

Factors associated to toxoplasmosis-related knowledge among pregnant women attending public health services in the municipality of Niterói, Rio de Janeiro, Brazil, 2013-2015

doi: 10.5123/S1679-49742016000300022

Fernanda Loureiro de Moura¹
Patrícia Riddell Millar Goulart²
Ana Paula Pereira de Moura¹
Thais Silva de Souza¹
Ana Beatriz Monteiro Fonseca³
Maria Regina Reis Amendoeira¹

¹Fundação Instituto Oswaldo Cruz, Laboratório de Toxoplasmose e outras Protozooses, Rio de Janeiro-RJ, Brasil

²Universidade Federal Fluminense, Departamento de Microbiologia e Parasitologia, Niterói-RJ, Brasil

³Universidade Federal Fluminense, Departamento de Estatística, Niterói-RJ, Brasil

Abstract

Objective: to analyze the factors associated to toxoplasmosis-related knowledge among pregnant women attending public health services in the municipality of Niterói, Rio de Janeiro, Brazil. **Methods:** this is a cross-sectional study conducted with pregnant women assisted in eight health care units; data was collected using a standardized questionnaire, from April 2013 to February 2015. **Results:** among the 405 pregnant women interviewed, 173 (42.7%) knew about toxoplasmosis and, of those, 24.3% knew about it through friends; the proportion of pregnant women with toxoplasmosis-related knowledge increased with age ($p<0.001$), education level ($p<0.001$) and the number of pregnancies ($p=0.031$); the history of abortion was also associated with toxoplasmosis-related knowledge ($p=0.019$). **Conclusion:** the variables 'age', 'education level', 'number of pregnancies' and 'abortion history' were important factors for toxoplasmosis-related knowledge among pregnant women assisted in the public health care sector of Niterói.

Key words: Toxoplasmosis, Congenital; Pregnant Women; Primary Prevention; Cross-Sectional Studies.

*Article based on the PhD thesis by Fernanda Loureiro de Moura, entitled 'Occurrence of congenital toxoplasmosis, toxoplasmosis-related knowledge and serological monitoring of pregnant women and implementation of prevention measures in the prenatal care of the public health services in the municipality of Niterói-RJ', presented to the Post-graduation Program in Tropical Medicine of Oswaldo Cruz Foundation (Fiocruz), in a partnership between Fiocruz and the Coordination for the Improvement of Higher Education Personnel (Capes)/Ministry of Education (ME): Brazil no Misery Plan. The thesis was developed under guidance of Dr. Maria Regina Reis Amendoeira and supervision of Dr. Patrícia Riddell Millar Goulart. It was defended in 2016. Grant by: Capes/ME. Scholarship by the Brazil without Misery Plan: Fernanda Loureiro de Moura

Correspondence:

Fernanda Loureiro de Moura – Fundação Instituto Oswaldo Cruz, Laboratório de Toxoplasmose e outras Protozooses, Av. Brasil, No. 4365, Manguinhos, Rio de Janeiro-RJ, Brasil. CEP: 21045-900
E-mail: fernanda.loureiro@ioc.fiocruz.br; fernanda.loureiro@outlook.com

Introduction

The congenital *Toxoplasma gondii* infection is a Public Health problem, and if pregnant women are not treated, it can bring severe consequences to the fetus.¹⁻⁴ The fetal infection happens when the mother is infected during pregnancy,⁵ and chronic infections reactivation³ or reinfection by the protozoan take place.⁶

There is no commercial vaccine against toxoplasmosis for pregnant women yet, so the adoption of preventive measures is highly important.⁷ The primary prevention is conducted through health education programs, mainly to women who are seronegative for toxoplasmosis, in order to avoid seroconversion.^{8,9} Secondary prevention is the serologic tracking for detecting seroconversion, so the treatment can start as soon as possible to avoid vertical transmission.⁸ Tertiary prevention acts in the infected newborn, aiming to treat and prevent complications.¹⁰

The infection by T. gondii during pregnancy has been reported in different regions of the country.

