







## KNOWLEDGE OF TOXOPLASMOSIS AMONG DOCTORS AND NURSES WHO PROVIDE PRENATAL CARE

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### ABSTRACT

**Objectives:** To describe the knowledge of doctors and nurses who provide prenatal care about toxoplasmosis.

**Method:** Cross-sectional analytical study, conducted between October 2018 and February 2019, with 89 professionals from 43 Basic Health Units in Aracaju, State of Sergipe, in Brazil, through a self-administered questionnaire. Absolute and relative frequencies and odds ratios were calculated. Fischer Exact test and Chi-square test were used for data analysis.

**Results:** Doctors and nurses who provide prenatal care have shown little knowledge about toxoplasmosis related to infectious forms ( $p = 1,000$ ), transmission routes ( $p = 1,000$ ), vulnerable group ( $p = 0,290$ ), transmission period ( $p = 1,000$ ), greater risk for complications in newborns ( $p = 0.828$ ), when tests should be performed ( $p = 0.015$ ), indication for performing and interpretation of the avidity test ( $p = 0.355$ ).

**Conclusion:** The present study identified knowledge gaps and may contribute to planning continuing education for prenatal care professionals, in order to prevent congenital toxoplasmosis.

**DESCRIPTORS:** Congenital toxoplasmosis; Prenatal care; Family Health; Nursing care; Preventive medicine.

### CONOCIMIENTO DE MÉDICOS Y ENFERMEROS ACTUANTES EN PRENATAL SOBRE LA TOXOPLASMOSIS

#### RESUMEN:

**Objetivos:** Describir el conocimiento de médicos y enfermeros de prenatal sobre la toxoplasmosis. **Método:** Estudio transversal, analítico, realizado entre octubre de 2018 y febrero de 2019, con 89 profesionales de 43 Unidades Básicas de Salud de Aracaju, Sergipe, Brasil, mediante cuestionario autocompletado. Se calcularon las frecuencias absolutas, relativas, y los odds ratios. Fueron utilizados para análisis de los datos los tests Exacto de Fischer y Chi-cuadrado. **Resultados:** Los médicos y enfermeros actuantes en el prenatal demostraron poco conocimiento sobre toxoplasmosis respecto a sus vías de infección ( $p=1,000$ ), modos de transmisión ( $p=1,000$ ), grupo vulnerable ( $p=0,290$ ), período de contagiosidad ( $p=1,000$ ), riesgo mayor de secuelas en el recién nacido ( $p=0,828$ ), momento de realización de análisis ( $p=0,015$ ), indicación e interpretación del test de avididad ( $p=0,355$ ). **Conclusión:** El estudio identificó brechas de conocimiento, y contribuirá a planificar una educación continua para profesionales de prenatal, a efectos de prevenir la toxoplasmosis congénita.

**DESCRIPTORES:** Toxoplasmosis Congénita; Atención Prenatal; Salud de la Familia; Atención de Enfermería; Medicina Preventiva.

## INTRODUCTION

Toxoplasmosis is a zoonosis with worldwide distribution and high prevalence caused by the *Toxoplasma gondii* parasite and can cause serious complications to the fetus<sup>(1)</sup>. Vertical transmission occurs when women are infected with *T. gondii* during pregnancy through the ingestion of food containing oocysts or bradyzoites<sup>(2)</sup>.

Given the high prevalence of toxoplasmosis<sup>(3)</sup>, health professionals must have appropriate knowledge about this infection, aiming at early prevention, diagnosis and treatment. When toxoplasmosis occurs in pregnant women, there is a high risk of fetal complications<sup>(3)</sup>. Early diagnosis reduces the chances of vertical transmission and the occurrence of serious complications. Thus, Brazil's Ministry of Health (MS) recommends that serological screening be performed at the first prenatal consultation and repeated for susceptible pregnant women<sup>(4)</sup>.

In Brazil, toxoplasmosis is endemic, with prevalence rates ranging from 31%<sup>(5)</sup> to 91.6%<sup>(6)</sup>. In Sergipe, the prevalence is 68.5%<sup>(7)</sup>, leading to a high risk of fetal complications with the occurrence of prime infection during pregnancy<sup>(8)</sup>. Populations with a prevalence of IgG for toxoplasmosis between 25% and 80% have a higher risk of congenital infection due to the high circulation of the parasite and a high percentage of susceptible pregnant women<sup>(9)</sup>.

All susceptible pregnant women should be advised about primary prevention, since this is the best way to avoid infection<sup>(10)</sup>, with health education being crucial for the prophylaxis of toxoplasmosis<sup>(4,11)</sup>. Moreover, serological screening is necessary for detection of seroconversion and initiation of treatment<sup>(4)</sup>.

