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RESEARCH ARTICLE

Seroprevalence of *Toxoplasma Gondii* In Pregnant Women in Attending a Private Hospital in İstanbul

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ABSTRACT

Objective: Toxoplasmosis is a zoonotic infection caused by *Toxoplasma gondii* (*T. gondii*), an obligate intracellular parasite. Toxoplasmosis can be dangerous for pregnant women in terms of 'Congenital Toxoplasmosis'. This condition may cause spontaneous abortion, foetal death, intrauterine growth retardation, hydrocephalus, neurological, ocular or auditory problems or cardiovascular diseases. The aim of this study was to determine the seroprevalence of *T. gondii* IgM and IgG in pregnant women and to compare it with studies conducted in Türkiye.

Materials and Methods: Pregnant women between the ages of 18-50 years who applied to our outpatient clinic between 2017 and 2022 and who had *T. gondii* IgM and IgG results from blood samples in the first trimester were included. Anti-*T. gondii* IgM and IgG antibodies were analysed in sera of the patients.

Results: Of the 2056 pregnant women included in the study, 2033 (98.9%) were IgM negative and 23 (1.1%) were IgM positive. IgG was negative in 1686 (82%) and IgG positive in 370 (18%) of 2056 pregnant women. 1671 pregnant women were both IgM and IgG negative, 362 pregnant women were IgM negative but IgG positive, 15 pregnant women were IgM positive but IgG negative and 8 pregnant women were both IgM and IgG positive.

Conclusion: The number of foetuses affected by toxoplasmosis can be reduced by determining the seroprevelance of toxoplasmosis in countries with different regions and lifestyles such as our country, screening pregnant women in regions with low rates such as the population admitted to our hospital for toxoplasmosis and informing pregnant women at risk about toxoplasmosis.

Keywords: Congenital toxoplasmosis, pregnancy, toxoplasmosis, toxoplasma seroprevelance

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INTRODUCTION

Toxoplasmosis is a type of zoonotic infection that can be transmitted between animals and humans. This infection is caused by the intracellular parasite *Toxoplasma gondii* (*T. gondii*). Toxoplasmosis affects populations in developing and low-income countries on a large scale.[1] Biologically, *T. gondii* has three different infective stages: invasive tachyzoites, bradyzoites, and sporozoites.[1] While tachyzoites invade cells, bradyzoites, formed by the transformation of tachyzoites, disrupt the structure of the host cell and cause its death. Sporozoites protect the parasites from chemical and mechanical damage, and thus, they can survive for a long time.[1] The incidence of this infection appears to differ considerably depending on geographical location, climate, and dietary habits, with higher incidence reported in hot and humid climates.[2] Identified risk factors for acquiring toxoplasmosis include handling raw or undercooked meat, contact with cat feces, and consuming unfiltered water or unpasteurized goat milk.[3] Studies have shown that most of the hosts of *Toxoplasma* infection are domestic or stray cats, and it is seen in 31 of the

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39 cat species identified in the world.[1] In immunocompetent individuals, the infection is generally asymptomatic and self-resolving.[4] However, the infection poses significant risks to immunocompromised individuals and pregnant women due to potential complications for the developing fetus.[4,5]

For fetal involvement to occur, *T. gondii* must be acquired during pregnancy and transmitted transplacentally to the fetus, leading to "Congenital Toxoplasmosis." This condition can result in various complications, including spontaneous abortion, fetal death, intrauterine growth restriction, hydrocephalus, encephalitis, neurological, ocular, auditory issues, or cardiovascular problems.[6,7] In addition, having this infection during pregnancy can result in preterm birth.[8] The risk of transmission of infection from mother to child depends on the gestational week during which the mother is infected.[9] The baby born to an infected mother has congenital toxoplasmosis, and while 5% develop normally, about 4% have visual impairments, neurological diseases, or die.[9]

Although the "Sabin-Feldman Dye" test is the reference method for diagnosing toxoplasmosis, serological tests are more commonly utilized due to their ease of application, as well as their high sensitivity and specificity. In our country, due to the lack of a standardized screening recommendation by the Ministry of Health, different institutions adopt varying approaches to the screening and management of toxoplasmosis.[10]

This study aims to evaluate the seroprevalence of *T. gondii* IgM and IgG in pregnant women followed up in the Gynecology and Obstetrics Outpatient Clinic of Acıbadem University Hospital for five years. We aim to compare these findings with other studies conducted in Türkiye and contribute to screening and management strategies by evaluating the frequency of infection.

