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# Gestational and Congenital Toxoplasmosis: Gaps in Healthcare Professionals' Knowledge at a Public Maternity Hospital in Central-West Brazil.

*Toxoplasmose gestacional e congênita: Lacunas no conhecimento de profissionais de saúde em uma maternidade pública do centro-oeste do Brasil.*

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## ABSTRACT

**Introduction:** Congenital toxoplasmosis is transmitted from the mother to the fetus via the placenta, potentially leading to various adverse outcomes for the infant. **Objective:** To assess healthcare professionals' knowledge of gestational and congenital toxoplasmosis in the maternity ward of a public university hospital. **Methods:** This is a descriptive study, with a cross-sectional design and mixed approach, carried out between October 2023 and April 2024. A structured questionnaire was used to investigate aspects of gestational and congenital toxoplasmosis, covering topics such as diagnosis, transmission mechanisms, clinical manifestations, prophylaxis measures, and therapeutic options. Results: Fifty-one professionals between the ages of 36 and 50 responded to the questionnaire. All reported having heard of toxoplasmosis, and 43 (84.3%) correctly identified the etiologic agent. Regarding the frequency with which the health care team counsels patients; 37.2% (19/21) and 35.2% (15/51), respectively, stated that they rarely or never do so. The majority of respondents (82.3%) said that contact with cats was the mode of transmission, followed by eating raw meat (72.5%). Less than half of the respondents said that the disease could be transmitted by eating fresh vegetables, drinking unfiltered water and handling soil. In addition, less than half of the respondents correctly identified the possible manifestations of congenital toxoplasmosis. Regarding diagnosis; 94.1% identified serologic testing as the correct method. According to the treatment, the answers varied considerably. **Conclusion:** The results showed that health professionals who care for pregnant women lack accurate knowledge about the disease, reinforcing the need for this training.

**Keywords:** Maternal and child health; Parasitology; Health Education; Toxoplasma, Foodborne Diseases.

## RESUMO

**Introdução:** A toxoplasmose congênita é transmitida da mãe para o feto via transplacentária e resultando em diversas consequências para o bebê. **Objetivo:** Avaliar o conhecimento dos profissionais de saúde da maternidade de um hospital público universitário, acerca da toxoplasmose gestacional e congênita. **Métodos:** Trata-se de um estudo descritivo, com delineamento transversal e abordagem mista, realizado entre outubro de 2023 e abril de 2024. Foi utilizado um questionário estruturado para investigar aspectos relacionados à toxoplasmose gestacional e congênita, abrangendo temas como diagnóstico, mecanismos de transmissão, manifestações clínicas, medidas de profilaxia e opções terapêuticas. **Resultados:** Cinquenta e um profissionais, entre 36 e 50 anos, responderam ao questionário. Todos afirmaram já terem ouvido falar sobre a toxoplasmose, e 43 (84,3%) identificaram corretamente o agente etiológico. Sobre a frequência em que a equipe de saúde orienta os pacientes; 37,2% (19/21) e 35,2% (15/51) afirmaram fazê-lo raramente ou nunca, respectivamente. A maioria dos entrevistados (82,3%) indicou o contato com gatos como forma de transmissão da doença, seguida pelo consumo de carnes cruas (72,5%). Menos da metade afirmou que transmissão poderia ocorrer pela ingestão de vegetais frescos, água não filtrada e manuseio de solo. Ainda, menos da metade dos entrevistados indicou corretamente as possíveis manifestações da toxoplasmose congênita. Quanto ao diagnóstico; 94,1% identificaram o exame sorológico como o método correto. Em relação ao tratamento as respostas variaram significativamente. **Conclusão:** Os resultados demonstram que os profissionais de saúde que atuam no atendimento às gestantes possuem carência de conhecimentos precisos sobre a doença, reforçando a necessidade de ações para a sua capacitação.

**Palavras-chave:** Saúde materno infantil; Parasitologia; Educação em Saúde; Toxoplasma, Doenças Transmitidas por Alimentos.