In 2018, the Ministry of Health determined the notification and investigation of gestational and congenital toxoplasmosis to identify outbreaks, block the source of transmission and take preventive, control and treatment measures in a timely manner<sup>(12)</sup>.

Adequate prenatal care presupposes knowledge about congenital infections and their forms of prevention, in order to reduce perinatal morbidity and mortality. This study is relevant, as research on the subject has shown ignorance about toxoplasmosis among professionals who provide prenatal care<sup>(13-15)</sup>. Furthermore, in the state of Sergipe, no studies have been conducted to measure such knowledge among doctors and nurses who provide prenatal care.

Thus, the present study aimed to describe the knowledge of doctors and nurses who provide prenatal care about toxoplasmosis.

## METHOD

Cross-sectional analytical study conducted between October 2018 and February 2019. The setting of the study were 44 Basic Health Units (UBS) of Aracaju, in the State of Sergipe, with a population of 137 family health teams. In one of the units, overcrowding made it impossible to carry out the research. Therefore, the final number was 43 UBS. Convenience non-probabilistic sample was used, and the inclusion criteria were: doctors or nurses who provided prenatal care present at the UBS at the time of data collection and who accepted to participate in the study.

The data collection instrument was a self-administered questionnaire, elaborated by the authors and validated through a pilot study, based on previous studies<sup>(16-18)</sup>. The

instrument was divided into two sections: the first concerned sociodemographic data and the second, knowledge about toxoplasmosis.

The data were stored and analyzed using Excel 2010 and Epi Info™ 7.0 software. Descriptive statistics was used and absolute and relative frequencies, odds ratios (ORs) and their respective 95% confidence intervals (95% CI) were calculated. Association between categorical variables was examined using Fisher's Exact and Chi-Square tests, with a 5% statistical significance ( $p < 0.05$ ).

The study was approved by the Committee for Ethics in Research on Human Beings of Universidade Federal de Sergipe (UFS), under Protocol no 2,771,825.

## RESULTS

The final sample consisted of 63 nurses and 26 doctors. Age ranged from 27 to 65 years, with mean, mode and median of 42, 40 and 41 years, respectively. Time elapsed since graduation ranged from two to 39 years, with mean and median of 18.5 and 17 years, respectively. Mode was 16 and 17 years, seven participants for each one. The length of time working in basic health care ranged from one to 432 months (36 years), with a mean of 160 months (13 years), median of 168 months (14 years) and mode of 192 months (16 years). Most professionals obtained their graduate degrees from Universidade Federal de Sergipe (UFS), were female, had specialized in prenatal care, and had employment contracts of up to 40 hours a week. Table 1 shows the distribution of the participants according to the characterization of the sample.

Table 1 - Professional and sociodemographic characterization of nurses and doctors. Aracaju, SE, Brazil, 2019 (continues)

Variable	Doctor (n=26)		Nurse (n=63)		Total (n=89)	
	n	%	n	%	n	%
University attended						
UFS	20	76.9	36	57.1	56	62.9
Others	6	23.1	27	42.9	33	37.1
Gender						
Female	17	65.4	52	82.5	69	77.5
Male	9	34.6	11	17.5	20	22.5
Specialization						
Yes	14	53.9	60	95.2	74	83.2
No	12	46.1	2	3.2	14	15.7
Did not answer	-	-	1	1.6	1	1.1
Master's degree						
Yes	-	-	4	6.3	4	4.5
No	22	84.6	53	84.2	75	84.3

Did not answer	4	15.4	6	9.5	10	11.2
Employment contracts						
1 employment	9	34.6	38	60.3	47	52.8
2 employments	12	46.2	25	39.7	37	41.6
3 or more employments	5	19.2	-	-	5	5.2
Weekly workload						
Up to 40 h	13	50	41	65.1	54	60.7
41-60	7	26.9	8	12.7	15	16.8
>60	6	23.1	14	22.2	20	22.5

Source: The authors (2019)

Regarding the professionals' knowledge, Table 2 shows the distribution of the participants according to their knowledge about the parasite's life cycle and its transmissibility. As for the etiologic agent and vulnerable groups for the acquisition of toxoplasmosis, there was greater knowledge among physicians ( $p < 0.05$ ); The lack of knowledge about the other categories, related to the parasite's life cycle, risk of vertical transmission and fetal impairment, did not differ between doctors and nurses.

