

# *Toxoplasma gondii* seropositivity in pregnancies with normal delivery and complicated with abortion

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## ABSTRACT

**Objective:** *Toxoplasma* infection during pregnancy may cause remarkable mortality and morbidity in fetus due to transplacental transmission. It has fetal consequences such as abortion, stillbirth and congenital malformations. In the Turkish literature, there is limited investigations evaluating the prevalence of *Toxoplasma gondii* among pregnancies complicated with abortion. The aim of this study is to compare the *Toxoplasma* seropositivity between pregnancies with normal delivery and complicated with abortion.

**Methods:** This is a retrospective, single center study conducted between May 2015 and June 2016. We included 412 patients in the study group and 828 patients in the control group. The study group (Group 1) was comprised of pregnant women whose pregnancies were complicated with abortion and the control group (Group 2) was pregnant women with normal delivery. *Toxoplasma* IgM and IgG seropositivity were compared between two groups.

**Results:** There was no difference between two groups in terms of sociodemographic features ( $p > 0.05$ ). *Toxoplasma* IgM was positive in 62 (5%) patients and IgG was positive in 282 (22.9%) patients in all groups. In subgroup analysis *Toxoplasma* IgM was found to be positive in 27 (6.6%) patients in Group 1 and 35 (4.2%) patients in Group 2. Moreover, *Toxoplasma* IgG was positive in 125 (30.6%) patients in Group 1 and in 157 (19.2%) patients in Group 2. *Toxoplasma* IgM and *Toxoplasma* IgG were significantly higher in Group 1 ( $p = 0.023$  and  $p = 0.016$ , respectively).

**Conclusion:** We concluded that *Toxoplasma* seropositivity is high in our country and routine screening is essential for pregnancies. Toxoplasmosis may play a role in the etiology of abortion.

**Keywords:** Abortus, pregnancy, toxoplasmosis, toxoplasma immunoglobuline

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**T***oxoplasma gondii*, which belongs to TORCH (*Toxoplasma gondii*, Rubella, Cytomegalovirus and Herpes simplex) group, is an intracellular obligate parasite with a complex life cycle [1]. Infection is transmitted to humans by ingestion of uncooked meat containing live organisms or by vegetables, fruits and water that are contaminated by oocysts [2, 3].

Although serologic positivity of *toxoplasma* is generally asymptomatic, during pregnancy this infection may cause remarkable mortality and morbidity in fetus due to transplacental transmission. While congenital transmission is most common during last trimester with a ratio of 70-80 %, it is 10-15% in the first trimester. However the risk of severe



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congenital sequela is much higher in the first trimester [4]. It is a preventable cause of severe fetal consequences such as abortion, still-birth and congenital malformations. It can result in central nervous system anomalies, mental and physical retardation, blindness, cerebral calcifications, pneumonia, hepatitis, myocarditis, hydrocephalus, microcephalus and chorioretinitis [5-8]. Fortunately, spiramycin treatment following confirmation of maternal infection is known to prevent the fetal transmission and congenital infection [9]. However, it is still controversial whether screening of *T. gondii* is essential. Since, the seropositivity ratios are high in our country screening is currently being suggested.

*T. gondii* can be determined in as high as 1/3 of world population. This frequency can change according to geographical regions, dietary habits, socioeconomic status and age [1]. In previous studies, the seropositivity of toxoplasmosis in women is reported to be 43.8% for Spain, 11% for USA and 63.7% for Iran [10]. In our country, this ratio is reported to be between 25.2 % to 69.5 % [11, 12]. Among pregnant women the prevalence of *T. gondii* is stated as 9.1% for England, 6.1% for Mexico, 43.8% for France, 35% for Switzerland and 33.9-60.4% for Turkey [6, 10, 13, 14]. Worldwide prevalence of *T. gondii* among pregnancies complicated with abortion is given to be between 17.5% and 79.03% [15-17]. In the Turkish literature, there is limited investigations evaluating the prevalence of *T. gondii* seropositivity among pregnancies complicated with abortion and the relevant data is quite limited.

The aim of this study is to compare the *T. gondii*

seropositivity between pregnancies with normal delivery and the ones complicated with abortion.

## METHODS

This is a retrospective, single center study which was conducted in a university affiliated research and training hospital between May 2015 and June 2016. A total of 1240 pregnancies, between 18-40 years of age were included in this study. There were 412 patients in the study group and 828 patients in the control group. The study group was comprised of pregnant women whose pregnancies were complicated with first trimester abortion and the control group was pregnant with normal delivery. We excluded patients whose *Toxoplasma* seropositivity and pregnancy outcomes were unavailable.

