

# Evaluation of the level of knowledge and prevalence of *Toxoplasma gondii* infection in pregnant women in Santa Catarina, Brazil

## Avaliação do nível de conhecimento e prevalência de infecção por *Toxoplasma gondii* entre gestantes de Santa Catarina, Brasil

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### Abstract

**Objective:** This study aimed to determine the prevalence of *Toxoplasma gondii* (*T. gondii*) infection in pregnant women in Santa Catarina, as well as to analyze the knowledge about zoonosis in the study population. **Methods:** Therefore, 109 volunteers evaluated in Basic Health Units in the city of Blumenau and Brusque were evaluated. The data were collected through questionnaires and analysis of the pregnant woman's handbooks with medical records. **Results:** In this study, the prevalence of IgG anti-*T. gondii* was 53.7%, with positivity for IgM anti-*T. gondii* was 1.0%. Seronegativity for toxoplasmosis was verified in 45.3% of the participants. In addition, the data demonstrated that the majority of pregnant women have not any knowledge of the disease. **Conclusion:** The results of obtained demonstrated that health actions promotion is crucial to clarify about *T. gondii* infection, in order to prevent this disease during pregnancy.

**Keywords:** Toxoplasmosis; Toxoplasmosis, Congenital; Pregnancy Complications; Prenatal Care

### Resumo

**Objetivo:** O presente trabalho teve por objetivo determinar a prevalência de infecção pelo *Toxoplasma gondii* (*T. gondii*) entre gestantes de Santa Catarina, bem como analisar o conhecimento sobre a zoonose na população em estudo. **Métodos:** Para tanto, foram avaliadas 109 voluntárias atendidas em Unidades Básicas de Saúde dos municípios de Blumenau e Brusque. Os dados foram coletados por meio de questionários e análise de cadernetas da gestante. **Resultados:** Neste estudo, a prevalência global de anti-*T. gondii* IgG foi de 53,7%, sendo que a positividade para anti-*T. gondii* IgM foi de 1,0%. A soronegatividade para toxoplasmose foi verificada em 45,3% das participantes. Além disso, os dados revelaram que a maioria das gestantes não tem conhecimento acerca da doença. **Conclusão:** Os resultados deste estudo demonstraram a necessidade da promoção de ações de saúde voltadas ao esclarecimento sobre o *T. gondii* visando prevenir a infecção durante a gestação.

**Palavras-chave:** Toxoplasmose; Toxoplasmose Congênita; Complicações Infeciosas na Gravidez; Cuidado Pré-Natal

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## INTRODUCTION

Infections caused by parasites represent an important worldwide health problem. Among them, we highlight those originated by protozoa such as *Toxoplasma gondii* (*T. gondii*), which, due to their high incidence, require preventive public health actions.<sup>(1)</sup> This obligate intracellular parasite is the etiologic agent of toxoplasmosis, a zoonosis of high infectivity.<sup>(2)</sup>

The main pathway of transmission of *T. gondii* to humans is through the consumption of raw or undercooked meat, especially pork and goat meat, which is contaminated with tissue cysts. Another form of transmission occurs through the ingestion of oocysts that are eliminated in the feces of the definitive hosts, especially cats, and that is capable of contaminating water, soil and food. In addition, the parasite can also be transmitted to the fetus via the transplacental route.<sup>(3)</sup>

In immunocompetent individuals and pregnant women, toxoplasmosis is self-limiting and benign. Usually, it appears as asymptomatic or with mild symptoms such as fever, headaches, epigastric and muscle pain.<sup>(4,5,6)</sup> In fetuses and newborns, infection by *T. gondii* is severe, which can lead to serious complications.<sup>(7)</sup>

Congenital toxoplasmosis has high rates of infant morbidity and mortality in worldwide, with approximately 15% of intrauterine death from fetal infections. In addition, in 80% of cases of fetal affection, symptoms are late.<sup>(8)</sup>

In this context, prenatal care during pregnancy is extremely important for the early diagnosis and treatment of patients who come into contact with the protozoan, as well as, after birth, monitoring the newborn.<sup>(2)</sup> By the fact that, when the diagnosis occurs prematurely there are chances that, with correct treatment, prevent or decrease fetal infection, substantially reducing the sequelae.<sup>(9)</sup> In addition, it is important to emphasize the prevention actions of congenital toxoplasmosis, which can be accomplished via strategies related to the guidance for pregnant women on preventive behavior and the basics knowledge of transmission.<sup>(10)</sup>

Nevertheless, is necessary more seroprevalence data for *T. gondii* among pregnant women in Brazilian cities and states, in order to provide support for the implementation of public health actions pointing to clarify prevention strategies, risks, and way of transmission of toxoplasmosis in pregnancy.<sup>(2)</sup> Therefore, the present study aimed to determine the prevalence of *T. gondii* infection in pregnant women attended at Basic Health Units (UBS) in Santa Catarina, as well as to evaluate knowledge about toxoplasmosis among the population studied.