In Brazil, there is a lack of notification of congenital toxoplasmosis in many regions, impairing the disease surveillance.^{11,12} Many women do not attend prenatal care or look for it too late,¹³ which can also contribute to the difficulty in controlling toxoplasmosis.

The infection by *T. gondii* during pregnancy has been reported in different regions of the country, with findings of seroprevalence of 2% for IgM antibodies anti-*T. gondii* in pregnant women from São José do Rio Preto-SP,¹⁴ 3.6% in the region of Alto Uruguai-RS,² 2.4% in Porto Alegre-RS,¹⁵ 0.25% in Niterói-RJ,¹⁶ 5.33% in Gurupi-TO⁴ and 0.9% in Caxias-MA.¹⁷ More than one decade ago, studies showed that the incidence rates of congenital toxoplasmosis in Brazil were from 0.2 to 5.0/1,000 live births.^{2,18,19} However, it is difficult to compare those studies, due to the wide regional and methodological variations.²⁰

Considering that the primary prevention is the only available way of avoiding maternal infection by the *Toxoplasma gondii* and that many pregnant women are not aware of the disease, this study aimed at analyzing the factors associated to toxoplasmosis-related knowledge among pregnant women attending public health services in the municipality of Niterói, Rio de Janeiro, Brazil.

Methods

A cross-sectional study was conducted with data collected through personal interviews, using standardized questionnaires that were validated in previous studies.^{16,21}

Data collection was conducted from April 2013 to February 2015, with the participation of pregnant women who attended the Regional Polyclinic of Largo da Batalha and in seven units of the Family Doctor Program (FDP) of the Municipal Health Foundation of Niterói-RJ, located in the following neighborhoods: Ititioca, Atalaia, Vila Ipiranga, Lagoinha, Maceió, Grota I and Preventório II.

The participants were selected by convenience sampling. All the pregnant women who went to one of the research units during the study period were invited to participate, by answering to the questionnaire; the women who refused to participate, those with dementia and those with hearing loss or cognitive deficits were not included in the sample. After answering to the questionnaire, all of them received a leaflet and information on toxoplasmosis.

The descriptive statistics was used for data analyses, being expressed in absolute and relative frequencies. The association was analyzed through Pearson chi-square test, with significance level of 5%. Cramér's V was used to quantify the degree of association between the variables: $0=V<0.1$ for weak or no association; $0.1<V<0.3$ for low association; $0.3\leq V<0.5$ for moderate association; and $V\geq 0.5$ for strong association. The results for multiple logistic regression were expressed by *odds ratio* (OR) and 95% confidence interval (95%CI).

The data was typed in Microsoft® Excel 2010® spreadsheets and analyzed using IBM® Statistical Package for Social Sciences (SPSS)® version 17.0.

The interviews were conducted individually, after the explanation by the researchers on the objectives of the study, and after the pregnant women had read and signed the Free Informed Consent Term. The study project was approved by the Research Ethics Committee of Oswaldo Cruz Foundation - Report No. 110.045, in 28 September 2012 - and conducted according to the recommendations of the National Health Council Resolution No. 466, dated 12 December 2012.

Results

A total of 405 pregnant women were interviewed. They were between 13 and 43 years old, and presented

education level from illiterate to higher education degree - 28.9% of them had complete high school -; 25.9% of the women were interviewed during the first trimester of pregnancy, 45.2% were in their first pregnancy, 34.3% were there for their first prenatal care appointment and 19.5% reported abortion history (Table 1).

Most of the surveyed women (57.3%) did not know about the disease (Table 1). The toxoplasmosis-related knowledge increased with age ($p < 0.001$). The chance of toxoplasmosis-related knowledge was higher among the older women: 4.38 times (95%CI 2.39;8.01) among pregnant women aged 31 to 43 years, comparing with the same chance among pregnant women from 13 to 20 years old (Table 1).