Demographic, clinical and laboratory parameters of patients were obtained from the systemic medical records of the study center. Also, *Toxoplasma* Immunglobuline (Ig) M and G values were obtained from patients' files. *Toxoplasma* specific IgM and IgG values were analyzed by micro-ELISA (Roche, cobalt E601). The positive value for anti-*Toxoplasma* IgM index was accepted as >1.0 IU/ml, the borderline value was  $\geq 0.8$  and  $\leq 1.0$  IU/ml and the negative value was < 0.8 IU/ml. Also anti-*Toxoplasma* IgG index was accepted as positive for values > 3.0 IU/ml, as borderline for values  $\geq 1.0$  and  $\leq 3.0$  IU/ml and as negative for values < 1.0 IU/ml. The ratios of seropositivity of *Toxoplasma* IgM and IgG were calculated.

**Table 1.** Socio-demographic characteristics of the patients

	Abortus (n = 412)	Normal Delivery (n = 828)	p value
Age (years)	27.6 ± 11.4	29.1 ± 9.87	0.921
Gravida (n)	3 (1:5)	3 (1:6)	0.708
Parity (n)	2 (1:4)	2 (1:5)	0.632
Residence			0.443
Urban	229 (55.6%)	418 (50.5%)	
Rural	183 (44.4%)	410 (49.5%)	
Education			0.826
Illiterate	52 (12.6%)	97 (11.7%)	
Primary	116 (28.2%)	253 (30.6%)	
Secondary	187 (45.4%)	365 (44.2%)	
High School	57 (13.8%)	112 (13.5%)	

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For retrospective studies, ethics committee approval is not required.

**Statistical Analysis**

Statistical analyses were performed with SPSS software (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). For group comparisons, independent samples t test or Mann Whitney U test were used according to normality test results. Variables were demonstrated as mean ± standard deviation or median values. A p value < 0.05 was considered as statistically significant. Also, categorical variables were shown as percentages and were compared by Chi-square or Fisher’s exact test.

**RESULTS**

The mean age of all participants was 28.4 ± 10.3 years. Mean gravida was 3 (1:5) and mean parity was 2 (1:4). The patients were divided into two subgroups: pregnancies complicated with abortus (Group 1) and pregnancies with normal delivery (Group 2). Demographic characteristics of the study (n = 412) and control (n = 828) group were presented in Table 1. There was no difference between two groups in terms of age, gravida, parity, education status and residency (p > 0.05).

According to the *T. gondii* seropositivity, *Toxoplasma* IgM was positive in 62 (5%) patients and *Toxoplasma* IgG was positive in 282 (22.9%) patients in all groups. A total of 47 patients were anti-

**Table 2.** The distribution of anti-*Toxoplasma* IgM and anti-*Toxoplasma* IgG

	<b>Anti-<i>Toxoplasma</i> IgM Positive (n=62)</b>	<b>Anti-<i>Toxoplasma</i> IgM Negative (n=1178)</b>
<b>Anti-<i>Toxoplasma</i> IgG Positive (n=282)</b>	47 (3.8%)	235 (19%)
<b>Anti-<i>Toxoplasma</i> IgG Negative (n=958)</b>	15 (1.2%)	943 (76%)

*Toxoplasma* IgG positive and anti-*Toxoplasma* IgM positive group. The distribution of both anti-*Toxoplasma* IgG and anti-*Toxoplasma* IgM was demonstrated in Table 2. In subgroup analysis *Toxoplasma* IgM was found to be positive in 27 (6.6%) patients in Group 1 and 35 (4.2%) patients in Group 2. The seropositivity of *Toxoplasma* IgM was statistically significantly higher in pregnancies complicated with abortus (p = 0.023). Moreover, *Toxoplasma* IgG was positive in 125 (30.6%) patients in Group 1 and in 157 (19.2%) patients in Group 2 (Table 3). In addition, the seropositivity of *Toxoplasma* IgG was statistically significantly higher in pregnancies complicated with abortus (p = 0.016).

**DISCUSSION**

Prevention, detection and management of congenital toxoplasmosis is a crucial issue for fetal well-being in daily obstetric practice. It has catastrophic consequences such as cephalic abnormalities, retinochoroiditis, blindness, epilepsy, retardation of psychomotor and mental functions, trombocytopenia and anemia [18, 19]. Although *T.*

**Table 3.** *Toxoplasma* seropositivity of the patients

	<b>Total (n = 1240)</b>	<b>Abortus (n = 412)</b>	<b>Normal Delivery (n = 828)</b>	<b>p value</b>
<b>Anti-<i>Toxoplasma</i> IgM</b>				
-Positive	62 (5%)	27 (6.6%)	35 (4.2%)	0.023
-Negative	1178 (95%)	385 (93.4%)	793 (95.8%)	
<b>Anti-<i>Toxoplasma</i> IgG</b>				
-Positive	282(22.9%)	125 (30.6%)	157 (19.2%)	0.016
-Negative	958 (77.1%)	287 (69.4%)	671 (80.8%)	

