoplasma gondii* range from asymptomatic or mild to severe infection in pregnant women, which results in severe congenital infection, abortion or fetal still birth. The aim of this study was to assess the risk factors and seroepidemiology of toxoplasmosis in pregnant women in their first trimester in Bandar Abbas.

Methods: This cross-sectional study was conducted on 600 pregnant women who were in their first trimester. Demographic data and risk factors were collected using a questionnaire. Also, blood samples were taken from each subject to detect IgM and IgG antibodies by ELISA method. Data was entered into the SPSS 16 software and descriptive statistics, chi-square and t- test were used for analysis.

Results: The mean age of the participants was 26.7 ± 5.89 years. IgG seropositivity was 41.93%. No significant difference was seen in housewives and working women ($p=0.221$). No significant relation was seen between seropositivity and parity ($p=0.06$). No significant relation was seen between gardening, owning a cat and consumption of raw or undercooked meat and seropositivity ($p>0.05$), and only raw eggs consumption was significantly related to seropositivity ($p=0.032$). No significant correlation was seen between abortion and seropositivity ($p=0.138$), however, still birth had a significant correlation with seropositivity ($p=0.049$).

Conclusions: According to the results, public education about toxoplasmosis transmission and lab testing before pregnancy may be effective in preventing congenital toxoplasmosis.

Keywords: Toxoplasmosis, Pregnancy, First Trimester



Introduction:

Toxoplasma Gondii is a common zoonotic parasite with worldwide distribution (1,2). Its prevalence is variable in different areas (3). Infection with this parasite is important in pregnant women, patients with organ transplant and immunocompromised patients (4). Humans can be infected by eating vegetables and food materials and water infected by oocyte or by vertical transmission (2,4).

Toxoplasmosis Infection is asymptomatic in pregnant women in the last months of pregnancy or will present weeks or months after delivery. However, it may cause severe neonatal infection with central nervous system (CNS) involvement in the first months of pregnancy. It can also cause chorioretinitis mental retardation, jaundice, abortion and stillbirth (5-9).

The risk of congenital toxoplasmosis with primary maternal infection increases from 0-9% in the first trimester to 35-59% in the third trimester (9). Maternal infection before pregnancy causes fetal immunity against it (6). Its prevalence in southern Iran is 26% - 49.6%, in northern Iran 55.7% and 27.4% in the central areas in Iran (4). The prevalence of congenital toxoplasmosis in Rafsanjan is 48.3%, in Isfahan 57% and 82.2% in Tehran (1). Its seroprevalence is reported to be between 4 to 100% women in the reproductive ages. Its incidence during pregnancy is between 1 to 310 in each 10000 pregnancy in Europe, Asia, Australia and America(7).

In pregnant women, the diagnosis is difficult. Transmission of IgG antibodies from mother to child and lack of specific symptoms in neonates causes some problems in the diagnosis of neonatal infections. Preventing this infection in pregnancy is the best way of preventing abortion, stillbirth and neonatal infections (7). With a 3-5% rate of seroconversion, the risk of fetal infection is high because most women will be infected in the reproductive ages. Congenital toxoplasmosis is an important issue in areas with high prevalence of toxoplasmosis and studies on its seroepidemiology may suggest suitable methods for prevention (4).

Some countries prevent this infection by obligatory screening and other countries such as the United States and Canada recommend screening for the disease. Many countries prevent it by lowering the likelihood of contacting with the parasite. Prevention methods depend on the prevalence of the infection in each country, risk of infection in each year, laboratory facilities and equipment and also financial resources (7). The aim of the current study is to determine the seroepidemiology of toxoplasmosis and its related risk factors in pregnant women in Bandar Abbas, in the southern Iran.

Methods:

This descriptive cross-sectional study was conducted in January 2008 to June 2008 on 608 pregnant women who were in their first trimester of pregnancy and were referred to urban health centers,



private and governmental clinics using random stratified sampling. Sample size was calculated considering 35% prevalence in the area with a 0.05 accuracy and 95% confidence intervals. The selected women were interviewed after obtaining informed consent.

Data regarding demographics, gravid and parity, previous history of abortion or stillbirth, contact with cats, contaminated sole and eating uncooked meat or egg was recorded. Patients who did not accept to participate in the study were excluded.

A two millimeter blood sample was obtained for determination of antitoxoplasma antibodies (IgM , IgG) and genesis kits were used. Serum samples were frozen after centrifuging the clotted sample with the speed of 2500 rpm for 5 minutes. Serologic tests were done for all pregnant women by the ELIZA method to detect IgG and IgM for toxoplasma infection. All isolated IgM positive pregnant women or pregnant women with positive IgM and IgG were suspected to have acute infection. Past toxoplasmosis infection was considered in patients with isolated IgG positive. Pregnant women were considered to be susceptible if they were negative for both antibodies.

