



## Seroprevalence of *Toxoplasma gondii* among Pregnant Women in Isparta Province, Turkey

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### ABSTRACT

Toxoplasmosis infection is a common zoonotic disease caused by the compulsory intracellular parasite *Toxoplasma gondii*. Infection is generally asymptomatic. It can cause congenital anomaly when infected during pregnancy, it can also cause stillbirth, miscarriage, and preterm labor. The aim of this study is detection of *Toxoplasma* IgG and *Toxoplasma* IgM prevalence in first-trimester pregnant women. Pregnant women admitted to the obstetrics and gynecology clinic of Isparta Obstetrics and Pediatrics Hospital between January 2013 and December 2013 have been included to this study. Results of *Toxoplasma* IgM and IgG were analyzed retrospectively. Serum specimens were studied by the method of macroelisa. Frequency, percentage, mean±standard deviations of data were calculated with SPSS 18.0, and the relationships between variables were evaluated by Chi-square test. In our study, 3140 serum specimens in total have been analyzed. A total of 1937 serum specimens were analyzed for *Toxoplasma* IgM and positivity was detected in 1.8% (n=34). For *Toxoplasma* IgG also 1213 serum specimen were analyzed in total and the ratio of seropositive cases were detected as 28.4% (n=344). *Toxoplasma gondii* seropositivity has been detected at a considerable level in the region where we did our study. Pregnant women and mothers who consider planned pregnancy should be evaluated for Toxoplasmosis. Serology in pregnancy should be tested, and acute infection should be diagnosed and treated. Seronegative pregnant women should be controlled periodically and appropriate treatment should be given in congenital toxoplasmosis.

**Keywords:** *Toxoplasma gondii*; IgG; IgM; seropositivity; pregnant.

### Isparta Bölgesinde Gebe Kadınlarda *Toxoplasma gondii* Seroprevalansı

### ÖZ

Toksoplazmoz enfeksiyonu, zorunlu hücre içi paraziti *Toxoplasma gondii*'nin neden olduğu, sık görülen zoonotik bir hastalıktır. Enfeksiyon genellikle asemptomatik seyrederek gebelik döneminde geçirildiğinde konjenital anomali yapabileceği gibi, ölü doğum, erken doğum ve düşüklere sebep olabilir. Çalışmada hamile kadınların ilk trimesterinde *Toxoplasma* IgG ve *Toxoplasma* IgM prevalansının saptanması amaçlanmıştır. Ocak 2013-Aralık 2013 tarihleri arasında Isparta Kadın Doğum ve Çocuk Hastalıkları Hastanesi Kadın Hastalıkları ve Doğum polikliniğine başvuran gebe kadınlar araştırmaya dahil edildi. Toksoplazma Ig M ve Ig G sonuçları retrospektif olarak incelendi. Serum örnekleri makroeliza yöntemi ile çalışıldı. Veriler için SPSS 18.0 programı kullanılarak frekans, yüzde, ortalama±standart sapma değerleri hesaplandı ve değişkenler arasındaki ilişkiler Ki-kare testi ile incelendi. Araştırmamızda, toplam 3140 serum örneği değerlendirilmiştir. Toksoplazma IgM için toplam 1937 serum örneği incelenmiş ve %1.8 (n=34) oranında pozitiflik saptandı. Toksoplazma IgG için ise toplam 1213 serum örneği incelendi ve seropozitif olguların oranı %28,4 (n=344) olarak tespit edildi. Çalışma yaptığımız bölgede Toksoplazma gondi seropozitifliğinin dikkate değer düzeyde olduğu gözlenmiştir. Gebe kadınlar ve planlı gebelik düşünen anne adayları Toksoplazmozis açısından mutlaka değerlendirilmelidir. Gebelikte serolojik test yapılarak akut enfeksiyon teşhis ve tedavi edilmelidir. Seronegatif gebeler periyodik olarak kontrol edilmeli ve konjenital toksoplazmozda uygun tedavi yapılmalıdır.

**Anahtar Kelimeler:** *Toxoplasma gondii*; IgG; IgM; seropozitiflik; gebelik.

### INTRODUCTION

Toxoplasmosis is a protozoal infection caused by *Toxoplasma gondii*. It is a compulsory intracellular zoonosis affecting human and animals, seen commonly throughout the World (1). It is a multisystemic disease. Toxoplasmosis can occur