Pregnant women with higher education levels had more chance of toxoplasmosis-related knowledge ($p < 0.001$), mainly women with complete high school (OR=6.26; 95%CI 3.51;11.19), incomplete higher education (OR=27.3; 95%CI 5.85;127.40) and complete higher education (OR=8.49; 95%CI 2.05;35.24), when comparing to those with incomplete elementary school (Table 1).

The number of pregnancies was associated to toxoplasmosis-related knowledge. Mothers with three or more pregnancies history had 1.87 (95%CI 1.16;3.02) more chances of knowing about toxoplasmosis than first-time mothers (Table 1).

Toxoplasmosis-related knowledge was higher among pregnant women with abortion history ($p = 0.019$; OR=1.80; 95%CI 1.10;2.96).

The association degree between the analyzed variables and the toxoplasmosis-related knowledge varied from low to moderate (Cramér's V of 0.1 to 0.5).

The gestational age and the number of prenatal care appointments were not associated to toxoplasmosis-related knowledge ($p > 0.05$).

Among the pregnant women that knew about toxoplasmosis, the information was received, mainly, during conversation with friends (24.3%) and from doctors (19.6%) (Table 2).

On Table 3, we present the distribution of pregnant women according to the number of prenatal care appointments per pregnancy period. It is important to highlight that among the interviewed women who were in their first prenatal care appointment ($n = 139$), 40.3% ($n = 56$) had 13 weeks or more of pregnancy, that is, they were starting a late prenatal care.

Discussion

This study revealed that factors such as age and education level, higher number of pregnancies and abortion history can influence on toxoplasmosis-related knowledge, which possibly has an important role in the primary prevention among the studied population.

Previous studies, conducted with pregnant and postpartum women in Niterói-RJ, from 2010 to 2011,^{16,21} showed that the risk of infection by the *T. gondii* increases with age and the higher education level can be a protection factor against the infection.

No association was found between toxoplasmosis-related knowledge and gestational age of the participants; however, it would be expected that women in a more advanced gestational age should know more about the disease. This fact can be explained by the late start of prenatal care and, consequently, by the reduced number of prenatal care appointments observed in the research. A study conducted in the United States of America in 2003²² did not find any difference in the toxoplasmosis-related knowledge connected to gestational age or number of pregnancies.

This study's results showed that a higher number of pregnancies was associated to Toxoplasmosis-related knowledge, as well as abortion history. Those findings were already expected. During the interviews, we observed that pregnant women under those conditions searched for more information on diseases that could cause severe problems in the fetus. Pregnant women being tested positive is also a variable that explains the toxoplasmosis-related knowledge.

No association was observed between the number of prenatal care appointments and toxoplasmosis-related knowledge, which suggests that this topic has not been treated during prenatal care, and this can be related to the delay on exams results, or to a big number of patients for a small number of health professionals.¹²

A study published in 2012,²³ with pregnant teenagers from Ceará State, showed positive association between the adoption of preventive measures and two or more prenatal care appointments. During this research, many factors capable of explaining the reduced number of prenatal care appointments in the population studied could be observed, such as, late suspicious and confirmation of pregnancy, postponement to schedule a prenatal care appointment and the fact that many women were being assisted in the private

Table 1 – Distribution of pregnant women assisted in the public health care services according to age group, education level, gestational age, number of pregnancies, number of prenatal care appointments, abortion history and toxoplasmosis-related knowledge in the municipality of Niterói, Rio de Janeiro, Brazil, 2013-2015