## MATERIALS AND METHODS

This article is a cross-sectional prevalence study. In this study, was evaluated the total of 109 pregnant women attended at UBS in the Santa Catarina cities of Brusque (from March to April 2018) and Blumenau (from January to May 2019).

Blumenau is located in the northern region of Santa Catarina. Its urban area is divided into 35 neighborhoods, including 2 districts, and its estimated population is 361,855 inhabitants.<sup>(11)</sup> The city has 74 UBS, of which two, located in the downtown of the city, were included in the survey.

Brusque, in turn, has a population of 137,689 habitants.<sup>(12)</sup> The city is divided into 31 neighborhoods, in addition to the Chácara Edith Private Natural Heritage Reserve (RPPN).<sup>(13)</sup> Of the 31 neighborhoods in the city, 23 of them have UBS. Herein, 10 of these UBS were evaluated, which correspond to 11 neighborhoods.

Through the collection of data obtained through the pregnant woman's handbooks, the results of serological tests were analyzed for the detection of IgG and IgM anti-*T. gondii*. The pregnant women were considered seropositive, when the presence of IgG reagent accompanied or not by IgM reagent. Those patients who presented non-reactive results for IgG and IgM antibodies were classified as susceptible to infection.

In addition, a questionnaire was applied regarding the participants' sociodemographic and socioeconomic characteristics. The variables surveyed were: age group, education level and monthly family income, as well as obstetric aspects and knowledge of pregnant women about toxoplasmosis.

The inclusion criteria of the research were: presence of pregnancy confirmed clinically or through exams; prenatal care performed at the UBS and signing the Free and Informed Consent Form.

## ETHICS

This study was approved by the Human Research Ethics Committee of the Fundação Universidade Regional de Blumenau (FURB), protocol number 2.440.560 and 3.033.737.

## RESULTS

Among the pregnant women analyzed, 47.7% (n = 52) were attended at UBS in the city of Blumenau, and 52.3% (n = 57) in the city of Brusque.

The range of age participants was 18 to 40 years old, and in Blumenau and Brusque, the prevalent age group was 20-25 years. Furthermore, the socioeconomic profile was similar among participants from both cities, with a majority family income ranging from 2 to 3 monthly minimum wages. As for education, it was observed that the rate of volunteers with undergraduate education was higher in Blumenau (Table 1).

Regarding the gestational period of the participants, among those from Blumenau, 28.8% (n = 15) were in the third trimester of pregnancy, 51.9% (n = 27) in the second trimester, and 19.2% (n = 10) in the first trimester. Considering the city of Brusque, 57.6% (n = 33) of the volunteers were in the third trimester of pregnancy, 28.1% (n = 16) in the second trimester, and 14.0% (n = 8) in the first trimester.

In Blumenau, it was not possible to access the results of serological tests for the detection of anti-toxoplasma

antibodies of 14 pregnant women's handbook (26.9%). While in participants from Brusque, the results of these tests were analyzed in full. The serology data obtained from the pregnant woman's handbooks are described in Table 2.

The prevalence of IgG anti-*T. gondii* with or without IgM among pregnant women was 53.7% (n = 51). The results obtained by the pregnant women's handbook also revealed a seropositivity of 1.0% (n = 1) for IgG and IgM anti-*T. gondii*, concomitantly. However, 45.3% (n = 43) of the population analyzed was considered susceptible to infection by the protozoan, showing negativity for IgG and IgM antibodies (Table 2).

In the present study, a data survey of toxoplasmosis in pregnant women revealed that the majority of interviewees in the two cities does not have knowledge about the disease (Table 3).

**Table 1**

Sociodemographic and socioeconomic characteristics of pregnant women attended at UBS in Santa Catarina.

