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Short Communication

Frequency of anti-*Toxoplasma gondii* IgA, IgM, and IgG antibodies in high-risk pregnancies, in Brazil

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Abstract

Introduction: Toxoplasmosis during pregnancy can be severe; thus, it is essential to diagnose the disease via serological tests. **Methods**: An enzyme-linked immunosorbent assay (ELISA) was used to investigate anti-*Toxoplasma gondii* immunoglobulin A (IgA), M (IgM) and G (IgG) antibodies in 62 high-risk pregnant women. **Results**: Forty-three (69.4%) women were positive for IgA, 31 (50%) for IgG, and 57 (91.9%) for IgM; 4 (6,5%) were positive for IgA but negative for IgM; 10 (16.1%) were negative for IgA and IgM but positive for IgG. **Conclusions**: Testing for these antibodies can help diagnose infection in pregnant women, thereby contributing to clinical management**.**

Keywords: *Toxoplasma gondii.* Acute infection. High-risk pregnancy.

Congenital toxoplasmosis is a serious disease that occurs when the *Toxoplasma gondii* parasite crosses the placental barrier and affects the fetus during pregnancy. The severity of the disease may be associated with the type of strain acquired, the immune status of the mother, and the gestational period in which maternal infection and fetal transmission occurs[1] [2].

Among the different types of antibodies, the anti-*Toxoplasma gondii* immunoglobulin G (IgG) and immunoglobulin M (IgM) are the most commonly reported among pregnant women worldwide[1] [3], and the presence of anti-*T. gondii* antibodies is an important factor in determining the time of infection. IgA and IgM class antibodies are associated with recent infections (acute infection) while IgG class antibodies are associated with chronic infection[3] [4] [5] [6]. However, the individual analysis of these antibodies does not differentiate the time of infection as IgA and IgM antibodies may be detectable for several months or even be undetectable in acute infections, and thus searching for more than one type of antibody is required to confirm the acute infection. In addition, the IgM antibody test is widely used to diagnose acute infections, as these antibodies usually appear 1 week after infection and may disappear within 6 months[7] [8]. However, the IgA antibody test is not commonly used, and most studies only use this test to detect the disease in cases of congenital infection. Thus, the IgA antibody test is an important marker for *T. gondii* infection in newborn babies. On the other hand, IgM antibodies during infection can arise at the beginning of pregnancy but be undetectable in the newborn serum at birth[6] [9] [10]. Furthermore, although the detection of IgA antibodies is similar to IgM antibodies, the peak titers of IgA antibodies occurs later[8] [10]. However, few studies, especially in Brazil, have described the behavior and use of IgA in the diagnosis of infection in pregnant women. Thus, considering the severity of toxoplasmosis during pregnancy and the contribution of serological diagnosis to identifying the disease, we aimed to investigate the frequency of anti-*T. gondii* IgM, IgA, and IgG antibodies to identify the incidence of infection during high-

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risk pregnancies among women attending a Brazilian National Health Service tertiary teaching hospital.

Peripheral blood samples were collected in dry tubes to obtain serum and were stored at -20°C until used to test for IgM, IgA, and IgG antibodies against *T. gondii*. The reactions were performed using an enzyme-linked immunosorbent assay (ELISA) with the ETI-TOXOK-A (for IgA), ETI-TOXOK-G (for IgG), and ETI-TOXOK-M (for IgM) commercial assays (DiaSorin, Italy) according to the manufacturer's instructions.

The mean age of the pregnant women was 24.9 ± 6.9 (range: 14-43). **Table 1** shows the results of the anti-*T. gondii* antibody analysis, and **Table 2** shows the serological profile of the *T. gondii* antibodies. IgM antibodies were more common than IgA antibodies (91.9% and 69.4%, respectively). However, IgA antibodies were detected without IgM antibodies in 4 samples (6.5%). This supports the results found by Fricker-Hidalgo et al., who found that 5 samples were positive for IgA but negative for IgM in pregnant women, as well as Roc et al., who identified 9 samples from neonates that were positive for IgA, only three of which were also positive for IgM[11,12].

We also found that 10 (16.1%) samples were negative for IgA and IgM antibodies but were positive for IgG antibodies. These results may suggest reactivation of a past infection, but clinical and serological follow-up of these pregnant women as well as an IgG avidity test, which was not conducted in the current study, would be necessary to verify this hypothesis. Moreover, treatment of pregnant women can modify the results of serological tests, and this may have contributed to the negative results for the IgA and IgM classes of antibodies, as previously described[13,14].

In addition, diagnosing toxoplasmosis in Brazil is difficult because there is no specific countrywide policy and no standard commercial assay to identify the type of infection hindering management of the different forms of the disease[1,13,15,16].

In France there are flowcharts for interpretation of serological results in pregnant women to prevent congenital toxoplasmosis. Villard et al. proposed other flowcharts for other forms of the disease, such as congenital toxoplasmosis, immunosuppressed situations, and ocular toxoplasmosis, highlighting the importance of the serological test chosen in identifying infection and the subsequent prevention of the disease. The authors also described the importance of the interpretation of the results and the association of IgA with IgM class antibodies characterizing acute infection[8]. However, in Brazil, most public health services do not perform more than one serological assay during antenatal care, and most of them do not offer an avidity assay to estimate the date of maternal infection. Nonetheless, the use of these laboratory assays performed during pregnancy can help guide clinical research and confirm the presence or absence of acute maternal infection[6,14,16].

In conclusion, our study showed that the identification of anti-*T. gondii* IgA antibodies as well as routine testing for IgM and IgG antibodies can help diagnose toxoplasmosis during pregnancy thereby contributing to clinical management.

TABLE 1

Anti-*Toxoplasma gondii* IgA, IgM, and IgG antibodies (ELISA) in high-risk pregnant women (n=62) in São José do Rio Preto, São Paulo, Brazil.

	Positive		Negative	
Assay	**n**	**%**	**n**	**%**
ELISA IgA	43	69.4	19	30.6
ELISA IgM	57	91.9	5	8.1
ELISA IgG	31	50.0	31	50.0

IgA: immunoglobulin A; **IgM:** immunoglobulin M; **IgG:** immunoglobulin G; **ELISA:** enzyme-linked immunosorbent assay.

TABLE 2

Anti-*Toxoplasma gondii* IgA, IgM, and IgG antibody profiles (ELISA) in high-risk pregnant women (n=62) in São José do Rio Preto, São Paulo, Brazil.

Serological profile	Number	Percentage
IgA+/IgM+/IgG+	27	43.5
IgA+/IgM-/IgG+	4	6.5
IgA-/IgM+/IgG+	16	25.8
IgA-/IgM-/IgG+	10	16.1

IgA: immunoglobulin A; **IgM:** immunoglobulin M; **IgG:** immunoglobulin G; **ELISA:** enzyme-linked immunosorbent assay.

Ethical considerations

This study was approved by the Research Ethics Committee of the São José do Rio Preto Medical School (FAMERP-CAAE 32259714.8.0000.5415). Serum samples from 62 high-risk pregnant women suspected of having toxoplasmosis or who had anti-*T. gondii* IgM antibodies at any time during pregnancy were analyzed. The pregnant women attended and were clinically evaluated in the High-Risk Antenatal Care and Fetal Medicine Outpatient Clinic of the *Hospital de Base, Fundação Faculdade Regional de Medicina,* São José do Rio Preto, São Paulo, Brazil.

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Conflict of Interest

The authors have no conflicts of interests to declare.

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