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as a generally slight upper respiratory infection, or asymptomatic in people with an uncompromised immune system (2,3). Transmission to human occurs by eating uncooked or insufficiently cooked meat containing tissue cysts of protozoa or by taking water or food contaminated with oocysts discarded by infected cat stool. The trophozooid form is responsible for transmission to the fetus (1). More rarely, it can be transmitted by organ transplantation, blood transfusion, inoculation of factor accidentally (e.g., laboratory workers) (4). In risk groups like newborn and the immuno compromised, it can cause a severe and life-threatening disease. It also can cause congenital infections with the parasite transmitted by placenta if the pregnant woman gets infected with it for the first time during pregnancy (5). Congenital toxoplasmosis by this method leads to very serious conditions like mental retardation, seizures, and blindness. The classical triad of it in the fetus is hydrocephaly, intracranial calcifications, and ocular lesions (6). Primary infections during pregnancy can lead to still birth, spontaneous miscarriages, and major ocular and neurological problems according to the immune system condition of the mother, virulence of parasite, and pregnancy period (5,7). The most effective way of protection from congenital disease is to avoid the factors of contamination during pregnancy (8). The severity of disease is related to virulence of *T. gondii* and personal bodily resistance to the factor. The most important risk groups are patients with malignancy (lymphoma and leukemia), patients on immunosuppressive treatment because of solid organ transplantation, bone marrow transplantation, collagen vascular diseases, AIDS patients, and pregnant women. Toxoplasmosis should be considered and investigated in these groups if probable symptoms are present (9). It has been reported that serological tests are important for diagnosis, because clinical findings are not specific to infection (10). Different tests like Sabin–Feldman Dye, Immunofluorescence Antibody (IFA), Indirect Hemagglutination (IHA), Complement Fixation and Enzyme Linked Immunosorbent Assay (ELISA) are used to make a diagnose for disease. Although Sabin–Feldman Dye test is very sensitive and specific, ELISA is preferred mostly by laboratories because it is an easy and trusted method (2,5). It is reported that avidity levels of anti-*Toxoplasma gondii* is effective to discriminate between new and old infection in the first trimester of pregnancy (11). Toxoplasmosis seropositivity has been reported to vary according to occupational groups, climate and environmental conditions, socioeconomic situation, prevalence of contact with cats, regional eating habits, and regions in our country and throughout the World (9). Toxoplasma IgG and IgM seroprevalence has been detected in pregnant women admitted to obstetrics and gynecology department of “Isparta obstetrics and pediatrics hospital” between January 2013 and December 2013. We aimed to compare data collected in this study in Turkey with other studies done in the world.

## MATERIALS AND METHODS

Pregnant women admitted to the obstetrics and gynecology clinic of Isparta Obstetrics and Pediatrics Hospital between

January 2013 and December 2013 have been included in this study. The result of Toxoplasma Ig M and Ig G was analyzed retrospectively. Serum specimens were studied by the method of macroeliza (Siemens IMMULITE 2000 XPi immunoassay system). Blood samples were collected in the first trimester. All positive test results were re-evaluated and controlled. As a routine, patients with positive IgM were sent to the research hospital for further tests. Comparative analyses were done by investigating studies done in different regions of Turkey and various countries around the world for Toxoplasma seropositivity in pregnant women.

## Statistical Analysis

Frequency, percentage, mean±standard deviations were calculated with an SPSS 18.0 program (Chicago, Illinois, USA) for statistical data, and the relationships between variables were evaluated by Chi-square test. A p level below 0.05 has been accepted as statistically significant.

## RESULTS

In total, 3.140 serum specimens have been evaluated in our study. Of those, 1.937 serum specimen were studied for Toxoplasma IgM, and 1.8% of them (n=34) were detected as seropositive. Additionally, 1.213 serum specimens were evaluated for Toxoplasma IgG, and the rate of seropositive cases were detected as 28.4% (n=344) (Table 1). The Pearson Chi-Square test was used to compare between age groups and antigen positivity. Test result was not statistically significant ( $X^2=9.185$  p=0.102). Looking at the distribution for age groups, Toxoplasma IgM was detected as the least common among the age group of under 20 years and between 31-35 years; the most common among the age group of 26-30 years and positivity was not detected among women aged 36 years and more (Table 2). Findings are summarized in (Table 3), and associated literatures reported in Turkey have been evaluated.

**Table 1.** The distribution of case by test results

Test result	Toxoplasma IgM	Toxoplasma IgG
	n (%)	n (%)
Positive	34 (1.8)	344 (28.4)
Negative	1903 (98.2)	869 (71.6)
<b>Total</b>	<b>1937 (100)</b>	<b>1203 (100)</b>

**Table 2.** The distribution by age groups of seropositive patients

Test result	Toxoplasma IgM	Toxoplasma IgG
	n (%)	n (%)
20 years under	4 (11.7)	26 (7.5)
20-25 years	10 (29.5)	91 (26.4)
26-30 years	16 (47.1)	106 (30.9)
31-35 years	4 (11.7)	81 (23.5)
36-40 years	0 (0)	28 (8.2)
40 years and over	0 (0)	12 (3.5)
<b>Total</b>	<b>34 (100)</b>	<b>344 (100)</b>

