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# Epidemiological study of pregnant women served by the public health system with emphasis on toxoplasmosis

Estudio epidemiológico de mujeres embarazadas servidas por el sistema de salud único con énfasis en la toxoplasmosis  
Estudo epidemiológico de gestantes atendidas pelo sistema único de saúde com ênfase na toxoplasmose

## ABSTRACT

**Objective:** to identify the correlation of risk factors associated with the incidence of toxoplasmosis in pregnant women attended by the Public Health System in a medium-sized city, in the State of Parana. **Method:** cross-sectional quantitative study from January to February 2019, with pregnant women followed up in 17 BHU, which answered questionnaire socio-economic, food, hygiene habits and aspects related to environment and the disease. **Statistical analysis** by using the EpiInfo version 7.0 program. 143 pregnant women were included in the study. **Results:** the analysis showed that the consumption of raw vegetables ( $p = 0.9$ ;  $OR = 1.71$ ) and raw or undercooked meat ( $p = 0.87$ ;  $OR = 0.82$ ), having a cat at home ( $p = 0.56$ ;  $OR = 1.16$ ), having low level of education ( $p = 0.17$ ;  $OR = 0.36$ ) and having a low family income ( $p = 0.45$ ;  $OR = 0.51$ ) did not have significant association with *Toxoplasma gondii* seroreactivity. Owning a dog at home ( $p < 0.001$ ;  $OR = 0.16$ ) presented a positive relationship between data, but with no representativeness of risk for these pregnant women. **Conclusions:** the need for further studies which may assist the formulation of new strategies for control and treatment of this infection.

**DESCRIPTORS:** Pregnancy Complications, Infectious; Prenatal Care; Public Health.

## RESUMEN

**Objetivo:** identificar la correlación de factores de riesgo asociados a la incidencia de toxoplasmosis en gestantes atendidas por el Sistema Único de Salud en un municipio mediano del Estado de Paraná. **Método:** estudio cuantitativo, transversal, de enero a febrero de 2019, con gestantes seguidas en 17 UBS, cuáles respondidas cuestionario socioeconómico, hábitos alimentarios, higiene y aspectos relacionados con el medio ambiente y la enfermedad. **Análisis estadístico** mediante el programa EpiInfo versión 7.0. Se incluyeron 143 mujeres embarazadas en el estudio. **Resultados:** el análisis mostró que el consumo de verduras crudas ( $p = 0,9$ ;  $OR = 1,71$ ) y carne cruda o poco cocida ( $p = 0,87$ ;  $OR = 0,82$ ), tener un gato en casa ( $p = 0,56$ ;  $OR = 1,16$ ), tener bajo nivel educativo ( $p = 0,17$ ;  $OR = 0,36$ ) y tener bajos ingresos familiares ( $p = 0,45$ ;  $OR = 0,51$ ) no tenían asociación significativa con serorreactividad para *Toxoplasma gondii*. Tener un perro en casa ( $p < 0,001$ ;  $OR = 0,16$ ) mostró una relación positiva entre los datos, pero sin representatividad de riesgo para estas gestantes. **Conclusiones:** la necesidad de estudios con el fin de ayudar en la formulación de nuevas estrategias para el control y tratamiento de esta infección.

**DESCRIPTORES:** Complicaciones infecciosas en el embarazo; Cuidado prenatal; Salud pública.

## RESUMO

**Objetivo:** identificar a correlação dos fatores de risco associados à incidência da toxoplasmose nas gestantes atendidas pelo Sistema Único de Saúde em município de médio porte no Estado do Paraná. **Método:** estudo transversal quantitativo, de janeiro a fevereiro de 2019, com gestantes acompanhadas em 17 UBS, as quais responderam questionário socioeconômico, hábitos alimentares, de higiene e aspectos relacionados ao ambiente e à doença. **Análise estatística** pelo programa EpiInfo versão 7.0. Incluídas no estudo 143 gestantes. **Resultados:** a análise mostrou que o consumo de verduras/legumes crus ( $p=0,9$ ;  $OR=1,71$ ), carne crua ou mal passada ( $p=0,87$ ;  $OR=0,82$ ), possuir gato na residência ( $p=0,56$ ;  $OR=1,16$ ), ter baixa escolaridade ( $p=0,17$ ;  $OR=0,36$ ) e ter baixa renda familiar ( $p=0,45$ ;  $OR=0,51$ ) não teve associação significativa com a sororeatividade para *Toxoplasma gondii*. Possuir cachorro na residência ( $p<0,001$ ;  $OR=0,16$ ) mostrou uma relação positiva entre dados, porém sem representatividade de risco para essas gestantes. **Conclusões:** necessidade de estudos que auxiliem na formulação de novas estratégias para o controle e tratamento desta infecção.