## INTRODUCTION

Toxoplasmosis is a disease caused by the obligate intracellular protozoan *Toxoplasma gondii*, whose biological cycle has three evolutionary forms, all of which are infectious to humans<sup>1</sup>. Tachyzoites are the forms present during the acute phase of the disease. They multiply rapidly and, in the case of infection acquired during pregnancy, this evolutionary stage is capable of crossing the placenta, leading to congenital toxoplasmosis. Cysts with bradyzoites are present in the tissues of infected hosts (mammals or birds) and, finally, there is the form of sporozoites, which are found in oocysts that are eliminated in the feces of felidae that are definitive hosts of the protozoan<sup>1</sup>.

Human infection can occur in a variety of ways, including ingestion of oocysts in contaminated water, vegetables, or gardens; and raw or undercooked meat containing cysts with bradyzoites. Transmission can also occur through blood transfusions, organ transplants, and laboratory accidents<sup>2</sup>. Once infected, the parasite persists in tissue cysts throughout the life of the host, usually asymptotically<sup>2</sup>. The risk of vertical transmission increases as pregnancy progresses, while the severity of the infection is directly influenced by the parasite's virulence, the mother's immune response, and the gestational age at which the infection occurs, being most severe when acquired in the first trimester<sup>3</sup>.

The Brazilian Ministry of Health has developed materials, such as technical notes and high-risk pregnancy manuals, that provide guidelines based on scientific evidence. These resources include flow charts to guide the surveillance, diagnosis, and treatment of toxoplasmosis in pregnant women and their offspring<sup>2,4</sup>.

The reporting and investigation protocol: "Gestational and Congenital Toxoplasmosis" establishes uniform guidelines for the reporting and investigation of cases of gestational and congenital toxoplasmosis following international and national standards and current legislation<sup>5</sup>. At the same time, reporting of these cases has become mandatory, but underreporting continues, hampering the analysis and implementation of strategies to control the disease<sup>6-7</sup>.

Maternal toxoplasmosis infection is usually asymptomatic. However, when transplacental transmission occurs, several irreversible sequelae or even abortion and fetal death may occur<sup>3,8</sup>. Therefore, gestational and congenital toxoplasmosis must be widely understood by health professionals, especially those who work in maternity wards. These professionals must be properly trained to provide correct information to patients and to manage cases appropriately<sup>3</sup>.

Therefore, this study assessed the level of knowledge about gestational and congenital toxoplasmosis among health professionals working in a reference maternity hospital in the Midwest region of Brazil.

## METHODS

### Ethical aspects and characterization of the study

This research was approved by the Ethics Committee for Human Subjects of the Federal University of Grande Dourados (UFGD), opinion 6.388.555. All participants agreed to answer the questionnaire by signing the Free and Informed Consent Form (FICF).

### Research site and sampling

The study was conducted in the maternity ward of a public university hospital located in a mid-sized city in the state of Mato Grosso do Sul (MS), Brazil. This city, the second most populous in the state, has a Municipal Human Development Index (MHDI) of 0.7479<sup>9</sup>. The hospital serves as a reference in public health care for a population spanning

multiple municipalities in the region, including indigenous communities and border inhabitants.

This was a descriptive cross-sectional study with a mixed approach, with a sample population made up of health professionals working in the maternity ward of the selected hospital, regardless of gender and age, carried out from October 2023 to April 2024. It was carried out by sending a questionnaire with objective questions about the socio-demographic characterization of the participants and questions about the transmission, diagnosis, consequences, and prevention of gestational and congenital toxoplasmosis.

The present study included health professionals such as physicians, nurses, psychologists, speech therapists and physiotherapists, nursing technicians, and nursing assistants, excluding professionals who were on vacation or absent during the survey period.

