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Abbreviations:
EDCA - Endemic Disease Combat Agent
CHA - Community Health Agent
CJV - Jorge Vaitsman Municipal Center for Veterinary Medicine
ESF - Family Health Team
GAL - Laboratory Environment Manager
ICF - Informed Consent Form
IgG – Immunoglobulin G
IVISA - Rio - Municipal Institute of Health Surveillance, Zoonoses and Agricultural Inspection
RIFI - Indirect Immunofluorescence Reaction
SUS - Unified Health System.

Knowledge of Toxoplasmosis Among Health Professionals in Areas with *T. gondii* Infection in Pet Animals

Conhecimento sobre toxoplasmose entre profissionais de saúde em áreas com infecção por T. gondii em animais de estimação

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ABSTRACT

Introduction: Toxoplasmosis is a significant zoonotic disease that requires a multidisciplinary approach for effective control and prevention. **Objective:** This study aims to assess health professionals' knowledge about toxoplasmosis in areas with animal seropositivity in Rio de Janeiro, Brazil. **Methods:** A survey based on serological diagnostic results was conducted to identify areas with a high prevalence of toxoplasmosis in animals in Rio de Janeiro. Based on these findings, selected primary healthcare units in these areas were targeted for distributing semi-structured questionnaires to 70 health professionals, including individuals with high school and superior education backgrounds. **Results:** The findings revealed that while health professionals had partial knowledge of toxoplasmosis transmission and prevention, significant gaps were evident, particularly in their understanding of the etiology and biology of *T. gondii*. Notable differences were observed between groups regarding the routes of transmission. **Conclusion:** Health professionals exhibit partial knowledge of toxoplasmosis. Integrated approaches could consolidate knowledge and improve health practices. **Conclusion:** Health professionals have demonstrated partial knowledge of toxoplasmosis. Integrated approaches may help strengthen their understanding and enhance health practices.

Keywords: Toxoplasmosis; One Health; Primary Health Care.

RESUMO

Introdução: A toxoplasmose é uma importante zoonose que necessita de intervenção multiprofissional para controle e prevenção eficazes. **Objetivo:** O objetivo deste estudo é avaliar o conhecimento dos profissionais de saúde sobre a toxoplasmose em áreas com soropositividade animal no Rio de Janeiro, Brasil. **Métodos:** Um estudo baseado em resultados de diagnóstico sorológico foi realizado para identificar áreas com alta prevalência de toxoplasmose em animais no Rio de Janeiro. Com base nestes resultados, foram selecionadas unidades básicas de saúde nestas áreas para a distribuição de questionários semiestruturados a 70 profissionais de saúde, incluindo funcionários do ensino médio e superior. **Resultados:** Os achados revelaram que, embora os profissionais de saúde possuíssem um conhecimento parcial sobre a transmissão e a prevenção da toxoplasmose, foram evidenciadas lacunas significativas, principalmente em relação à etiologia e à biologia de *T. gondii*. Foram observadas diferenças notáveis entre os grupos com relação às rotas de transmissão. **Discussão:** Há uma necessidade crítica de treinamento contínuo e da incorporação de disciplinas de parasitologia nos currículos de saúde. O estudo ressalta a importância da educação multiprofissional para aprimorar o conhecimento e as práticas de prevenção da toxoplasmose. **Conclusões:** Os profissionais de saúde apresentam conhecimento parcial sobre a toxoplasmose. Abordagens integradas poderiam consolidar o conhecimento e melhorar as práticas de saúde.

Palavras-chave: Toxoplasmose, Saúde Única, Atenção Primária à Saúde.

INTRODUCTION

Toxoplasmosis is a zoonotic disease caused by the protozoan *Toxoplasma gondii*, which can infect mammals and birds. The domestic cat (*Felis catus*) plays a crucial role in the urban transmission cycle of the parasite, as it serves as the definitive host capable of shedding oocysts in its feces. These oocysts can remain viable in the environment for months, posing a risk of contamination[1]. Humans, other mammals and birds, can act as intermediate hosts and may develop tissue cysts in muscles, the central nervous system, and the eyeball during chronic infection[2].

