

Seroprevalence of Toxoplasma Gondii Infection among High School Girls in Ajabshir from East Azarbaijan Province, Iran

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ABSTRACT

Introduction: Toxoplasmosis is a disease parasite which can infect human and animals. The infection may be serious if is transmitted to the fetus during pregnancy. The aim of this study was to determine the prevalence of specific antibodies and the associated risk factors for toxoplasmosis in students attending high-school in Ajabshir.

Methods: In this descriptive study, 549 blood samples were collected from high school girls. The samples divided into two groups (147 and 402 samples from rural and urban schools respectively). IgG and IgM specific antibodies to Toxoplasma gondii were detected using enzyme-linked immunosorbent assay (ELISA).

Results: The results of study showed that from 402 urban samples, 50 (12.4) and 34(8.5) cases and from 147 rural samples, 38 (25.9) and 32 (21.8) cases were seropositive for anti-Toxoplasma IgG and IgM antibodies respectively. Of the risk factors studied, the significant association was found between T. gondii-specific antibodies with residency and age.

Conclusion: Based on data found in our study, 87.6% of young girls from urban areas in Ajabshir did not have antibodies to Toxoplasma and this is a very important issue, because these young women were in fertile age. Therefore required Preventive and control programs especially in these cases in order to reduce the rate of disease.

Introduction

Toxoplasma gondii is a protozoal parasite with worldwide distribution and it able to grow in various species of vertebrate hosts, but cats and felines are its certain host.¹⁻³

The disease caused by T. gondii which belongs to subgenus of Sporozoa and subclass coccidae.⁴ The infection by this protozoon in individuals with healthy immune system is usually free of clinical signs.^{1,5}

Congenital transmission from mother to fetus, contact with cat, eating raw meat, blood and leukocyte injection, organ transplantation, contact to infected soil, consuming infected row fruit and

vegetables are the risk factors for toxoplasmosis.²

Eighty percent of toxoplasmosis infections are related to eating habits and contact to cat.¹

The disease ranges from non-symptomatic infections, infection with mild symptoms to latent toxoplasmosis with personality changes and IQ reductions.⁶ Toxoplasma attacks to all nucleotide cells and the host defense is related to T cells.^{1,6}

Congenital toxoplasmosis is most severe when maternal infection occurs early in pregnancy. Approximately 67% of patients have no signs or symptoms of infection. Retinochoroiditis, intracranial calcifications and Cerebrospinal fluid (CSF) pleocytosis

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and elevated protein values occurs in about 15, 10 and 20% of patients, respectively.

Infected newborns usually have anemia, thrombocytopenia, and Jaundice at birth also; microcephaly has been rarely reported.⁷

This parasitic infection is responsible for 20% of all deaths in America and about one third of world people are infected with this parasite.¹ *Toxoplasma* has highest rate among diseases related to animal.² The ELISA test is one of the most usual methods for detecting anti-*Toxoplasma* antibodies. This test is safe, sensitive and easy to carry out. Of the other methods for detecting anti-*Toxoplasma* is indirect Fluorescent Antibody (IFA). Disadvantages of IFA test are; a microscope with UV light is needed, specific fluorescent immunoglobulin is required for each species, finally false-positive titers may occur in hosts with anti-nuclear antibodies.^{6,7}

In recent years, attention to toxoplasmosis and hygienic problems arises from it, has grown significantly, so that main part of efforts, dedicated to prevention of congenital infections and providing suitable solutions and plans to control primary infections.⁸

There have been several reports regarding screening of *T. gondii* antibodies in various countries.⁹⁻¹¹ In Iran the seroprevalence of *Toxoplasma* antibodies in Karaj was 45.5% and in Chaharmahal and Bakhtyari among pregnant women using IFA was 27.6%.^{12,13}

Epidemiological studies of toxoplasmosis in female before child bearing age will be very useful for designing preventive policies during child bearing age. In the other hand; the lack of suitable data regarding *Toxoplasma* infection in Ajabshir district, the major factor was for the decision to perform a study to evaluate the levels of anti-*Toxoplasma* IgG and IgM antibodies

among high school girls in this district by using ELISA test.

Materials and methods

In this descriptive study a total of 549 sera were randomly collected from high school girls in Ajabshir from East Azarbaijan province, from March to July 2012. Sample groups were chosen from public high school girls. Ajabshir is one of the western cities of East Azarbaijan and center of Ajabshir Township. Its climate is mountainous and has 26280 urban and 40466 rural person's population in 2011.¹⁴

According to the census conducted every five years census 2014 is not available.

Therefore census 2011 was cited. Written agreements were obtained from all participants or parents after explaining the purpose of the study. Multi-stage cluster sampling was conducted. for this purpose 147 people from rural schools were selected by random cluster sampling and also 402 people were selected from urban schools.

The forms were prepared based on desired variables and distributed among students. In addition, before sampling one person of health staff was to explain about toxoplasmosis for students. Blood sampling was performed without anticoagulant according to standard techniques and after 30 minutes, the tubes were centrifuged at 2,000 rpm for 5 min and then sera were divided in several labeled vials and kept frozen at -20°C. All serologic tests were performed after field work was done. The frozen sera were liquefied in room temperature and tested for anti-*T. gondii* using a commercial enzyme-linked immunosorbent assay (ELISA) kit (Pishtazteb Iran).