Variable	Blumenau n (%)	Brusque n (%)	Total n (%)
Age (years)			
15-19	4 (7,7%)	6 (10,5%)	10 (9,2%)
20-25	25 (48,1%)	22 (38,6%)	47 (43,1%)
26-30	12 (23,1%)	15 (26,3%)	27 (24,8%)
31-35	5 (9,6%)	10 (17,5%)	15 (13,8%)
36-40	6 (11,5%)	4 (7,0%)	10 (9,2%)
<b>Total</b>	<b>52 (100%)</b>	<b>57 (100%)</b>	<b>109 (100%)</b>
Education			
Illiterate	—	1 (1,8%)	1 (0,9%)
Incomplete Elementary School	2 (3,8%)	8 (14,0%)	10 (9,2%)
Complete Elementary School	2 (3,8%)	10 (17,5%)	12 (11,0%)
Incomplete High School	5 (9,6%)	10 (17,5%)	15 (13,8%)
Complete High School	19 (36,5%)	21 (36,8%)	40 (36,7%)
Undergraduate	24 (46,2%)	7 (12,3%)	31 (28,4%)
<b>Total</b>	<b>52 (100%)</b>	<b>57 (100%)</b>	<b>109 (100%)</b>
Monthly family income			
Up to 1 minimum wage	2 (3,8%)	17 (29,8%)	19 (17,4%)
2 to 3 minimum wages	33 (63,5%)	27 (47,4%)	60 (55,0%)
4 to 5 minimum wages	15 (28,8%)	10 (17,5%)	25 (22,9%)
Above 6 minimum wages	2 (3,8%)	2 (3,5%)	4 (3,7%)
Others	—	1 (1,8%)	1 (0,9%)
<b>Total</b>	<b>52 (100%)</b>	<b>57 (100%)</b>	<b>109 (100%)</b>

**Table 2**

Frequency of IgM and IgG anti-*Toxoplasma gondii* antibodies in pregnant women attended at UBS in Santa Catarina.

	Blumenau	Brusque	Total
Antibodies	n (%)	n (%)	n (%)
IgG (+) IgM (-)	20 (52,6%)	30 (52,6%)	50 (52,6%)
IgG (+) IgM (+)	—	1 (1,8%)	1 (1,0%)
IgG (-) IgM (+)	1 (2,6%)	—	1 (1,0%)
IgG (-) IgM (-)	17 (44,7%)	26 (45,6%)	43 (45,3%)
<b>Total</b>	<b>38 (100%)</b>	<b>57 (100%)</b>	<b>95 (100%)</b>

**Table 3**

Knowledge of pregnant women attended at UBS in Santa Catarina about toxoplasmosis.

	Blumenau	Brusque	Total
Level of knowledge	n (%)	n (%)	n (%)
Unknown	8 (15,4%)	13 (22,8%)	21 (19,3%)
You've heard, but don't know nothing about it	28 (53,8%)	28 (49,1%)	56 (51,4%)
Know something about	16 (30,8%)	16 (28,1%)	32 (29,4%)
<b>Total</b>	<b>52 (100%)</b>	<b>57 (100%)</b>	<b>109 (100%)</b>

## DISCUSSION

The results of the serological tests presented here were similar to those of other studies carried out with pregnant women in the southern region of Brazil.<sup>(14,15)</sup> However, the frequency of IgG anti-*T. gondii* antibody is lower compared to studies carried out in other regions of the Brazil, as 77.9% in Maranhão,<sup>(2)</sup> 77.5% in Recife, Pernambuco<sup>(5)</sup> and in Cuiabá, where the marker of contact with the parasite was evidenced in 70.7% of pregnant women attended by the Unified Health System.<sup>(16)</sup>

The prevalence of positive IgG and IgM antibodies variable in worldwide, including within the country itself.<sup>(17)</sup> This variation may be related to diet behavior, hygiene, basic sanitation, geographic location, socioeconomic conditions and factors of each population.<sup>(15)</sup> The seroprevalence data found in Brazil are high when compared to other countries: 10.3% in Japan;<sup>(18)</sup> and 11.9% in England.<sup>(19)</sup> In Mexico, the prevalence among pregnant women is considered low, varying between 6.1% and 8.2%.<sup>(20)</sup>

In this survey, only one pregnant woman (1.0%) was positive for IgG and IgM anti-*T. gondii*, simultaneously. However, due to the unavailability of the avidity of the IgG

antibody data, it was not possible to determine if was an acute infection, since the presence of IgM class antibodies can be detected up to 18 months after the primary infection, called as residual antibodies.<sup>(21)</sup>

It is also worth pointing out the susceptibility index, IgG and IgM non-reactive, of the pregnant women here studied, which makes women vulnerable to *T. gondii* and, consequently, at greater risk of acquiring the infection during pregnancy. Thus, it is importante to emphasize the importance of implementing actions to prevent and control the infection, thereby reducing the number of congenital infections.