**Tablo 3.** Comparison of studies evaluating *Toxoplasma gondii* seroprevalences from different regions of Turkey

Researches	Region	IgG (%)	IgM (%)	Study Group	Methods
Our study	Isparta	28.4	1.8	Pregnant women	Elisa
Ocak et al. (19)	Hatay	52.1	0.5	Pregnant women	Elisa
Tamer et al. (20)	Kocaeli	48.3	0.4	Pregnant women	Elisa
Karabulut et al. (21)	Denizli	37.0	1.4	Pregnant women	Elisa
Ertug et al. (22)	Aydın	30.1	0.0	Pregnant women	Elisa
Toklu et al. (23)	Uşak	18.3	3.0	Pregnant women	Elisa
Gunes et al. (24)	Isparta	26.9	2.5	Pregnant women	Elisa

## DISCUSSION

Toxoplasmosis is a common zoonosis seen all over the world. Cats are the main source for infection. One percent of cats around the world discharge oocyst. Ten *T. Gondii* protozoa are enough to infect (9). Toxoplasmosis is generally asymptomatic or causes unspecific symptoms. Though primary infection can cause serious fetal defects in pregnancy, it can be treated to reduce fetal effects if diagnosed (2,8). Toxoplasmosis seropositivity has been reported to vary according to occupational groups, climate and environmental conditions, socioeconomic situation, prevalence of contact with cats, and regional eating habits (11). Seropositivity increases by age. Seropositivity begins in the first year, when children start to play with contaminated soil, and it rises to 50–75% in adolescents (9). In America, toxoplasmosis prevalence is detected as 15.1% in fertile women by III. National Health and Nutrition Control Research (1988–1994) (12). In another study investigating the risk factors for *T. gondii* in Brasil, prevalence of *Toxoplasma* was found in 65.8% in fertile women, and previous pregnancy contributes to a higher risk of infection with toxoplasma by 1.74% compared to environmental factors (13). *Toxoplasma* seropositivity in France has been reported as 43.8% (14). Low prevalence rates have been reported in the UK (15) and Norway (7) 7.7–9.1% and 10.9%, respectively. *Toxoplasma* seroprevalence is 62.2% in Lebanon and 78% in Nigeria (16,17). *Toxoplasma* IgG seropositivity in Turkey varies between 30.1 and 61.3% in the studies, only in pregnant women (Table 3). In our study of only pregnant women, this rate has been detected as 28.4%. Related to various factors such as geographic place, it has been reported that climate conditions, socioeconomic situations, eating habits, different calculation methods, and data usage of the university hospital or state hospital can contribute to differences in similar studies done in cities in the same region or even in the same city. In studies, *Toxoplasma* seropositivity has shown a statistically significant increase at middle age. There has been also reported an increase in prevalence with an increase in age in different countries (13,14,17). In our country, seroprevalence of *Toxoplasma*

*gondii* in pregnant women increases with age in different regions. In our study, it is also increased by age, similar with the literature, especially in that the age group of 26–30 years is the most effected group (47.1%) (Table 2). This is an expected result due to contact with the factor of increased age. Looking at the studies in various regions of Turkey, rates of *Toxoplasma* IgG and IgM have been found by Bayman et al. (18), 61.3–0.9% in Diyarbakır, Ocak et al. (19), 0.54–52.1% in Hatay, Tamer et al. (20), 0.4–48.3% in Kocaeli, Karabulut et al. (21), 37.0–1.4% in Denizli, Ertug et al. (22), 30.1–0.0% in Aydın and Toklu et al. (23), 18.3–3.0 in Uşak. Seroprevalence shows geographical differences due to differences of hygiene conditions and eating habits. In our study also, the rate was found to be 28.4–1.8% respectively. Gunes et al. (24), found *Toxoplasma* IgG (26.9%) and *Toxoplasma* IgM (2.5%) positive in their research in 2008. Compared to the results of our study, the other studies seems to be similar, but because these studies have been done at the university hospital and were all done on women of childbearing age, there are minor differences despite using the same serological method.

## CONCLUSIONS

*Toxoplasma gondii* seropositivity was found to be in remarkable levels in the region of our study. Pregnant women and mothers who plan pregnancy should be evaluated for Toxoplasmosis. We think that due to the high proportion of seronegativity, the protection of mothers and babies from the risk of *Toxoplasma* infection will be achieved by investigating toxoplasmosis in pregnant women in the initial examination, giving education to seronegative pregnant women. In addition, the planning of studies to determine the seroprevalence of parasite, especially in areas with high prevalence, the evaluation of *Toxoplasma gondii* positivity in pregnant women or women planning pregnancy should be investigated routinely. Serology in pregnancy should be tested, and acute infection should be diagnosed and treated. Seronegative pregnant women should be controlled periodically and appropriate treatment should be given in congenital toxoplasmosis. It is very important to give information about the parasite during education of pregnant women, and to give public health education about protection against the parasite. Working collaboratively with state hospitals and university hospitals can contribute to the accurate detection national and regional seropositivity of toxoplasmosis. Evaluation and interpretation of the data obtained about the parasite will guide the researchers.

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