Variables	Knew about toxoplasmosis n (%)	Unaware about toxoplasmosis n (%)	Total n (%)	p-value ^a	Cramér's V	Odds ratio (95% confidence interval)
Age group (in years)						
13-20	37 (26.4)	103 (73.6)	140 (34.6)	<0.001	0.259	1.00
21-30	92 (47.7)	101 (52.3)	193 (47.6)			2.54 (1.59;4.06)
31-43	44 (61.1)	28 (38.9)	72 (17.8)			4.38 (2.39;8.01)
Education level						
Incomplete Elementary School	25 (25.6)	91 (78.4)	116 (28.6)	<0.001	0.402	1.00
Complete Elementary School	16 (50.0)	16 (50.0)	32 (7.9)			3.64 (1.60;8.28)
Incomplete High School	36 (32.1)	76 (67.9)	112 (27.7)			1.72 (0.95;3.12)
Complete High School	74 (63.2)	43 (36.8)	117 (28.9)			6.26 (3.51;11.19)
Incomplete Higher Education	15 (88.2)	2 (11.8)	17 (4.2)			27.3 (5.85;127.40)
Complete Higher Education	7 (70.0)	3 (30.0)	10 (2.5)			8.49 (2.05;35.24)
Illiterate	–	1 (100.0)	1 (0.2)			–
Gestational age						
First trimester (2-12 weeks)	40 (38.1)	65 (61.9)	105 (25.9)	0.384	0.069	1.00
Second trimester (13-24 weeks)	75 (42.4)	102 (57.6)	177 (43.7)			1.20 (0.73;1.96)
Third trimester (25-41 weeks)	58 (47.2)	65 (52.8)	123 (30.4)			1.45 (0.85;2.46)
Number of pregnancies						
1	66 (36.1)	117 (63.9)	183 (45.2)	0.031	0.131	1.00
2	50 (45.1)	61 (54.9)	111 (27.4)			1.45 (0.90;2.35)
≥3	57 (51.3)	54 (48.7)	111 (27.4)			1.87 (1.16;3.02)
Number of prenatal care appointments						
1	55 (39.6)	84 (60.4)	139 (34.3)	0.079	0.112	1.00
2-5	83 (40.9)	120 (59.1)	203 (50.1)			1.06 (0.68;1.64)
>5	35 (55.6)	28 (44.4)	63 (15.6)			1.91 (1.05;3.49)
Abortion history						
Sim	43 (54.4)	36 (45.6)	79 (19.5)	0.019	0.117	1.80 (1.10;2.96)
Não	130 (39.9)	196 (60.1)	326 (80.5)			1.00
Total	173 (42.7)	232 (57.3)	405 (100.0)			

a) Pearson chi-square test

Table 2 – Source of information on toxoplasmosis reported by pregnant women assisted at the public health services in the municipality of Niterói, Rio de Janeiro, Brazil, 2013-2015

Source of information on toxoplasmosis	n (173)	%
Conversation with friends	42	24.3
Doctor	34	19.6
Television	24	13.9
School	23	13.3
Others (relatives who had the disease; courses and lectures at work; previous pregnancies)	15	8.8
Leaflets	12	6.9
Nurse	11	6.3
Internet	11	6.3
Newspaper	1	0.6

Table 3 – Distribution of pregnant women according to the number of prenatal care appointments divided by gestational age in the municipality of Niterói, Rio de Janeiro, Brazil, 2013-2015

Gestational age	Number of prenatal care appointments			Total n (%)
	1 n (%)	2 a 5 n (%)	more than 5 n (%)	
First trimester (2-12 weeks)	83 (79.0)	22 (21.0)	–	105 (25.9)
Second trimester (13-24 weeks)	50 (28.2)	121 (68.4)	6 (3.4)	177 (43.7)
Third trimester (25-41 weeks)	6 (4.9)	60 (48.8)	57 (46.3)	123 (30.4)
Total	139 (34.3)	203 (50.1)	63 (15.6)	405 (100.0)

health care, but searched for public services for not having financial condition for paying the labor costs, thus, getting to the public health care during the third trimester of pregnancy - according to the narrative of the women during the interviews. Studies conducted in Europe, in 2001²⁴ and 2008,²⁵ proved the positive effect of primary prevention of toxoplasmosis on the knowledge and exposition to the risk factors for the disease. However, in Niterói and other Brazilian municipalities, this practice is still unappreciated, according to previous studies.^{9,12,17,21,23,26,27}

It was clear the lack of toxoplasmosis-related knowledge, which represents a challenge for health professionals to conduct primary prevention of congenital toxoplasmosis, an action that requires a change in

behavior and eating habits by the pregnant women. It is highly important that the health professionals are well trained, and the education measures must be conducted continuously, so the primary prevention of congenital toxoplasmosis can be effective.