Considering the zoonotic profile of *T. gondii*, prevention and control strategies require multiprofessional action, given the inseparability between human, animal, and environmental health under the concept of One Health[3]. In the urban context, a way of determining the spread of *T. gondii* in this environment is to evaluate the exposure of sentinel companion animals, since they may share risk factors for infection with humans[4].

The public health importance of toxoplasmosis lies in the possibility that this zoonosis generates severe clinical conditions in immunocompromised humans and in infected pregnant women, which can culminate in abortion or fetal sequelae such as retinochoroiditis, hydrocephalus or microcephaly[5]. Thus, the best way to reduce the transmission of gestational and congenital toxoplasmosis is primary prevention measures, through the promotion of knowledge about how to avoid infection[6]. In this sense, the Ministry of Health, in the "Notification and Investigation Protocol: Gestational and Congenital Toxoplasmosis", recommends that all pregnant women, regardless of their serological status, be periodically advised about primary prevention care due to the risk of congenital *T. gondii* transmission[7].

Brazil still faces challenges in the primary prevention of toxoplasmosis due to its vast territory, diverse epidemiological scenarios, habits, and cultural practices among regions, the lack of systematization of educational measures among health professionals, in addition to the different genotypes of *T. gondii* circulating in the country that may lead to acute disease[8]. In addition, there are continuous deficits in knowledge regarding toxoplasmosis, including its epidemiology and prevention, among health professionals in Brazil and other countries[8-20].

According to the national care guidelines of the Unified Health System (SUS), health education is an important resource for health promotion in Primary Care[21]. According to Ordinance No. 2,436 of the Ministry of Health; the Family Health Team (FHS), multi-professional, is responsible for issues of a sanitary, environmental, and epidemiological nature that occur in the territory, and may intervene in a clinical or sanitary way. It is also responsible for the development of primary prevention actions for diseases and injuries and the development of educational actions so that they interfere in the health-disease process of the population[22]. In this context, Primary Care professionals are key players in the process of raising awareness among the population about how diseases are transmitted and the care needed to avoid them.

Therefore, the present study aimed to evaluate the knowledge regarding toxoplasmosis among health professionals working in the basic health units in the city of Rio de Janeiro, located in areas where animal toxoplasmosis occurs.

METHODS

Ethical Considerations

This study was previously approved by the Human Research Ethics Committee of the Municipal Health Department of the city of Rio de Janeiro (CAAE: 71235423.7.0000.5279). In addition, the project was approved by the managers of the Zoonoses Surveillance Coordination – IVISA/RIO and the Municipal Health Centers upon signing the Institutional Consent Terms.

Definition of Basic Health Units based on Suspected Cases of Animal Toxoplasmosis

To define the primary health units to be visited; data from the Laboratory Environment Manager (GAL) of the Parasitology Laboratory of the Jorge Vaitsman Municipal Center of Veterinary Medicine (CJV) were used, referring to the tests requested for diagnostic confirmation of canine and feline toxoplasmosis. Suspected clinical cases of toxoplasmosis analyzed between January 2020 and April 2023 were selected. During this period, 961 pet animals were included in this previous analysis, 433 dogs and 528 cats, residents of the city of Rio de Janeiro. Seropositivity cases for anti-IgG *T. gondii* were confirmed in the laboratory by indirect fluorescent antibody test (IFAT)[23], when total fluorescence of the tachyzoites surface was observed at a dilution ≥ 1:16[24].

Subsequently, the addresses of dog and cat owners exposed to T. gondii were retrieved by the GAL for spatial mapping of positive cases in Rio de Janeiro. The data points were plotted using ArcGIS Pro® software (California, USA). Finally, the neighborhoods with the highest numbers of seropositive animals were identified and selected—Tijuca and Maré, both located in the northern zone of the city.