MATERIALS and METHODS

The current study was designed as a retrospective, single-center analysis. It was approved by the Acıbadem Mehmet Ali Aydınlar University Ethics Committee with the decision dated May 20, 2022, and numbered 2022-09/06. Additionally, the procedures were performed in accordance with the principles outlined in the Declaration of Helsinki.

It included pregnant women aged 18–50 who presented to the Obstetrics and Gynecology outpatient clinic at Acıbadem University Hospital between 2017 and 2022. These women had *T. gondii* IgM and IgG results obtained from routine blood samples collected during the first trimester. The serum samples were tested for anti-*T. gondii* IgM and IgG antibodies using the microparticle enzyme immunoassay method (Axsym Abbott, USA), following the manufacturer's protocol. Demographic data and laboratory results for a total of 2,056 pregnant women were recorded by reviewing the hospital information management system. To assess age-related prevalence, the cohort was divided into four age groups: 18–25, 26–30, 31–36, and 36–50 years.

Statistical Analysis

Shapiro–Wilk test was used to evaluate the data distribution. Because data were not normally distributed, statistical comparisons were made using nonparametric tests. The Kruskal–Wallis and Mann–Whitney U tests were used for intergroup comparisons of continuous variables. Descriptive statistics for nonparametric tests were presented as medians (min–max values). Categorical variables were compared using the Chi-square, Fisher's Exact, and Fisher–Freeman–Halton tests. Descriptive statistics for categorical variables were expressed as frequencies and percentages. Data analysis was performed using the SPSS v25 software package (SPSS Statistics v25, Armonk, New York, USA: IBM Corp.) with a significance level of p=0.05.

RESULTS

Among the 2,056 pregnant women included in the study, 2,033 (98.9%) were IgM negative, while 23 (1.1%) were IgM positive (Table 1). Although the highest IgM positivity rate was observed in the 26–30 age group (1.4%), there was no statistically significant difference in IgM positivity rates across different age categories (Table 2).

Of the 2,056 pregnant women, 1,686 (82%) were IgG negative, and 370 (18%) were IgG positive (Table 1). The highest IgG positivity rate was observed in the 18–25 age group (24.2%); however, no statistically significant difference was found in IgG positivity rates across the age groups (Table 3).

A total of 1,671 pregnant women (81.3%) were negative for both IgM and IgG, 362 (17.6%) were IgM negative but IgG positive, 15 (0.7%) were IgM positive but IgG negative, and 8 (0.4%) were positive for both IgM and IgG (Table 4). No statistically significant difference was found in the distribution of IgM and IgG positivity across the age categories (Table 5).

DISCUSSION

Toxoplasmosis is a global health concern, affecting a substantial proportion of the population, particularly in less developed and developing countries, including ours.[1,11] Early and accurate diagnosis is crucial, given the potential for complications such as abortion and preterm birth in pregnant women and the risk of permanent damage in newborns. Timely treatment has been shown to mitigate adverse fetal outcomes.[12]

Table 1. Distribution of IgM and IgG results in 2056 pregnant women

	Total case (n=2056)	
	n	%
IgM		
Negative	2033	98.9
Positive	23	1.1
IgG		
Negative	1686	82
Positive	370	18

IgM: Immunglobulin M; IgG: Immunglobulin G

Table 2. Number of IgM positive and negative cases by age categories

Age	IgM			
	Negative		Positive	
	n	%	n	%
18–25	33	100.0	0	0.0
26–30	352	98.6	5	1.4
31–36	1042	99.0	11	1.0
36–50	606	98.9	7	1.1
Total	2033	98.9	23	1.1