Table 2 - Distribution of the proportion of correct answers ( $n=89$ ) according to knowledge about the parasite's life cycle and transmissibility. Aracaju, SE, Brazil, 2019

Variable	Doctor ( $n=26$ ) n (%)	Nurse ( $n=63$ ) n (%)	OR (CI 95%)	p-value
Biological cycle				
Etiologic agent	24 (92.4)	45 (71.4)	4.8 (1.03-22.44)	0.048*
Definitive host	12 (46.2)	44 (69.8)	0.37 (0.14-0.95)	0.063
Infectious forms	1 (3.8)	4 (6.2)	0.59 (0.06-5.55)	1.000*
Mode of transmission	20 (76.9)	51 (80.9)	0.78 (0.26-2.37)	0.888
Routes of transmission and contamination	-	1 (1.6%)	-	1.000*
Transmission				
Vulnerable group	12 (46.1)	20 (31.7)	1.84 (0.72-4.70)	0.296
Period of highest vertical transmission	7 (26.9)	18 (28.6)	0.92 (0.33-2.57)	1.000
Period of highest risk of serious complications	16 (61.5)	42 (66.7)	0.80 (0.31-2.06)	0.828

\*Fisher's exact test

Source: The authors (2019)

The health professionals were asked about the guidelines for the prevention of toxoplasmosis in susceptible pregnant women. Many of them still have doubts about the

forms of transmission and contamination of toxoplasmosis, since most wrong alternatives were related to contact with the definitive host. Table 3 shows these guidelines.

Table 3 - Distribution of the percentage of responses (n=89) according to knowledge about correct and incorrect guidelines given to pregnant women to prevent toxoplasmosis during pregnancy. Aracaju, SE, Brazil, 2019

Variables	Doctor (n=26) n (%)	Nurse (n=63) n (%)	Total (n=89) n (%)
Correct guidelines for toxoplasmosis prevention			
Avoid contact with cat feces	23 (84.5)	61 (88.4)	84 (94.4)
Wash hands before meals and when handling food	22 (84.6)	27 (39.1)	49 (55.1)
Do not eat raw and undercooked meat	21 (80.8)	28 (40.6)	49 (55.1)
Avoid direct contact with the earth	19 (73.1)	30 (43.5)	49 (55.1)
Properly wash the fruits and vegetables you are going to eat raw	20 (76.9)	28 (40.6)	48 (53.9)
Avoid consumption of untreated water	16 (61.5)	21 (30.4)	37 (41.6)
Wash kitchen utensils	10 (38.4)	18 (26.1)	28 (31.5)
Avoid consumption of unpasteurized raw milk	12 (46.1)	9 (13.0)	21 (23.6)
Avoid consumption of sausages (sausages, salami))	3 (11.5)	5 (7.2)	8 (9.00)
Incorrect guidelines for toxoplasmosis prevention			
Do not walk barefoot	13 (50.0)	33 (47.8)	46 (51.7)
Avoid contact with cat urine	5 (19.2)	19 (27.5)	24 (26.9)
Avoid contact with cat saliva	4 (15.4)	17 (24.6)	21 (23.6)
Avoid contact with dog feces	8 (30.8)	13 (18.8)	21 (23.6)
Avoid contact with cat blood	3 (11.5)	13 (18.8)	16 (18.0)
Avoid the consumption of fish and seafood in general	4 (15.4)	10 (14.5)	14 (15.7)
Avoid contact with dog saliva, urine or blood	3 (11.4)	13 (18.7)	16 (17.2)
Do not bathe in the river	1 (3.8)	3 (4.3)	4 (4.5)
Avoid crowding	1 (3.8)	-	1 (1.1)
Avoid closed environments	1 (3.8)	-	1 (1.1)

Source: The authors (2019)

Table 4 shows the distribution of the study participants according to the clinical management of toxoplasmosis and knowledge about neonatal complications. The items about which the participants demonstrated less knowledge were as follows: time recommended for performing serology, indication and interpretation of the avidity test and treatment. Nurses showed less knowledge than doctors about the time to perform serology and the interpretation of the results ( $p < 0.05$ ).