Any of samples was diluted by serum diluter solution by rate 1: 101 and other stages proceeded based on kit instruction, finally at last stage and following addition of reaction stop solution, the results was readed by ELISA reader at 450 and 630 nm.

With regard to kit instruction, all of serum samples which their anti-toxoplasma special IgG content were over than 11 IU/ml considered positive samples. In addition, the serum samples which their special IgM were over then 11 IU/ml considered positive. At last, the results of experiments collected along with demography data by SPSS software and independent, chi-square (X^2) statistical tests and logistic regression mode was analyzed.

In order to evaluate the frequency of the variables (risk factors) and *T. gondii* antibodies, estimated using an Odds ratio (OR). Too the relative proportions were calculated with a confidence interval of 95% (CI).

Results

In this study, blood samples of 549 high school girls aged between 13 to 19 years were analyzed for anti *T. gondii* IgG and IgM antibodies using ELISA method. The highest frequency of patients was observed in 18 years old (30.8%), while patients less than 14 years old had the lowest frequency (6.3%). There was a statistically significant association of toxoplasmosis seroprevalence with age ($P < 0.05$). From 402 urban samples, 50 cases 12.4% and from 147 rural samples, 38 cases 25.9% were seropositive for anti-Toxoplasma IgG antibodies (Table 1). The results showed the variance of frequency distribution of IgG in urban and rural group is statistically different, so that positive IgG among rural area was more than urbanites (OR=2.45, 95%CI=1.52-3.94). Also from 402 urban samples, 34 cases 8.5 % and from 147 rural samples 32 cases 21.8 % were seropositive for anti-Toxoplasma IgM antibodies (Table 1). The review of results in X^2 relationship test showed that IgM frequency distribution is statistically different in urban and rural populations. ($X^2=18.02$, $df=1$, $P < 0.01$). As frequency of positive IgM was more in rural than urbanites, (OR=3.01, 95% CI=1.78- 5.09). The result of

study showed in rural samples, 22 cases 14% and in urban samples 12 cases 2.98% were seropositive for IgG and IgM antibodies simultaneously. From the risk factors studied, the significant association was found between *T. gondii*-specific antibodies with residency and age ($P < 0.01$), but the association was not significant with another variable.

Table 1. Prevalence of IgG and IgM *Toxoplasma gondii*- specific antibodies in high- school girls in urban and rural areas

Population	Urban (402) N (%)	Rural (147) N (%)
IgG+	50 (12.4)	38 (25.9)
IgG-	352 (87.6)	109 (74.1)
IgM+	34 (8.5)	32 (21.8)
IgM-	368 (91.5)	115 (78.2)

Discussion

The survey of anti-Toxoplasma IgG antibodies among high school girls in Ajabshir from northwest Iran showed that 38.3% (12.4% in urban and 25.9% in rural area with IgG positive) of girls had previous exposure to this infection. Based on high prevalence rate of anti-Toxoplasma IgG antibodies among examined individual may we can conclude that the geographical area is noticeably is contaminated. The prevalence of *T. gondii*-specific antibodies has been found in different countries among high school students. Hatam et al., surveyed on 947 high school girls aged between 14 to 19 years-old in Fasa area, Iran, 96 cases (10%) were seropositive for *T. gondii*- specific IgG antibodies.⁹ In study by Galván-Ramírez et al. in Zapopan, Jalisco, Mexico on high- school girls, the prevalence specific IgG and IgM antibodies of *Toxoplasma gondii* were 17.8% and 4.6%, respectively and students who had consumed undercooked meat had a 10.8 times greater risk of acquiring *Toxoplasma gondii*

infection.¹⁰ In other report of Fortaleza, Ceará, Brazil, in 584 students between 7 and 18 years old, found 40.8% seropositive subjects.¹¹

Different studies showed the incidence rates of infection in hot and humid climates more than cold and dry ones.¹⁵ Too infection level to toxoplasma in different points depends on various factors such as living location, age, host immunity, genus, and genotype of parasite and so on.¹⁶ The obtained data of various area in Iran showed the prevalence of toxoplasma gondii were variable. In Isfahan, Sabzavar, Tehran and Mazandaran where the researchers found a prevalence of 20.1%, 19.2%, 84% and 74.6% in the studied pregnant women, respectively.¹⁷⁻²⁰

The results of this study showed that incidence rate of anti-Toxoplasma antibodies in girl's inhabitant rural areas were more than urban areas. The reasons it seems that contact of rural women with various infection sources such as animals, soil, fresh infected meats and other factors were more than urban women. Infected cats play an important role in contaminating soil. Too in suitable environment conditions, toxoplasma oocysts live in the soil for long time and retain their pathogen.²¹

In present survey such as other studies,^{22,23} significant association between Toxoplasma gondii infection and age was found. This is predictable, because older individuals have more chances for exposure to infectious form of parasite. The study did not show association between the seroprevalence toxoplasma infections with close contact with cats. Although some surveys attribute great importance contact with cats in high seropositivity rate of T. gondii, the lack association between contacts with animals was previously reported in some study.^{24,25} Not have of association with animals suggest that either most infection is acquired through the food chain or other routes of ingestion.²¹

Conclusion

Results of this study indicate that 87.6% of people in this community were serum negative; this means that they had not acquired any immunity against the infection, so there is the probability for their newborns to become toxoplasmosis infection. Hence the researchers suggest in order preventing of the risk infection during pregnancy by T. gondii in young girls in this area, Preventive and control programs regulated especially in pre-marriage ages in order to reduce the rate of disease.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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