**DESCRIPTORIOS:** Complicações Infecciosas na Gravidez; Cuidado pré-natal; Saúde pública.

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**Caio Henrique Hashimoto Pugliesi**Medical student at Unicesumar  
ORCID: 0000-0002-7467-0862**Márcio Renan Fabene**Medical student at Unicesumar  
ORCID: 0000-0002-6072-1964**Francielle Renata Danielli Martins Marques**Master's student in Nursing at the Postgraduate Program in Nursing at the State University of Maringá.  
ORCID: 0000-0002-8578-9615**Marcelle Mareze**Professor of the Nursing course at the Faculty of Technology of Vale do Ivaí.  
ORCID: 0000-0001-7266-5851**Maria Aparecida Salci**PhD in Nursing, Professor of the Postgraduate Program in Nursing at the State University of Maringá.  
ORCID: 0000-0002-6386-1962**Patrícia Bossolani Charlo**Professor of Medicine at Unicesumar.  
ORCID: 0000-0002-8262-2086**INTRODUCTION**

**A** Toxoplasmosis results from the ingestion of oocysts in raw or semi-cooked meat, contact with feces of cats infected with the oocyte and vertical transmission.<sup>1</sup> During pregnancy, the main form of contamination occurs through the consumption of raw or undercooked meat, contaminated water, or poor hand hygiene after contact with feline feces in soil, sand or garbage.<sup>2</sup>

The high incidence of congenital transmission, which ranges from four to 10 cases for every 10.000 live births in Brazil, can cause serious complications, including ocular (chorioretinitis), neurological (encephalitis, microcephaly and macrocephaly), systemic (hepatomegaly, jaundice) changes<sup>3-4</sup>, fetal (abortion or malformations) or severe late sequelae, even in asymptomatic children at birth.<sup>5-6</sup>

Brazil is among the countries that have the highest incidence rates of toxoplasmosis in the world, which has resulted in restructuring in epidemiological surveillance through changes in the compulsory notification of gestatio-

nal and congenital toxoplasmosis, and standardization of the investigation of suspected and confirmed cases.<sup>7</sup>

In the national scenario, about 60 to 75% of women of childbearing age have immunity to toxoplasmosis (reactive IgG and non-reactive IgM).<sup>8</sup> Susceptibility occurs when the serological result indicates non-reactive IgG and IgM; and a possible active infection, when the serology shows reactive or non-reactive IgG and reactive IgM.<sup>8</sup>

In a municipality in the north of Paraná, it was found that more than 50% of pregnant women are susceptible to toxoplasmosis, increasing the incidence of congenital cases.<sup>5</sup> It is emphasized that the knowledge of the epidemiological scenario becomes essential to outline control measures for the prevention of this disease.<sup>1</sup>

Maternal screening for infectious diseases during prenatal care allows early diagnosis and treatment, given that the transmission of vertical infections is responsible for the increased morbidity and mortality of the mother-child binomial, becoming a serious Public Health problem in Brazil.<sup>9</sup>

In this sense, the federal govern-

ment implemented the Rede Cegonha starting with Ordinance No. 1.459, dated June 24th, 2011<sup>10</sup> as a way to complement the Humanization Program in Prenatal and Birth (Programa de Humanização no Pré-natal e Nascimento - PHPN).<sup>10,11</sup> And the State of Paraná saw the need to create, in 2013, the Rede Mãe Paranaense (RMP) covering a set of actions involving the early capture of pregnant women, prenatal monitoring, consultations and examinations, risk stratification with attachment to maternity for childbirth, with toxoplasmosis identified in prenatal care as a risk stratification criterion, and follow-up considered high risk.<sup>12</sup>

Given the importance of having an early diagnosis of Toxoplasmosis, the RMP Guide Line recommends requesting serology (IgG and IgM) at the first visit, being repeated every quarter if the pregnant woman is susceptible.<sup>12</sup> Confirmation of susceptibility or diagnosis of acute infection contributes to the reduction of primary infection, vertical transmission and sequelae, especially to the fetus, as it allows primary prevention and early treatment.<sup>13</sup>

The establishment of protocols allows the collection of epidemiological information to identify the source of infection, mode of transmission, groups vulnerable to the disease, risk factors for illness; and, confirm the diagnosis and determine the main epidemiological characteristics, resulting in prevention, control and treatment measures to prevent the occurrence of new cases.<sup>14</sup>

Given this context and considering the relevance of knowing the factors associated with toxoplasmosis infection in a specific population, in order to pro-

duce data that can assist epidemiological surveillance in the construction of preventive and curative measures, the following research question emerged: adherence of risk behaviors is associated with the presence of IgM positive for toxoplasmosis during pregnancy?