Authors' Contributions

Moura FL, Amendoeira MRR, Goulart PRM, Moura APP, Souza TS and Fonseca ABM contributed to the conception and design of the study, drafting and critical review of its intellectual content, results analysis and interpretation, and approval of the manuscript's final version. All the authors declare to be responsible for all aspects of the work, ensuring its accuracy and integrity.

References

1. Jones JL, Lopez A, Wilson M, Schulkin J, Gibbs R. Congenital toxoplasmosis: a review. *Obstet Gynecol Surv.* 2001 May;56(5):296-305.
2. Spalding SM, Amendoeira MRR, Ribeiro LC, Silveira C, Garcia AP, Camilo-Coura L. Estudo prospectivo de gestantes e seus bebês com risco de transmissão de toxoplasmose congênita em município do Rio Grande do Sul. *Rev Soc Bras Med Trop.* 2003 jul-ago;36(4):483-91.
3. Remington JS, McLeod R, Wilson CB, Desmonts G. Toxoplasmosis. In: Remington JS, Klein JO, Wilson CB, Baker CJ. *Infectious diseases of the fetus and newborn infant.* 7th ed. Philadelphia: Elsevier, 2011. p. 918-1041.
4. Silva MG, Vinaud MC, Castro AM. Prevalence of toxoplasmosis in pregnant women and vertical transmission of *Toxoplasma gondii* in patients from basic units of health from Gurupi, Tocantins, Brazil, from 2012 to 2014. *PLoS One.* 2015 Nov;10(11):e0141700
5. Thiebaut R, Leproust S, Chêne G, Glibert R. Effectiveness of prenatal treatment for congenital toxoplasmosis: a meta-analysis of individual patients' data. *Lancet.* 2007 Jan;369(9556):115-22.
6. Gavinet MF, Robert F, Firtion G, Delouvrier E, Hennequin C, Mawrin JR, et al. Congenital toxoplasmosis due to maternal reinfection during pregnancy. *J Clin Microbiol.* 1997 May;35(5):1276-7.
7. Ambroise-Thomas P. Toxoplasmose congénitale: les différentes stratégies préventives. *Arch Pediatr.* 2003 Feb;10 Suppl 1:12-4.
8. Foulon W. Congenital toxoplasmosis: is screening desirable? *Scand J Infect Dis Suppl.* 1992;84:11-7.
9. Contiero-Toninato AP, Cavalli HO, Marchioro AA, Ferreira EC, Caniatti MC, 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.* 2014 Mar-Apr;47(2):198-203.
10. Paul M, Petersen E, Szczapa J. Prevalence of congenital *Toxoplasma gondii* infection among newborns from the Poznań region of Poland: validation of a new combined enzyme immunoassay for *Toxoplasma gondii*-specific immunoglobulin A and immunoglobulin M antibodies. *J Clin Microbiol.* 2001 May;39(5):1912-6.
11. Vaz RS, Rauli P, Mello RG, Cardoso MA. Toxoplasmose congênita: uma doença negligenciada? atual política de saúde pública brasileira. *Facts Reports.* 2011 Nov; 3 Spec No
12. Moura FL, Goulart PRM, Sudre AP, Amendoeira MRR. Programs for controlling congenital toxoplasmosis: study of current status in a Brazilian municipality. *Rev Patol Trop.* 2015 out-dez;44(4):478-82.
13. Rosa CQ, Silveira DS, Costa JSD. Fatores associados à não realização de pré-natal em município de grande porte. *Rev Saude Publica.* 2014 dez;48(6):977-84.
14. Mattos CCB, Spegiorin LCJE, Meira CS, Silva TC, Ferreira AIC, Nakashima F, et al. Anti-*Toxoplasma gondii* antibodies in pregnant women and their newborn infants in the region of São José do Rio Preto, São Paulo, Brazil. *São Paulo Med J.* 2011;129(4):261-6.
15. Varella IS, Wagner MB, Darela AC, Nunes LM, Muller RW. Prevalência de soropositividade para toxoplasmose em gestantes. *J Pediatr (Rio J).* 2003 jan-fev;79(1):69-74.
16. Moura FL, Amendoeira MR, Bastos OM, Mattos DP, Fonseca AB, Nicolau JL, et al. Prevalence and risk factors for *Toxoplasma gondii* infection among pregnant and postpartum women attended at public healthcare facilities in the City of Niterói, State of Rio de Janeiro, Brazil. *Rev Soc Bras Med Trop.* 2013 Mar-Apr;46(2):200-7.
17. 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 fev;37(2):64-70.
18. Neto EC, Anele E, Rubim R, Brites A, Schulte J, Becker D, et al. High prevalence of congenital toxoplasmosis in Brazil estimated in a 3-year prospective neonatal screening study. *Int J Epidemiol.* 2000 Oct;29(5):941-7.
19. Segundo GR, Silva DA, Mineo JR, Ferreira MS. Congenital toxoplasmosis in Uberlândia, MG, Brazil. *J Trop Pediatr.* 2004 Feb;50(1):50-3.
20. Mitsuka-Breganó R, Lopes-Mori FMR, Navarro IT. Toxoplasmose adquirida na gestação e congênita: vigilância em saúde, diagnóstico, tratamento e condutas. Londrina: Eduel, 2010.62 p.
21. Millar PR, Moura FL, Bastos OMP, Mattos DPBG, Fonseca ABM, Sudré AP, et al. Conhecimento sobre