Data was analyzed using SPSS 16 software and descriptive statistics, chi-square and T-test.

Results:

The mean age of the participants was 26.7 ± 5.89 in our study. The mean gestational age was 11.9 ± 5.22 . All women had negative IgM and 252 (41.93%) had positive IgG. Among them, 46.2% were in the 15 to 25 years age group, 45.6% were in the 25 to 35 years age group and 8.2% were over 35 years of age. Also, 58.67% of women were housekeepers. Among the participants of our study, 63.33% were in their first pregnancy, 54.65% in their second, 56.93% in their third pregnancy, 52.5% in the fourth and 45.45% in their fifth pregnancy were positive for IgG. There wasn't any significant relationship between parity and IgG ($p=0.062$).

Table 1 compares the prevalence of positive toxoplasma IgG in Our study according to the demographics.



Table 1. Comparison of demographic characteristics among IgG positive and negative patients

Factor		Toxoplasma IgG				P value
		Positive		Negative		
Age group	15 – 25	93	15.47%	185	30.78%	< 0.001
	25 – 35	128	21.29%	145	24.12%	
	35 – 50	31	5.15%	19	3.16%	
Job	Household	318		224		0.821
	worker	28		31		
Abortion	Yes	43.11%		56.89%		0.431
Still birth	Yes	15		10		0.061
Miscarriage	Yes	60		69		0.234

Table 2 shows that there isn't any significant relationship between IgG serropositivity and risk factors of the infection in our study.

Table 2- Prevalence of IgG serropositivity according to risk factors of Toxoplasma infection

	Uncooked Meat	Uncooked Egg	Contact with cat	Contact with contaminated soil
IgG positive (percent)	43.34	47.53	37.5	38.13
P Value	0.327	0.320	0.65	0.35

Conclusion:

More than 90% of primary toxoplasmosis in persons with intact immune system is asymptomatic, primary prevention is the best way to reduce maternal infection. In United States, the overall serroprevalence is 22.5% and the serroprevalence in women in reproductive age is about 15%.



In the United States, 5000 hospitalizations and 750 deaths occur yearly because of toxoplasmosis infection and toxoplasmosis is the third most fatal infection which is transmitted by food material (9). In a study in 2001 in Bandar Abbas among 418 patients, 143 (34.21%) had IgG and 33 patients (7.89%) had IgM positive. In our study, among 608 women 41.9% were seropositive and no one had positive IgM and there was not any case of acute infection. Previous studies showed that toxoplasmosis epidemiology is different in different climates in Iran, (4) and our serroepidemiology is similar to that of Bushehr (37.8%) which, could be due to similar climates. One of the transmission ways of toxoplasmosis infection is eating food materials which are infected with oocyte (3,4,16,10) but this wasn't confirmed in our study and other studies in Hamadan (4), Panama (8), Ghom (11), UAE (12), Gorgan (13), and Mexico. We found correlations between uncooked egg and serropositivity for toxoplasma. This finding wasn't compatible with studies in Hamadan (4) and Panama (8).

The other known cause of the transmission of toxoplasma is contact with infected cats. In this study, we found no correlation between contact with cat and serropositivity which, can be due to a small number of persons with contact with cat. Similar results were reported from other studies.(5,7,11,12,14). A previous study in Bandar Abbas (2) showed that 62.7% of persons who had cat in their home had positive antitoxoplasma antibody and there was a significant correlation between contact with cat and antitoxoplasma antibody. The study in Bushehr showed that not all persons who had cat in home were positive for antitoxoplasma antibody and no all who had positive antitoxoplasma antibody had cat in their home. Pinnard et Al. (15) Frenkel et al. (8) showed that serropositivity was more prevalent in persons with contact with dogs in comparison to those who had contact with cat. Many studies suggested that persons with contact with cat aren't at increased risk of toxoplasma infection but they should use gloves when having contact with contaminated soil and cat stool. A study in France (9) showed that contact with cat has an intermediate correlation with positive antibody but in a study in Isfahan (6) there was a correlation between contact with cat and positive antitoxoplasma antibody.

The variability in the results of studies about correlation of contact with cat and positive antibody can be due to difference in the infection rate in cats.

We didn't find any correlation between serropositivity and contact with contaminated soil. Other studies confirm our results (4,7,9,11).