## Statistical Analysis

The responses were organized into tables using Microsoft Excel for Windows 12. R software v. 4.3.3 for Windows was used to analyze the variables after data collection, with categorical variables expressed by their absolute and relative frequencies<sup>10</sup>. The Chi-squared test or Fisher's exact test was used to compare groups, with a p-value of <0.05 considered significant. The chi-squared test was used for multiple-choice responses and Fisher's exact test was used for single-choice responses.

## RESULTS

Fifty-one responses were collected, with the professionals divided into two groups: 28 professionals categorized as higher education (physicians, nurses, psychologists, speech therapists, and physiotherapists) and 23 categorized as technical/medium education (nursing technicians and assistants). Table 1 shows the socio-demographic profile of the professionals who responded to the questionnaire. A total of 45 (88.2%) female professionals and 6 (11.8%) male professionals participated in the survey. The predominant age group was between 36 and 50 years (50.9%). According to length of experience; 22 professionals (43.1%) who responded to the questionnaire had been working in the field for between one and 10 years. The level of knowledge about gestational and congenital toxoplasmosis did not differ statistically ( $p > 0.05$ ) between higher education and technical/medium-level professionals in any of the questions.

Of the responses received on gestational and congenital toxoplasmosis, all said they had heard about the disease; 43 (84.3%) correctly identified the etiologic agent as a protozoan, five (9.8%) thought it was a virus, 1 (1.9%) mentioned bacteria and two (3.9%) said they didn't know. Only 14 (50%) of the professionals at the university level, and seven (30.4%) of those at the technical/medium level said they knew about the treatment of congenital toxoplasmosis. Among the health professionals who answered the questionnaire; 45 (88.2%) said they did not know of any reference center for monitoring cases of gestational and congenital toxoplasmosis. In addition; 39 professionals (76.5%) knew that the disease is notifiable, while seven (13.7%) said that it is not notifiable and five (9.8%) were unable to answer this question. When asked how often the health care team advises patients about toxoplasmosis; 37.2% (19/51) and 35.2% (18/51) of the professionals said they rarely or never do so, respectively; 11.7% (6/51) said they give advice only when there are changes in the tests, and 15.9% (8/51) said they always or often do so. Of the participants, only one (1.9%) had ever received training on toxoplasmosis. "Supplementary table 1" shows the responses of professionals working in the HU-UFGD maternity ward to some aspects of toxoplasmosis in pregnancy.

**Table 1.** Sociodemographic profile of health professionals working in a maternity ward who answered the questionnaire on knowledge of gestational and congenital toxoplasmosis, central-western Brazil, 2023-2024.

	Higher education 28 n (%)	Middle education 23 n (%)	Total 51 n (%)
<b>Sex</b>			
Female	25 (89.3)	20 (86.9)	45 (88.2)
Male	3 (10.7)	3 (13.1)	6 (11.8)
<b>Age range</b>			
20-35 years	15 (53.6)	3 (13.1)	18 (35.3)
36-50 years	10 (35.7)	16 (69.6)	26 (50.9)
51-55 years	2 (7.1)	3 (13.1)	5 (9.8)
Not informed	1 (3.6)	1 (4.4)	2 (3.9)
<b>Time working in the area</b>			
<1 year	0 (0)	1 (4.4)	1 (1.9)
1 – 10 years	13 (46.4)	9 (39.1)	22 (43.1)
11 anos – 20 years	10 (35.7)	7 (30.4)	17 (33.3)
> 20 years	2 (7.1)	4 (17.4)	6 (11.8)
Not informed	3 (10.7)	2 (8.7)	5 (9.8)
<b>Profession</b>			
Physician	4 (14.3)	-	4 (7.8)
Physiotherapist	2 (7.1)	-	2 (3.9)
Psychologist	2 (7.1)	-	2 (3.9)
Nurse	18 (64.3)	-	18 (35.3)
Speech therapist	2 (7.1)	-	2 (3.9)
Nursing assistant	-	2 (8.7)	2 (3.9)
Nursing technician	-	21 (91.3)	21 (41.2)

## DISCUSSION

Our results reveal a concerning gap in knowledge about gestational and congenital toxoplasmosis among health professionals working in a maternity hospital in the Central-West region of Brazil, combined with a lack of adequate training, which may compromise the quality of prenatal care. Despite being a serious health problem capable of causing irreversible damage to the fetus; the lack of knowledge about the disease persists among these professionals, as observed in this study and other regions of the country<sup>11-16</sup>.