Table 4 - Distribution of the percentage of correct answers (n=89) according to the knowledge of the clinical management of toxoplasmosis. Aracaju, SE, Brazil, 2019

Knowledge	Doctor (n=26) n (%)	Nurse (n=63) n (%)	OR (CI 95%)	p-value
Diagnostic examination				
Type of exam requested	26 (100)	58 (92.1)	-	0.316*
About the moment to perform the test	8 (30.8)	5 (7.9)	5.15 (1.50-17.75)	0.015
Interpretation of the result				
IgG+ IgM+	22 (84.6)	42 (66.7)	2.75 (0.84-9.01)	0.120*
IgG- IgM-	22 (84.6)	43 (68.5)	2.56 (0.78-8.41)	0.188*
IgG+ IgM-	25 (96.1)	44 (69.8)	10.79 (1.36-85.55)	0.005*
IgG- IgM+	24 (92.3)	42 (66.7)	6.00 (1.29- 27.84)	0.015*
Indication for performing the avidity test	8 (30.8)	12 (19.1)	1.89 (0.67-5.36)	0.355
Interpretation of the avidity test	3 (11.5)	5 (7.9)	1.51 (0.33-6.85)	0.687*
Need to repeat serology	22 (84.6)	46 (73.0)	2.03 (0.61-6.76)	0.285*
Reason to repeat serology	11 (42.3)	23 (36.5)	1.27 (0.50-3.24)	0.785
Recommended treatment	3 (11.5)	7 (11.1)	1.04 (0.25-4.39)	1.000*
Fetal impairment				
Cited all the results correctly	6 (23.1)	13 (20.6)	1.15 (0.39-3.46)	1.000

\* Fisher's exact test

Source: The authors (2019)

## DISCUSSION

Although toxoplasmosis is a serious health problem, which can cause irreversible damage to the fetus, until recently this zoonosis was not the target of intensive surveillance policies. Because of the risks it may pose to the fetus, prenatal care professionals must be able to carry out prevention and treatment to avoid congenital infection. The results obtained reveal worrying data regarding the lack of knowledge of these professionals, which can impact the quality of prenatal care.

In addition to other professionals, family health teams must also be composed of at least one doctor and one nurse<sup>(19)</sup>. However, 63 (70.8%) participants in this study were nurses, indicating the low adherence of doctors to the research, since the teams must have the same number of doctors and nurses.

Historically, the nursing profession was considered as a female work, corroborating the findings of another study carried out in Goiás<sup>(20)</sup>. In contrast with the referred study (20) where the participants graduated from private institutions, the professionals that participated in the present study graduated from Universidade Federal de Sergipe (UFS), a public university. This finding can be justified by the time elapsed since graduation, on average 18 years, given that the first private courses of nursing and medicine in Sergipe started in 2006 and 2010, respectively.



Of the total participants, 74 (83.2%) were trained to provide prenatal care, in accordance with Ordinance 2,4362/2017 of the Ministry of Health, which recommends that doctors and nurses of the family health teams are specialized in family medicine and/or family health<sup>(19)</sup>.

Nearly two-thirds of the doctors had more than one job and half of them had a workload of more than 40 hours per week. As for nurses, 38 (60.3%) had only one employment contract. The proportion of doctors and nurses who worked more than 60 hours per week was similar. Therefore, these professionals would not have time for more training and specialization.

The nurses had less knowledge about toxoplasmosis than the doctors. There is no justification for this difference, as most participants graduated from the same institution, and the subjects of the basic cycle of both courses are similar, especially the discipline of parasitology, with the same workload and teaching plan for the two courses.

Health professionals must know the biological cycle of the parasite in order to be capable of providing guidance on prevention strategies. Thus, their lack of knowledge about infectious forms deserves attention. Poor knowledge about this infection has been frequently observed in university students, as it was the case in a study with 107 students from the UFS<sup>(18)</sup>.

Regarding the forms of contamination and infection, only one nurse answered the question completely and correctly. This finding is alarming, since lack of knowledge of the ways in which susceptible pregnant women can acquire toxoplasmosis implies inadequate health education. In a study with pregnant women and nurses conducted in São Luís, Maranhão, pregnant women said they received information on the topic, but only superficially<sup>(14)</sup>.

Pregnant women and immunosuppressed patients are risk groups for the acquisition of toxoplasmosis, since, in the case of the former, infection can lead to congenital toxoplasmosis and, in the case of immunosuppressed patients, to neurotoxoplasmosis<sup>(3,21)</sup>. Asked about the risk groups for toxoplasmosis, the participants demonstrated ignorance.

Regarding the trimesters of pregnancy in which there is a greater risk of vertical transmission of toxoplasmosis and a greater risk to the fetus, again the participants revealed ignorance. The highest risk of transmission of toxoplasmosis occurs in the third trimester of pregnancy, and the highest risk of severe neonatal complications occurs in the first trimester<sup>(22)</sup>. A study found a vertical transmission rate of 23%, 24% and 28% in the first, second and third quarters, respectively, with a higher frequency of abnormalities detected in transfontanelar ultrasound in cases where maternal infection occurred in the first and second trimesters, compared to the third trimester<sup>(23)</sup>. More data that are significant were found in a study whose risk of vertical transmission was 3-9%, 33-47% and 60-81%, up to the thirteenth, twentieth and thirty-sixth weeks, respectively<sup>(24)</sup>.