Therefore, the objective of this study was to identify the correlation of risk factors associated with the incidence of toxoplasmosis in pregnant women attended by the Unified Health System (SUS) in a medium-sized municipality located in the State of Paraná.

## METHOD

This is a cross-sectional, quantitative study, carried out from January to February 2019, in 17 Basic Health Units (UBS) located in a municipality in the State of Paraná.

The 17 UBS were chosen at random aiming at a homogeneous sample of the population. In these UBS, 143 pregnant women who underwent prenatal care at SUS were selected. As an inclusion criterion: having performed at least 7 prenatal consultations at the health service.

Data collection took place through interviews based on a structured questionnaire with questions about: education level, family income, housing / basic sanitation, research on contact with cats, food hygiene habits and knowledge on toxoplasmosis prevention.

The data were organized using Microsoft Excel, 2010, later analyzed using descriptive statistics, expressed in the form of absolute and relative frequency. The measure of the strength of association between the variables was obtained using the EpiInfo version 7.0 CDC-Atlanta program using unconditional logistic regression, which initially identified, using the odds ratio (Odds Ratio - OR), the value of the gross OR, for the variables in each block that showed a statistically significant association ( $p < 0.05$ ). The control of possible confounding factors existing in the associations obtained in the univariate analysis was achieved through the multivariate analysis technique, in which the adjusted OR value was obtained.

The present study followed the recommendations of Resolutions 466/2012 and 510/2016 15 of the National Health Council that regulate research involving human beings and all participating pregnant women signed a Free and Informed Consent Form (ICF). It was submitted to and approved by the Research Ethics Committee of Unicesumar according to opinion number 3.031.898, CAAE number 02582618.3.0000.5539.

Table 1. Characterization of the research subjects. Maringá, 2019.

Variáveis sociais	Frequência (n=143)	%
<b>Estado civil</b>		
Casada	54	39,4
Solteira	31	22,6
união estável	47	34,3
Divorciada	5	3,6
<b>Raça</b>		
Branca	65	47,4
Parda	53	38,6
Preta	13	9,5
Amarela	5	3,6
Indígena	1	0,7
<b>Faixa etária</b>		
≤ 18 anos	6	4,5
≥ 19 e ≤ 59	137	95,8
<b>Escolaridade</b>		
≤ 9 anos	29	20,2
≥ 10 e ≤ 13 anos	79	55,2
≥ 14 anos	35	24,4
<b>Renda familiar</b>		
< 1 salário mínimo	9	7,1
≥ 1 e ≤ 3 salários mínimos	80	63,4
> 3 salários mínimos	37	29,3
<b>Responsável pela renda</b>		
Gestante	23	16,7
Esposo	101	73,7
Família	13	9,7

\* Minimum wage in effect in 2019: R\$998,00

Table 2. Characterization of hygiene habits. Maringá, 2019.

Hábitos de higiene	Frequência (n=143)	%
<b>Lavar a tábua após cortar carne</b>		
Com água	9	6,2
Água e sabão	132	92,3
Não lava	2	1,4
<b>Comer verduras e legumes crus</b>		
Todos os dias	60	41,9
Duas vezes na semana	62	43,3
Não come	21	14,6
<b>Comer carne crua ou mal passada</b>		
Sim	24	16,9
Não	118	83,1
<b>Quibe cru</b>		
Sim	17	11,8
Não	126	88,1
<b>Churrasco mal passado</b>		
Sim	39	27,2
Não	104	72,7

Table 3. Characterization of aspects related to the disease. Maringá, 2019.

Aspectos relacionados à doença	Frequência (n=143)	%
<b>Conhecimento prévio sobre Toxoplasmose</b>		
Sim	113	79,1
Não	30	20,9
<b>Realizado sorologia para Toxoplasmose</b>		
Sim	91	63,6
Não	31	21,6
Não sabe	21	14,6
<b>Resultado IgM para Toxoplasmose</b>		
Positivo	13	9,3
Negativo	72	51,8
Não sabe	54	38,8
<b>Fez tratamento para Toxoplasmose</b>		
Sim	2	1,5
Não	132	98,5

Table 4. Characterization of environmental aspects. Maringá, 2019.