The risks of vertical transmission and the severity of the sequelae are directly related to the gestational period at which the infection occurs.<sup>(22)</sup> The consequences of congenital toxoplasmosis for the fetus are several, as abortion, intrauterine growth restriction, prematurity, low weight and other damages to the newborn, such as: chorioretinitis, strabismus, jaundice, hepatomegaly, brain calcifications, hydrocephalus and developmental delay.<sup>(7,23)</sup>

Considering that maternal-fetal transmission can be avoided with early diagnosis and treatment, the rate of absence of information on serology for *T. gondii* reported here represents a negative indicator. In addition, the fact that the minority of participants was in the first trimester of pregnancy may be related to the delay in starting prenatal care. In this context, examinations are performed late, potentially resulting in a high incidence of congenital toxoplasmosis.

In Brazil, a serological test at the first prenatal visit is part of the routine of pregnant women care. However, the main problem is a non-repetition of serological tests during pregnancy. In addition, part of the pregnant women does not receive any prenatal care or receive care in advanced period of pregnancy. In this case, even if the tests detect specific maternal antibodies, it will not be possible to identify whether the infection was acquired before or during pregnancy.

According to the data here analyzed, it was observed that the majority of pregnant women in the two cities in Santa Catarina are not aware of toxoplasmosis. This is not consistent with the fact that most of the participants in Blumenau has undergraduate. The approach to information by pregnant women is a fundamental part of the disease prevention, especially among those who are classified as susceptible to infection. In this way, health professionals develop an essential role in the health information and education, as they are in direct contact with pregnant women and the community in general. Therefore, it is essential that they are updated and attentive to the demands of the community.<sup>(24)</sup>

## CONCLUSION

In conclusion, the results of this study demonstrated the essential to promote public health policies to elucidate about *T. gondii* infection among pregnant women, as well as the prevention and control of toxoplasmosis in pregnancy. These actions are an important tool for reducing fetal infection and reducing the morbidity and mortality rates associated with congenital toxoplasmosis.