Regarding the repetition of serologic tests during pregnancy, most professionals reported that it is important and necessary. However, they were unable to inform why, demonstrating lack of knowledge. A study with primary care professionals in Paraná<sup>(25)</sup> found that 94.8% of the respondents recognized that susceptible pregnant women (non-reactive IgM and IgG) should receive guidance on prevention and repeat serology quarterly. A study with primary care professionals in Paraná<sup>(25)</sup> found that 94.8% of the respondents recognized that susceptible pregnant women (non-reactive IgM and IgG) should receive guidance on prevention and repeat serology quarterly.

Many prophylactic guidelines were expressed in an assertive manner by the participants. However, there was a great variation in the frequency of certain recommendations (9.0% to 94.4%). Also, inadequate recommendations were made, particularly regarding contact with the definitive host. This can be explained by the participants' scarce knowledge about the etiological agent, infectious forms and mode of transmission. A study carried out in

Maringá, Paraná, showed that most professionals had little knowledge about evolutionary forms and behavior<sup>(13)</sup>.

The health professionals did not consider the fact that toxoplasmosis can occur during the entire pregnancy, and that serology is important for early diagnosis and prevention of vertical transmission. There is evidence that, in cases of pregnant women treated before the third week after seroconversion, the chances of vertical transmission are reduced<sup>(26)</sup>. In addition, when asked about the interpretation of serological testing, part of the professionals still showed difficulty in interpretation, which can lead to inappropriate actions, absence of treatment and birth of congenitally infected children.

The participants did not answer the items related to the definition, interpretation and situation in which the avidity test should be requested. In Sergipe, the avidity test is not provided under the Unified Health System, which may explain this lack of knowledge. A study conducted in Mexico found that 90.1% of participants were unaware of the avidity test<sup>(15)</sup>.

Most of the professionals who participated in the present study provided wrong answers to the question about the action to be taken in the case of pregnant women with toxoplasmosis. The correct answer is to immediately start the treatment prescribed by the unit's doctor and then refer the patient to the specialized service, according to the protocol of the Ministry of Health<sup>(27)</sup>.

Regarding the drug treatment, few professionals mentioned all the drugs most used for the treatment of toxoplasmosis, providing incomplete or wrong answers. However, it should be mentioned that nurses do not prescribe drug treatment, which may be a factor that contributed to their lack of knowledge. According to the literature, treatment with spiramycin should be implemented before the thirtieth week of pregnancy and, after that period, the triple treatment with pyrimethamine, sulfadiazine and folinic acid should be adopted. Folinic acid is essential for the prevention of spinal aplasia caused by pyrimethamine, a teratogenic agent that should not be used before the twenty-eighth week of pregnancy<sup>(28)</sup>.

It is known that toxoplasmosis infection can lead to complications such as chorioretinitis, microcephaly, hydrocephalus, holoprosencephaly, brain calcifications, cardiomegaly, pulmonary infarction, placentomegaly, ventriculomegaly and lower limb malformation, in addition to underweight, prematurity, strabismus, jaundice, among others<sup>(24)</sup>. Asked about the possible neonatal complications related to the infection, most professionals gave incomplete answers or did not answer the question.

The lack of knowledge of doctors and nurses found in the present study can be justified by the fact that toxoplasmosis had deserved little attention and only in 2016 its notification became mandatory<sup>(29)</sup>. In 2018, the Protocol for notification and investigation of gestational and congenital toxoplasmosis was launched<sup>(12)</sup>.

The small sample size, which can be explained by the fact that many professionals refused to participate in the research, was one of the limitations of this study. Another limitation was the fact that the questionnaire administered did not include questions related to compulsory notification of suspected or confirmed cases of congenital and/or gestational toxoplasmosis. The construction and submission of the research project was carried out before the launch of the Protocol for notification and investigation of gestational and congenital toxoplasmosis<sup>(12)</sup>. Although Ordinance No. 204, of February 17, 2016, included toxoplasmosis in the list of compulsory notification diseases<sup>(28)</sup>, it was not widely disseminated.

## CONCLUSION



It is concluded that prenatal doctors and nurses had little knowledge about the parasite's life cycle, prevention, diagnosis and treatment of toxoplasmosis. Comparison of the two groups revealed that the nurses had less knowledge about toxoplasmosis than the doctors.