- toxoplasmose entre gestantes e puérperas atendidas na rede pública de saúde do município de Niterói, Rio de Janeiro, Brasil. *Rev Inst Med Trop Sao Paulo*. 2014 set-out;56(5):433-8.
22. Jones JL, Ogunmodede F, Scheftel J, Kirkland E, Lopez A, Schulkin J, et al. Toxoplasmosis-related knowledge and practices among pregnant women in the United States. *Infect Dis Obstet Gynecol*. 2003;11(3):139-45.
23. Costa FF, Gondim APS, Lima MB, Braga JU, Vieira LJES, Araújo MAL. Preventive behavior for toxoplasmosis in pregnant adolescents in the state of Ceara, Brazil. *BMC Public Health*. 2012 Jan;12:73.
24. Pawlowski ZS, Gromadecka-Sutkiewicz M, Skommer J, Paul M, Rokossowski H, Suchocka E, et al. Impact of health education on knowledge and prevention behavior for congenital toxoplasmosis: the experience in Pozna, Poland. *Health Educ Res*. 2001 Aug;16(4):493-502.
25. Gollub EL, Leroy V, Gilbert R, Chêne G, Wallon M, European Toxoprevention Study Group (EUROTOXO). Effectiveness of health education on Toxoplasma-related knowledge, behaviour, and risk of seroconversion in pregnancy. *Eur J Obstet Gynecol Reprod Biol*. 2008 Feb;136(2):137-45.
26. Branco BHM, Araújo SM, Falavigna-Guilherme AL. Prevenção primária da toxoplasmose: conhecimento e atitudes de profissionais de saúde e gestantes do serviço público de Maringá, estado do Paraná. *Sci Med*. 2012 out-dez;22(4):185-90.
27. Amendoeira MRR, Coura LFC. Uma breve revisão sobre toxoplasmose na gestação. *Sci Med*. 2010 jan-mar;20(1):113-9.

Received on 29/01/2016
Approved on 17/05/2016