According to a regulation issued by the Brazilian Ministry of Health, since February 2016, it has been mandatory to report cases of gestational and congenital toxoplasmosis<sup>17</sup>. However, some of these professionals were unaware of this obligation, which contributes to the persistence of underreporting and hinders the analysis and implementation of strategies to fight the disease.

Some preventive measures, such as washing vegetables before consumption and washing hands after contact with soil, sand and animals, were emphasized by the majority of participants, but not eating raw meat or not feeding raw meat to cats was not frequently mentioned as a preventive measure. Consumption of contaminated meat without proper thermal preparation is an important route of infection for cats and is the main route of toxoplasmosis infection in humans<sup>13</sup>. However, when respondents were asked about sources of infection, more than half thought that vegetables (84.3%), unfiltered water (64.7%), and handling soil (82.3%) could transmit toxoplasmosis. These are the main sources of

*T. gondii* infection for humans<sup>18</sup>. This apparent inconsistency in responses indicates uncertainty and a lack of more precise knowledge about how the disease is acquired and what forms of prevention are available. Since there is no cure for toxoplasmosis and the available treatments are not fully effective in eliminating the protozoan and have significant side effects<sup>19</sup>; education and prevention are essential to reduce transmission, especially in pregnant women due to the risk of fetal infection<sup>3</sup>. It is also concerning that fecal parasitological examination was mentioned as a diagnostic method by higher and middle education professionals, despite not being recommended for diagnosing gestational or congenital toxoplasmosis<sup>3-4</sup>. This further highlights gaps in knowledge regarding the disease, emphasizing the need for targeted educational interventions.

Regarding the consequences of congenital toxoplasmosis, it is known that the infection can lead to serious damage to the fetus, such as chorioretinitis, microcephaly, hydrocephalus, holoprosencephaly, hepatic or cerebral calcifications and ventriculomegaly, as well as low birth weight, prematurity, strabismus, jaundice, among others<sup>3,10-21</sup>. When asked about the possible impairments the fetus could suffer as a result of the infection; the majority of professionals said that the main consequence was related to the visual system, followed by the risk of miscarriage. Only 29.4% mentioned learning disabilities; 33.3% hydrocephaly and microcephaly, and 21.5% intracranial calcifications.

One point that deserves attention is the fact that a minority (15.9%) of professionals at the HU-UFGD maternity ward reported that they frequently advised pregnant women about toxoplasmosis. This is different from what was observed in the states of Rio de Janeiro and Paraíba by Moura et al. (2017)<sup>12</sup> and Barbosa (2020)<sup>11</sup>, respectively. The lack of habit of advising pregnant women about toxoplasmosis may be related to the lack of training of health professionals on this subject, as observed in this study. Barbosa (2020)<sup>11</sup> reported that practically all the professionals interviewed had received some training on toxoplasmosis, which probably led to better counseling of pregnant women.

According to Schneider et al. (2017)<sup>20</sup>, direct instruction on toxoplasmosis by health professionals is more effective than the use of other educational media, such as brochures and audiovisual materials. In addition, health education is considered the most effective and accessible strategy to reduce risks and prevent toxoplasmosis<sup>3</sup>.

A limitation of this study was the lack of compliance of all professionals involved in the care of pregnant women. Many refused to participate in the study, even though we guaranteed the confidentiality of their responses.

## CONCLUSION

Our study found that while healthcare professionals are aware of toxoplasmosis, most have insufficient knowledge regarding its transmission, prevention, diagnosis, and treatment. Furthermore, the majority do not offer adequate guidance to pregnant women during consultations."

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