Aspectos ambientais	Frequência (n=143)	%
<b>Gato na residência</b>		
Sim	21	14,7
Não	122	85,3

## RESULTS

143 pregnant women were included in the study. Most were married (54-39,4%), white (65-47,4%), aged over 19 years (137-95,8%), with schooling ranging from 10 to 13 years of study (79-55,2%), with family income between one to three minimum wages (80-63,4%), with the husband (101-73,7%) being the main responsible for the family income, according to Table 1.

Regarding hygiene habits, the majority said washing the meat board with soap and water (132-92.3%), eating raw vegetables or vegetables twice a week (62-43.3%), not eating raw meat or rare (118-83.1%), do not eat raw kibbeh (126-88.1%) and do not eat rare barbecue (104-72.7%), as described in Table 2.

As for the disease, most said they had prior knowledge about Toxoplasmosis (113-79,1%), had undergone serology (91-63,6%), with just over half (72-51,8%) having negative diagnosis at the time and reported not having undergone specific treatment for the disease in this pregnancy (132-98,5%), as shown in Table 3.

As for environmental issues, living with domestic animals, most had a dog (88-62,4%), followed by the presence of a cat in the home (21-14,7%), as shown in Table 4.

The analysis showed that the consumption of raw vegetables ( $p = 0.9$ ;  $OR = 1.71$ ), raw or undercooked meat ( $p = 0.87$ ;  $OR = 0.82$ ), having a cat at home ( $p = 0.56$ ;  $OR = 1.16$ ), having low education ( $p = 0.17$ ;  $OR = 0.36$ ) and having low family income ( $p = 0.45$ ;  $OR = 0.51$ ) had no significant association with seroreactivity for *Toxoplasma gondii* in these pregnant women. As for the variable having a dog at home ( $p < 0.001$ ;  $OR = 0.16$ ), there was a positive relationship, but without representativeness of risk for these pregnant women (Table 5).

## DISCUSSION

The sociodemographic characteriza-

Cachorro na residência		
Sim	88	62,4
Não	53	37,6

Table 5. Association between risk factors and seroreactivity for *T. gondii*. Maringá, 2019.

Variável	Soropositivo/Total	Valor de p	OR	(IC 95%)
<b>Comer verduras e legumes crus</b>				
2x semana	12/66	0,9	1,71	(0,19-14,8)
Não consome	1/10	Ref.		
<b>Comer carne crua ou mal passada</b>				
Sim	2/15	0,87	0,82	(0,16-4,17)
Não	11/70	Ref.		
<b>Gato na residência</b>				
Sim	1/7	0,56	1,16	(0,009-2,98)
Não	2/4	Ref.		
<b>Cachorro na residência</b>				
Sim	81/88	<0,001	0,16	(0,07-0,36)
Não	8/53	Ref.		
<b>Escolaridade</b>				
≤ 12 anos de estudo	7/62	0,17	0,36	(0,10-1,21)
≥ 13 anos de estudo	6/23	Ref.		
<b>Renda</b>				
≤ 3 SM*	6/49	0,45	0,5	(0,14-1,77)
≥ 4 SM*	6/28	Ref.		

\*\* Minimum wage in effect in 2019: R\$998,00

tion, hygiene habits and environmental aspects of high-risk pregnant women are data that can assist in the construction of an epidemiological plan for the prevention of diseases, but that is consistent with the reality presented.<sup>16</sup> In this study, pregnant women who were married or in a stable relationship predominated, showing that the planning of a pregnancy has occurred within a more consolidated relationship.<sup>17-18</sup> The presence of the white race corroborates with the study 18 about high-risk prenatal care carried out in a region close to the present study, showing that it is an ethnic characteristic of the population of this region.