*gondii* infection which occurs up to 3 months before conception have nearly no risk for fetus, the rate of transmission varies between 60-81% in the third trimester [20]. Therefore, the confirmation of primary infection is critical to evaluate the risk of transmission and provide appropriate therapy and counseling. It is controversial whether routine screening for *T. gondii* is essential among pregnant women all over the world. Generally, decision on routine screening depends on the prevalence of infection, testing costs, sensitivity of screening tests and limitations of treatment effectiveness [21].

The seroprevalence of toxoplasmosis shows a widespread distribution all over the world depending on age, geographical regions, dietary habits and socioeconomic status [5]. Recent studies have demonstrated that *Toxoplasma* IgG positivity was 48.7% in Argentina, 9.1% in England, 61.6% in Brasil, 35% in Switzerland, 6.1% in Mexico, 50.6% in Morocco, 43.8% in France and 10.6% in China [10, 13, 22, 23]. In our country, Saracoglu *et al.* [24] reported *Toxoplasma* IgG positivity as 38.1% in Ankara. Moreover, it has been reported to be 60.4% in a city of southeastern region, 36% in a city of eastern region, 30.1% in a city of western region [14, 25, 26]. In our study *Toxoplasma* IgG positivity was found to be 22.9%. Our prevalence seems to be lower as compared to our country data. We suggest that the age of our patients was younger than the other studies and our trial center was in the northwestern part of our country which had a better socioeconomic status than the other regions.

Another interesting data of our study is that *Toxoplasma* IgM positivity was 5% among our study group. Similarly, in a study of Aynalı *et al.* [27] they found *Toxoplasma* IgM positivity as 5.2% among reproductive women. Also, other studies evaluating *Toxoplasma* IgM positivity in Turkey showed a prevalence between 0.3%-9.9% [26-28].

In the literature, there is a few data about the prevalence of *T. gondii* in pregnancies complicated with abortion. Ghasemi *et al.* [29] reported *Toxoplasma* IgG prevalence as 25.5% in abortion and stillbirth group, and as 26.4% in control group. Also they reported that *Toxoplasma* IgM was detected in 6.4% of the case group and 1.8% in control group and they concluded that toxoplasmosis might play a role in the etiology of abortion and stillbirth [29]. Tamam

*et al.* [30] demonstrated that *Toxoplasma* specific IgG seropositivity was 46.1% and IgM was 18.4% in spontaneous abortus group. They suggested that *Toxoplasma* seroprevalence is high and antenatal screening is needed in Egypt [30]. In Iran, *Toxoplasma* IgG seropositivity was 17.5% in repeated abortion, in Sari 34.21% and in South Iran 79.03% [15, 16, 31]. In those studies *Toxoplasma* IgM prevalence was reported to be 7.89-15.32%. In the study of Anubhuti *et al.* [32] *Toxoplasma* IgG was found to be positive in 20% of women with history of spontaneous abortion and 5% of women with no bad obstetric history while none of the women were reported to be *Toxoplasma* IgM positive. The seroprevalence of *Toxoplasma* IgM was investigated in women with recurrent abortion and it was found as 49.47%. This was much more higher than the seroprevalence in normal delivery group, which was reported as 8.88% [33]. The cases of abnormal pregnancies, including spontaneous abortions, premature deliveries, embryo damage and birth defects, were shown to have significantly higher seropositivity rates of *Toxoplasma* IgM and IgG as compared to normal pregnancies (7.94% vs 1.90% and 19.84% vs 8.75%, respectively) [34]. In our study, *Toxoplasma* IgG positivity was 30.6% in abortus group and 19.2% in control group. Also, *Toxoplasma* IgM was positive in 6.6% of abortus group and in 4.2% of control group. Consequently, the seropositivity of IgM and IgG were significantly higher in pregnancies complicated with abortus as compared to pregnancies with normal delivery and the *Toxoplasma* seroprevalence was observed to be similar with other countries. Moreover, as it was suggested by the authors of those researches, we suggest that toxoplasmosis is related with first trimester abortus.

## CONCLUSION

In conclusion, *Toxoplasma* seropositivity is high in our country and routine screening is essential for pregnancies to provide fetal well-being. Toxoplasmosis may play a role in the etiology of abortion and this can be prevented by routine screening and appropriate management.

### Conflict of interest

The authors disclosed no conflict of interest during

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