This study contributed to the identification of knowledge gaps in the training of prenatal care professionals regarding toxoplasmosis. The findings presented here can support the planning of continuing education actions for primary care professionals responsible for prenatal care, in order to prevent congenital toxoplasmosis.

## REFERENCES

1. Capobianco JD, Breganó RM, Mori FMRL, Navarro IT, Campos JS de A, Tatakihara LT, et al. Toxoplasmose adquirida na gestação e toxoplasmose congênita: uma abordagem prática na notificação da doença. *Epidemiol. Serv. Saúde*. [Internet]. 2016 [accessed 10 out 2019]; 25(1). Available from: <http://www.scielo.br/pdf/ress/v25n1/2237-9622-ress-25-01-00187.pdf>.
2. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Doenças infecciosas e parasitárias: guia de bolso. 8. ed. Brasília: Ministério da Saúde; 2010.
3. Djurkovic-Djakovic O, Dupouy-Camet J, Giessen JV der, Dubey JP. Toxoplasmosis: overview from a one health perspective. *Food and Waterborne Parasitol.* [Internet]. 2019 [accessed 05 jun 2019]; 15(e00054). Available from: <https://doi.org/10.1016/j.fawpar.2019.e00054>.
4. Ministério da Saúde (BR). Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Gestação de alto risco: manual técnico. [Internet] Brasília: Ministério da Saúde; 2010 [accessed 21 jan 2019]. Available from: [http://bvsm.sau.gov.br/bvs/publicacoes/manual\\_tecnico\\_gestacao\\_alto\\_risco.pdf](http://bvsm.sau.gov.br/bvs/publicacoes/manual_tecnico_gestacao_alto_risco.pdf).
5. Detanico L, Basso RMC. Toxoplasmose: perfil sorológico de mulheres em idade fértil e gestantes. *RBAC*. [Internet]. 2006 [accessed 22 maio 2019]; 38(1). Available from: [https://www.researchgate.net/publication/237490086\\_Toxoplasmose\\_perfil\\_sorologico\\_de\\_mulheres\\_em\\_idade\\_fertil\\_e\\_gestantes\\_Toxoplasmosis\\_serological\\_profile\\_of\\_childbearing\\_age\\_and\\_pregnant\\_women](https://www.researchgate.net/publication/237490086_Toxoplasmose_perfil_sorologico_de_mulheres_em_idade_fertil_e_gestantes_Toxoplasmosis_serological_profile_of_childbearing_age_and_pregnant_women).
6. Figueiró-Filho EA, Lopes AHA, Senefonte FR de A, Souza Júnior VG de, Botelho CA, Figueiredo MS, et al. Toxoplasmose aguda: estudo da frequência, taxa de transmissão vertical e relação entre os testes diagnósticos materno-fetais em gestantes em estado da Região Centro-Oeste do Brasil. *Rev. Bras. Ginecol. Obstet.* [Internet]. 2005 [accessed 22 maio 2019]; 27(8). Available from: <http://dx.doi.org/10.1590/S0100-72032005000800002>.
7. Inagaki AD de M, Cardoso NP, Lopes RJPL, Alves JAB, Mesquita JRF, Araújo KCGM de et al. Análise espacial da prevalência de toxoplasmose em gestantes de Aracaju, Sergipe, Brasil. *Rev. Bras. Ginecol. Obstet.* [Internet]. 2014 [accessed 22 maio 2019]; 36(12). Available from: <http://dx.doi.org/10.1590/S0100-720320140005086>.
8. Romanelli RM de C, Carellos EVM, Campos FA, Pinto AS de P, Marques BA, Anchieta LM, et al. The approach to neonatal congenital infections – toxoplasmosis and syphilis. *Rev. Med. Minas Gerais*. [Internet]. 2014 [accessed 22 maio 2019]; 24(2). Available from: <http://rmmg.org/artigo/detalhes/1601>.
9. Naoi K, Yano A. A theoretical analysis of the relations between the risk of congenital toxoplasmosis and the annual infection rates with a convincing argument for better public intervention. *Parasitol. Int.* [Internet]. 2002 [accessed 09 maio 2019]; 51(2). Available from: [https://doi.org/10.1016/S1383-5769\(02\)00009-0](https://doi.org/10.1016/S1383-5769(02)00009-0).
10. Di Mario S, Basevi V, Gagliotti C, Spettoli D, Gori G, D'Amico R, et al. Prenatal education for