## REFERENCES

- Vasoo S, Pritt BS. Molecular diagnostics and parasitic disease. *Clin Lab Med*. 2013;33(3):461-503.
- Câmara JT, Silva MG, Castro AM. Prevalência de toxoplasmose em gestantes atendidas em dois centros de referência em uma cidade do Nordeste, Brasil. *Rev Bras Ginecol Obstet*. 2015;37(2):64-70.
- Lopez A, Dietz VJ, Wilson M, Navin TR, Jones JL. Preventing congenital toxoplasmosis. *MMWR Recomm Rep*. 2000;49(RR-2):57-75.
- Andrade GMQ, Carvalho AL, Orefice F, Carvalho IR, Nogueira MGS. Toxoplasmose congênita: orientação prática sobre prevenção e tratamento. *Rev Med Minas Gerais*. 2004;14(1 Supl. 3):S85-S91.
- Porto AMF, Amorim MMR, Coelho ICN, Santos LC. Perfil sorológico para toxoplasmose em gestantes atendidas em maternidade. *Rev Assoc Med Bras* 2008;54(3):242-8.
- Carvalho MAS, Sátiro FAZ, Oliveira RMP, Ventura CA. Soroprevalência de toxoplasmose humana na cidade de Teresina, no período de 2010 a 2014. *Revista Saúde e Pesquisa*. 2015;8(3):517-24.
- Capobianco JD, Mitsuka-Breganó R, Navarro IT, Rezende Neto CP, Casella A, Lopes-Mori FM, et al. Congenital toxoplasmosis in a reference center of Paraná, Southern Brazil. *Braz J Infect Dis*. 2014;18(4):364-71.
- Nascimento TL, Pacheco CM, Sousa FF. Prevalência de *Toxoplasma gondii* em gestantes atendidas pelo Sistema Único de Saúde. *Ciência & Saúde*. 2017;10(2):96-101.
- Pessanha TM, Carvalho M, Pone MVS, Gomes Junior SC. Abordagem diagnóstica e terapêutica da toxoplasmose em gestantes e as repercussões no recém-nascido. *Rev Paul Pediatr*. 2011;29(3):341-7.
- Serrano MGI, Taques MDB, Gomes M, Elias RM, Silva LM. Toxoplasmose na gravidez: revisão bibliográfica. *Connection Line*. 2016;14:36-46.
- Instituto Brasileiro de Geografia e Estatística. Brasil (IBGE). Santa Catarina. Blumenau. Instituto Brasileiro de Geografia e Estatística [Internet]. 2020 [cited 2021 May 25]. Available from: <https://cidades.ibge.gov.br/brasil/sc/blumenau/panorama>.
- Instituto Brasileiro de Geografia e Estatística (IBGE). Brasil. Santa Catarina. Brusque. Instituto Brasileiro de Geografia e Estatística [Internet]. 2020 [cited 2021 May 25]. Available from: <https://cidades.ibge.gov.br/brasil/sc/brusque/panorama>.
- Sistema Leis Municipais. Lei complementar nº 238, de 30 de setembro de 2015. Define, denomina e estabelece a divisão dos bairros do município de Brusque, e dá outras providências. Sistema Leis Municipais. Santa Catarina. Brusque [Internet]. 2015 [cited 2021 Jan 21]. Available from: <https://leismunicipais.com.br/a/sc/b/brusque/lei-complementar/2015/24/238/lei-complementar-n-238-2015-define-denomina-e-estabelece-a-divisao-dos-bairros-do-municipio-de-brusque-e-da-outras-providencias?q=Bairros>.
- Ferezin RI, Bertolini DA, Demarchi IG. Prevalência de sorologia positiva para HIV, hepatite B, toxoplasmose e rubéola em gestantes do noroeste paranaense. *Rev Bras Ginecol Obstet*. 2013;35(2):66-70.
- Martinelli MT, Zapelini RM, Iser BPM, Gonçalves HC, Goetten A. Toxoplasmose em parturientes de um Hospital do Sul de Santa Catarina, Brasil. *Rev AMRIGS*. 2017;61(1):25-9.
- Leão PRD, Filho JM, Medeiros SF. Toxoplasmose: Soroprevalência em Puérperas atendidas pelo sistema único de saúde. *Rev Bras Ginecol Obstet*. 2004;26(8):627-32.
- Montoya JG, Rosso F. Diagnosis and management of toxoplasmosis. *Clin Perinatol*. 2005;32(3):705-26.
- Sakikawa M, Noda S, Hanaoka M, Nakayama H, Hojo S, Kakinoki S, et al. Anti-Toxoplasma antibody prevalence, primary infection rate and risk factors in a study of toxoplasmosis in 4,466 pregnant women in Japan. *Clin. Vaccine Immunol*. 2012;19(3): 365-7.
- Flatt A, Shetty N. Seroprevalence and risk factors for toxoplasmosis among antenatal women in London: a re-examination of risk in an ethnically diverse population. *Eur J Public Health*. 2013;23(4):648-52.
- Alvarado-Esquivel C, Torres-Castorena A, Liesenfeld O, García-López CR, Estrada-Martínez S, Sifuentes-Alvarez A, et al. Seroepidemiology of *Toxoplasma gondii* infection in pregnant women in rural Durango, Mexico. *J Parasitol*. 2009;95(2):271-4.
- Beck S, Konopka CK, Silva AK, Diehl FP. Importância do rastreamento sorológico da toxoplasmose em gestantes atendidas em ambulatório de pré-natal de alto risco. *Revista Saúde*. 2010;36(1):29-36.
- Reis MM, Tessaro MM, D'Azevedo PA. Perfil sorológico para toxoplasmose em gestantes de um hospital público de Porto Alegre. *Rev Bras Ginecol Obstet*. 2006;28(3):158-64.
- Silva BCT, Gonçalves DD, Lopes LF, Diegas PHF, Teixeira VS, Esteves APVS. Toxoplasmose congênita: estratégias de controle durante o pré-natal. *Rev Cad Med*. 2019;2(1):16-26.
- Lovison F, Rodrigues RM. Incidência e prevalência da toxoplasmose na região sul do Brasil: revisão bibliográfica. *Rev Saúde Públ Santa Cat*. 2017;10(3):61-75.