Table 3. Number of IgG positive and negative cases by age categories

Age	IgG			
	Negative		Positive	
	n	%	n	%
18–25	25	75.8	8	24.2
26–30	292	81.8	65	18.2
31–36	873	82.9	180	17.1
36–50	496	80.9	117	19.1
Total	1686	82	370	18

Table 4. Distribution of IgG and IgM positivity and negativity

	Total case (n=2056)	
	n	%
IgM and IgG negative	1671	81.3
IgM negative	362	17.6
IgG positive		
IgM positive	15	7
IgG negative		
IgM and IgG positive	8	4

The prevalence of toxoplasmosis varies globally. For instance, it has been reported at 10% in the United States, 25% in Canada, 31% in Austria, 47% in rural France, 53% in Belgium, 10% in Norway, 16% in the United Kingdom, and 49% in Malaysia.[13] In Türkiye, studies report *T. gondii* IgG seropositivity rates ranging from 18% to 63%, while IgM seropositivity rates range from 0.2% to 3.9%.[14–19] The highest seroprevalence was reported in a study conducted in Bingol, where 63% seroprevalence was observed among 10,178 pregnant women.[16] Another study in Hatay found

Table 5. Comparison of IgG and IgM seroprevelance by age categories

Age	IgM-IgG								p
	IgM and IgG negative		IgM negative IgG positive		IgM positive IgG negative		IgM and IgG positive		
	n	%	n	%	n	%	n	%	
18–25	25	75.8	8	24.2	0	0.0	0	0.0	0.900
26–30	289	81.0	63	17.6	3	0.8	2	0.6	
31–36	865	82.1	177	16.8	8	0.8	3	0.3	
36–50	492	80.3	114	18.6	4	0.7	3	0.5	
Total	1671	81.3	362	17.6	15	7	8	4	

IgG: Immunglobulin G; IgM: Immunglobulin M

a seropositivity rate of 48.7% among 11,564 pregnant women.[17] These high seropositivity rates are thought to be affected by factors like geographical location, hygiene practices, dietary habits, social and cultural behaviors, or testing methods used.

In our study, the IgG seroprevalence was 18%, while the IgM seroprevalence was 1.1%. The IgM seroprevalence aligns with the results of most studies conducted in Türkiye.[18–20] However, IgG seroprevalence is less than that documented in previous studies in Istanbul.[15,21] The lower IgG seroprevalence among the pregnant women presenting to our hospital, compared to the national average, may be attributed to the higher socioeconomic status of our patient population, the low prevalence of livestock farming in our region, the rarity of living in large households, and the limited consumption of raw meat. Detailed toxoplasmosis seroprevalence studies, combined with comprehensive surveys in our region, could provide more in-depth data.[22]

The lower IgG seroprevalence observed in our study, compared to other studies conducted in Istanbul, also suggests a higher proportion of pregnant women who are not immune to *T. gondii* and are therefore at increased risk of congenital toxoplasmosis if they contract the parasite during or just before pregnancy. Consequently, it is important not to ignore the possibility of *T. gondii* infection during pregnancy among women admitted to our hospital and to evaluate for early diagnosis, as early diagnosis and treatment can reduce fetal damage caused by *T. gondii*. Educating seronegative pregnant women on prevention methods to avoid *T. gondii* infection during pregnancy could help reduce the incidence of this infection.

This study includes the data of pregnant women admitted to only one hospital. Therefore, the inability to reach more pregnant women is a limitation of this study. In addition, a survey including the socioeconomic status and dietary habits of pregnant women was not conducted. This is another limitation of this study.

CONCLUSION

Toxoplasmosis seroprevalence appears to be decreasing in accordance with contemporary lifestyles. In countries like Türkiye, with diverse regions and lifestyles, determining regional toxoplasmosis seroprevalence and screening pregnant women in low-prevalence areas such as our hospital can reduce the number of fetuses affected by toxoplasmosis by informing at-risk pregnant women.

Disclosures

Ethics Committee Approval: The study was approved by the Acıbadem Mehmet Ali Aydınlar University Medical Research Ethics Committee (No: 2022-09/06, Date: 20/05/2022).

Informed Consent: Informed consent was obtained from all participants.

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