- congenital toxoplasmosis. *Cochrane Database of Syst. Rev.* [Internet]. 2013 [accessed 08 maio 2019]; Available from: <https://doi.org/10.1002/14651858.CD006171.pub3>.
11. Rajapakse S, Weeratunga P, Rodrigo C, Silva NL de, Fernando SD. Profilaxia da toxoplasmose humana: uma revisão sistemática. *Pathog. Glob. Health.* [Internet]. 2017 [accessed 25 jan 2019]; 111(7). Available from: <https://doi.org/10.1080/20477724.2017.1370528>.
  12. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Protocolo de Notificação e Investigação: Toxoplasmose gestacional e congênita. [Internet]. Brasília: Ministério da Saúde; 2018 [accessed 07 maio 2019] Available from: [http://bvsmms.saude.gov.br/bvs/publicacoes/protocolo\\_notificacao\\_investigacao\\_toxoplasmose\\_gestacional\\_congenita.pdf](http://bvsmms.saude.gov.br/bvs/publicacoes/protocolo_notificacao_investigacao_toxoplasmose_gestacional_congenita.pdf).
  13. Branco BHM, Araújo SM de, Falavigna-Guilherme AL. Prevenção primária da toxoplasmose: conhecimento e atitude de profissionais de saúde e gestantes do serviço público de Maringá, estado do Paraná. *Sci. Med.* [Internet]. 2012 [accessed 09 maio 2019]; 22(4). Available from: <http://revistaseletronicas.pucrs.br/ojs/index.php/scientiamedica/article/viewFile/11718/8616>.
  14. Sousa JA da S, Corrêa R da GCF, Aquino DMC de, Coutinho NPS, Silva MACN da, Nascimento M do DSB. Knowledge and perceptions on toxoplasmosis among pregnant women and nurses who provide prenatal in primary care. *Rev. Inst. Med. Trop. São Paulo.* [Internet]. 2017 [accessed 24 abr 2019]; 59. Available from: <http://dx.doi.org/10.1590/s1678-9946201759031>.
  15. Alvarado-Esquivel C, Sánchez-Anguiano LF, Berumen-Segovia LO, Hernández-Tinoco J, Rico-Almochantaf YDR, Cisneros-Camacho A, et al. Knowledge and Practices of Toxoplasmosis among Clinical Laboratory Professionals: A Cross-Sectional Study in Durango, Mexico. *Int. J. Environ. Res. Public Health.* [Internet]. 2017 [accessed 25 jun 2019]; 14(11). Available from: <https://doi.org/10.3390/ijerph14111413>.
  16. Silva LB da, Oliveira R de VC de, Silva MP da, Bueno WF, Amendoeira MRR, Neves E de S. Knowledge of Toxoplasmosis among Doctors and Nurses Who Provide Prenatal Care in an Endemic Region. *Infect Dis Obstet Gynecol.* [Internet]. 2011 [accessed 05 jul 2019]. Available from: <http://dx.doi.org/10.1155/2011/750484>.
  17. Silva JAO, Galeão PAB de A, Vasconcelos EMR de, Alencar EM de. Nursing and medical students' knowledge about toxoplasmosis. *Rev enferm UFPE* [Internet]. 2011 [accessed 05 jul 2019]; 5(3). Available from: <https://doi.org/10.5205/reuol.1262-12560-1-LE.0503201130>.
  18. Inagaki AD de M, Ribeiro CJN, Silva AKA da, Abud ACF, Santos AO dos, Cruz VC. Conhecimento dos acadêmicos de enfermagem e medicina sobre toxoplasmose. *Rev enferm UFPE* [Internet]. 2015 [accessed 05 jul 2019]; 9(10). Available from: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/10889/12143>.
  19. Ministério da Saúde (BR). Portaria n. 2.436, de 21 de setembro de 2017. Aprova a Política Nacional de Atenção Básica, estabelecendo a revisão de diretrizes para a organização da Atenção Básica, no âmbito do Sistema Único de Saúde (SUS). *Diário Oficial da União* [Internet]. 21 set. 2017 [accessed 23 abr 2019]. Available from: [http://bvsmms.saude.gov.br/bvs/saudelegis/gm/2017/prt2436\\_22\\_09\\_2017.html](http://bvsmms.saude.gov.br/bvs/saudelegis/gm/2017/prt2436_22_09_2017.html).
  20. Oliveira MPR de, Menezes IHCF, Sousa LM de, Peixoto M do RG. Formação e qualificação de profissionais de saúde: Fatores associados à qualidade da atenção primária, *Rev. Bras. Educ. Med.* [Internet]. 2016 [accessed 09 maio 2019]; 40(4). Available from: <http://dx.doi.org/10.1590/1981-52712015v40n4e02492014>.
  21. Domingos A, Ito LS, Coelho E, Lúcio JM, Matida LH, Ramos Júnior AN. Seroprevalence of *Toxoplasma gondii* IgG antibody in HIV/AIDS-infected individuals in Maputo, Mozambique. *Rev. Saúde Pública.* [Internet]. 2013 [accessed 24 abr 2019]; 47(5). Available from: <http://dx.doi.org/10.1590/S0034-8910.2013047004661>.
  22. Amendoeira MRR, Camillo-Coura LF. Uma breve revisão sobre toxoplasmose na gestação. *Sci. Med.* [Internet]. 2010 [accessed 24 abr 2019]; 20(1). Available from: <https://www.arca.fiocruz.br/handle/icict/40114#:~:text=A%20triagem%20sorol%C3%B3gica%20para%20toxoplasmose,a%20gesta%C3%A7%C3%A3o%20e%20instru%C3%ADdas%20sobre>.