Regarding the age group of pregnant women, there is a relationship between

seroprevalence and the increase in age.<sup>2,19</sup> People over 18 years of age, as found in this study, have a higher risk of being seropositive for IgG because they have longer exposure to *T. gondii* in the environment.<sup>20</sup>

The low educational and economic level<sup>18,20-23</sup>, as evidenced in this research, they are also risk factors associated with *T. gondii* infection, demonstrating that pregnant women with these risk factors should be monitored more carefully during prenatal consultations. Pregnant women with higher educational levels demonstrate better hygiene habits and better access to information.<sup>24-26</sup>

Regarding lifestyle and hygiene habits, the vast majority of pregnant wo-

men reported washing the meat board with soap and water. The habit of washing kitchen utensils with soap and water was statistically associated as a protective factor against the disease.<sup>23</sup>

This study found a low consumption of raw vegetables and greens, a data considered satisfactory since the consumption of these foods had a significant association with seroreactivity for *T. gondii* in pregnant women in a similar study.<sup>24</sup> Regarding the consumption of raw meat, raw kebab and rare barbecue, these habits were not significantly associated with the infection by the pathogen in question, as found in other Brazilian studies.<sup>20,25</sup> In a systematic review 27 carried out on the prevalence of *T. gondii* in meat, he highlighted that cattle meat are generally those that contain less oocysts, with a lower prevalence than that of pork and sheep.

Prenatal care is the ideal time to advise on preventive measures for maternal-fetal transmission diseases, such as toxoplasmosis, with measures ranging from counseling to serology<sup>21</sup>, being referred by the pregnant women of the studied sample previous knowledge about the disease and the importance of serology for toxoplasmosis, which differs from the data found in a study on the knowledge of pregnant women in Maranhão.<sup>23</sup>

In a literature review on the quality of prenatal care in Brazil<sup>28</sup>, they stand out as factors that contribute to the low quality of care, the failure to perform routine laboratory tests and the lack of guidance during consultations. Knowledge about high-risk pregnancies, as well as pre-existing diseases, is information transmitted during a quality prenatal consultation, in which nurses seek to perform qualified listening, identify problems and outline an individualized care plan for the pregnant woman attended. In this study, the prevalence of IgM antibodies in pregnant women was 9,3%, higher than other studies conducted in Brazil.<sup>21,24</sup> The importance of preventive work and health promotion is emphasized, with investments in edu-

cational programs as a strategy in Public Health to prevent toxoplasmosis.<sup>24</sup>

In relation to living with a pet, most pregnant women had it, being predominantly the creation of the dog. Toxoplasmosis is a zoonosis, therefore, transmitted to humans by animals, and dogs can act as mechanical vectors of infective forms of *T. gondii* adhered to the hair.<sup>24</sup>

Regarding the associations between risk factors and seroreactivity for *T. gondii*, it is highlighted that there is no evidence between the pathogen and the various behavioral habits, such as consuming raw vegetables and vegetables, consuming raw or undercooked meat, owning a cat, corroborating findings in previous studies.<sup>2,20,24-25</sup>

There was a positive relationship with no representativeness of risk for these pregnant women, however it is known that the seroprevalence of *T. gondii* can vary from 5% to 84% depending on the geographical region and age of the dog<sup>29</sup>, the risk of exposure being greater for stray dogs than for domestic dogs due to their free lifestyle, which allows contact with other intermediate and definitive hosts.<sup>30</sup>

Sociodemographic characteristics are

pointed out because they show risk factors for toxoplasmosis, being mentioned, mainly low income and schooling.<sup>21</sup> However, in this analysis there was no significant association in relation to these aspects as in previous studies.

It should be noted that despite the non-statistical association with the sociodemographic profile, previous reports have shown that education is an important risk factor for the occurrence of toxoplasmosis, and in general, people with a higher level of education have more knowledge about the infection and the methods prevention.<sup>18,20-23</sup>

In view of the high incidence of gestational toxoplasmosis in Brazil and, consequently, the changes in public policies in prenatal care for investigation and early treatment of this infection, studies that aim to identify and correlate the risk factors to pregnant women infected with *t. gondii* contribute to strengthen the actions of epidemiological surveillance and prenatal care, subsidizing the formulation of care protocols.

## CONCLUSION

It was possible to conclude that the

pregnant women practiced preventive behaviors properly, such as washing the meat board with soap and water, avoiding raw or undercooked meat, as well as the foods that contained it, had previous knowledge about toxoplasmosis, had undergone serology for disease and had no cat in the residence.

Sociodemographic characteristics and some hygiene habits did not show a significant association for the risk of toxoplasmosis among pregnant women, however this does not exclude the possibility of these components providing contact with *T. gondii* during pregnancy.

The need for further studies on this disease is reinforced, in particular, associating risk factors, so that they can assist the formulation of new strategies for the control and treatment of this infection.

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