We found a correlation between age group and antitoxoplasma antibody. Other studies confirm our findings (1,5,4,10,11,17)

According to our results, still birth was more prevalent among women with positive antitoxoplasma antibody. This finding which is compatible with other studies in Iran (1) shows the importance of knowledge about serology of this disease in women before pregnancy. According to these results women who are in contact with contaminated soil, cat or dog and who have specific nutritional habits such as eating uncooked meat and egg, also women with previous history of abortion or still birth IgG and IgM antibodies should be tested.



Detection of toxoplasma infection before pregnancy is important in prevention of congenital toxoplasmosis and its complications. Educating people about the routes of transmission and prevention is important and healthcare professionals should educate women who refer for their prenatal care and women in reproductive age.

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References:

1. WHO. World Health Organization Global tuberculosis control surveillance planning financing. 2006 (cited Jul 18); Available from: <http://www.who.int/tb/publications/global-report/2004/en/index.html>.
2. Pilheu JA. Tuberculosis 2000: problems and solutions. *Int J Tuberc Lung Dis* 1998;2(9):696-703.
3. World Health Organization. Global tuberculosis control: a short update to the 2009 report. Geneva:WHO;2009.
4. World Health Organization, Global Tuberculosis Control. WHO Report 2002. WHO/CDS/TB/2002.295. Geneva, Switzerland:WHO 2002.
5. Lonroth K, Raviglione M. Global epidemiology of tuberculosis: Prospects for control . *Semin Respir Crit Care Med* 2008;29(5):481 - 491.
6. WHO, 2008. Global tuberculosis control. WHO/HTM/B/2008.393. Geneva:World Health Organization.
7. Lalloo UG, Pillay S. Managing tuberculosis and HIV in subsahara Africa. *Curr HIV/AIDS Rep*, 2008;5(3):132-139.
8. World Health Organization: Global Tuberculosis Control: WHO Report 2000. WHO, Geneva:WHO/CDS/TB/2000.275.
9. Mandell GL, Bennett JE, Dolin R. Principles and practice of infectious diseases. 6th ed. Philadelphia: Elsevier Churchill Livingstone;2005:2852-3.
10. Hatami H. Epidemiology and control of tuberculosis regarding to bioterrorism aspects. Ebook of Health Ministry of Iran in file:/A/Clinic-ITHM.
11. Smeltzer SC, Bare BG. Text book of Medical Surgical Nursing. 8th ed. Philadelphia, J.B Lippin cott Co;1996:495.
12. Raviglione MC, O'Brien RJ. Tuberculosis. In: Braunwald E, Fauci AS, Kasper DL, Hauser SL, Longo DL, Janeson JL: Harrison's Principles of Internal Medicine. 15th ed. McGraw Hill; 2001. Chap 169:1024-1035.
13. Mangesho PE, Shayo E, Makunde WH, Keto GB, Mandara CI, Kamugisha ML, and et al."Community knowledge, attitudes and practices towards tuberculosis and its treatment in Mpwapwa district, central Tanzania." *Tanzan Health Res Bull*. 2007 Jan;9(1):38-43.
14. Cameron C. Patient compliance: Recognition of factors involved and suggestions for promoting compliance with therapeutic regimens. *J Adv Nurs* 1996; 24(2):244-250.



15. Ailinger RL, Dear MR. Adherence to tuberculosis preventive therapy among Latino immigrants. *Public Health Nurs* 1998; 15(1):19-24.
16. Wandwalo ER, Mørkve O. Knowledge of disease and treatment among tuberculosis patients in Mwanza, Tanzania. *Int J Tuberc Lung Dis* 2000; 4(11):1041-6.
17. Portero NJ, Rubio YM, Pasicanan MA. Socio-economic determinants of knowledge and attitudes about tuberculosis among the general population of Metro Manila, Philippines. *Int J Tuberc Lung Dis* 2002;6(4):301-6.
18. Hoa NP, Thorson AE, Long NH, Diwan VK. Knowledge of tuberculosis and associated health-seeking behaviour among rural Vietnamese adults with a cough for at least three weeks. *Scand J Public Health Suppl* 2003;31(62):59-65.
19. Zhang T, Liu X, Bromley H, Tang S. Perceptions of tuberculosis and health seeking behaviour in rural Inner Mongolia, China. *Health Policy* 2007; 81(2-3):155-65.
20. Ngang PN, Ntaganira J, Kalk A, Wolter S, Ecks S. Perceptions and beliefs about cough and tuberculosis and implications for TB control in rural Rwanda. *Int J Tuberc Lung Dis* 2007;11(10):1108-13.
21. Emam Hadi M.A, Jalilvand M, Hadian M, . Assessment of the Amount of Knowledge and Attitude of Tehran High School Students Regarding Tuberculosis. *Tanaffos*. 2006;5(4): 23-28.