23. Andrade JV, Resende CT do A, Correia JCFNSC, Martins CMBSC, Faria CCF de, Figueiredo MCM, et al. Recém-nascidos com risco de toxoplasmose congênita, revisão 16 anos. *Sci. Med.* [Internet]. 2018 [accessed 24 abr 2019]; 28(4). Available from: <http://revistaseletronicas.pucrs.br/ojs/index.php/scientiamedica/article/view/32169/17562>.
24. Goldstein EJC, Montoya JG, Remington JS. Management of *Toxoplasma gondii* Infection during Pregnancy. *Clin. Infect. Dis.* [Internet]. 2008 [accessed 09 maio 2019]. 47(4). Available from: <https://doi.org/10.1086/590149>.
25. Cotiero-Toninato AP, Cavalli HO, Marchioro AA, Ferreira EC, Caniatti MC da CL, Breganó RM, et al. Toxoplasmosis: an examination of knowledge among health professionals and pregnant women in a municipality of the State of Paraná. *Rev. Soc. Bras. Med. Trop.* [Internet]. 2014 [accessed 13 nov 2019]; 47(2). Available from: <http://dx.doi.org/10.1590/0037-8682-0016-2014>.
26. Thiebaut R, Leproust S, Chêne G, Gilbert R. Effectiveness of prenatal treatment for congenital toxoplasmosis: a meta-analysis of individual patients' data. *Lancet.* [Internet]. 2007 [acesso 10 jul 2019]; 369(9556). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK73941/>.
27. Ministério da Saúde (BR). Instituto Sírio-Libanês de Ensino e Pesquisa. Protocolos da Atenção Básica: saúde das mulheres. [Internet]. Brasília: Ministério da Saúde; 2016. [accessed 24 abr 2019]. Available from: [http://189.28.128.100/dab/docs/portaldab/publicacoes/protocolo\\_saude\\_mulher.pdf](http://189.28.128.100/dab/docs/portaldab/publicacoes/protocolo_saude_mulher.pdf).
28. Lima RCM, Amaral WN do, Costa Júnior AO da, Gonçalves FT, Tocchio ML, Cândido RL, et al. Relação entre más-formações e óbitos fetais em decorrência de toxoplasmose congênitas tratadas em uma clínica particular de Goiânia-GO. *Ensaio e Ciência: C. Biológicas, Agraria e da Saúde.* [Internet]. 2011 [accessed 26 jun 2019]; 15(4). Available from: <https://revista.pgskroton.com/index.php/ensaioeciencia/article/viewFile/2861/2715>.
29. Ministério da Saúde (BR). Portaria n. 204. de 17 de fevereiro de 2016. Define a Lista Nacional de Notificação Compulsória de doenças, agravos e eventos de saúde pública nos serviços de saúde públicos e privados em todo o território nacional, nos termos do anexo, e dá outras providências. *Diário Oficial da União*, [Internet]. 2016 [accessed 09 maio 2019]. Available from: [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2016/prt0204\\_17\\_02\\_2016.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2016/prt0204_17_02_2016.html).

**HOW TO REFERENCE THIS ARTICLE:**

Inagaki AD de M, Souza IES, Araujo ACL, Abud ACF, Cardoso NP, Ribeiro CJN. Knowledge of toxoplasmosis among doctors and nurses who provide prenatal care. *Cogitare enferm.* [Internet]. 2021 [accessed "insert day, month and year"]; 26. Available from: <http://dx.doi.org/10.5380/ce.v26i0.70416>.

Received: 28/11/2019

Approved: 09/09/2020

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Final approval of the version to be published - ADMI, IESS, ACLA, ACFA, NPC, CJNR

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - ADMI, IESS, ACLA, ACFA, NPC, CJNR



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