Participants´ Awareness and Application of the Questionnaire

After obtaining approval from the managers of the selected primary health care units, the following units were chosen for visitation: the Heitor Beltrão Municipal Health Center (Tijuca) and the Augusto Boal Family Clinic (Maré). This study included physicians, nurses, community health agents (CHAs), and endemic disease control agents (EDCAs) working in family health teams at these units. Professionals who were absent on the data collection days or who declined to participate were excluded from the study.

To assess knowledge regarding toxoplasmosis, two semi-structured questionnaires were elaborated with closed questions. One was applied to professionals with high school or technical level (CHA and EDCA – group 1) and the other to those with superior education (physicians and nurses – group 2). This division was due to the need to adapt the specific content of toxoplasmosis according to each of these educational levels. The two questionnaires had questions in common, related to the transmission and prevention of toxoplasmosis. In addition to these, specific questions were also included for superior education professionals, such as the etiology and biological cycle of *T. gondii*, and for high school or technical level professionals, such as the role of CHAs and EDCAs in raising awareness against the transmission of the parasite. The questionnaires had multiple-choice statements and self-descriptive statements submitted to a 5-point *Lickert* scale with answers containing extremes of opinion (1=strongly disagree, 2=partially disagree, 3=neither agree nor disagree, 4=partially agree, 5=strongly agree).

Between October 2023 and January 2024, the questionnaires were administered in person in the health agents' offices and during team meetings, where professionals from various categories were present. After the project was introduced and the Informed Consent Form (ICF) was signed, participants individually completed the structured questionnaires via Google Forms. The questionnaire could be accessed using a device provided by the researcher, a computer at the health unit, or a QR code that allowed participants to use their personal devices. Upon completing the questionnaires, participants with remaining questions had the opportunity to clarify them with the researcher in person.

Data analysis

The collected data were stored in Microsoft Excel® 2013 spreadsheets for subsequent calculation of absolute and relative frequencies. Statistical analysis was performed using the free software GraphPad Prism v. 5 (https://graphpadprism.software.informer.com/5.0/). Pearson's Chi-square test (χ^2) or Fisher's exact test was applied, with a significance level of 5.0%, to assess the association between educational level and responses.

RESULTS

Spatialization of Canine and Feline Toxoplasmosis Cases

The spatial distribution of seropositive animals revealed that the neighborhoods with the highest numbers of diagnosed cases of animal toxoplasmosis were Tijuca and Maré, each with five cases (Figure 1). The neighborhoods of the other animals diagnosed with toxoplasmosis are listed in Supplementary Table 1. Of the total number of animals included in this analysis, 69.4% were residents of neighborhoods in the northern zone of Rio de Janeiro.

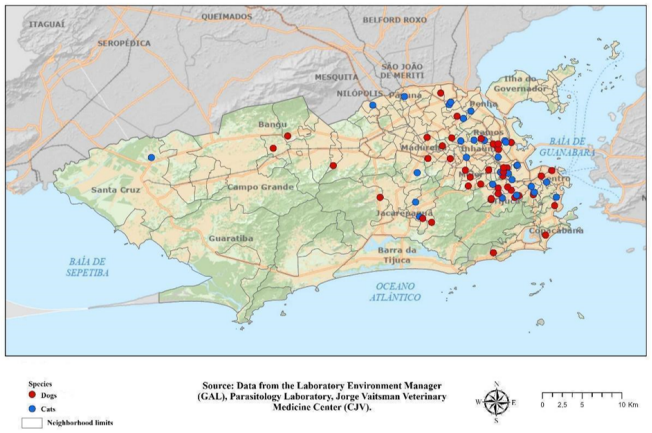

Figure 1. Distribution of confirmed cases of canine and feline toxoplasmosis in Rio de Janeiro city between January 2020 and April 2023.

Evaluation of Knowledge Regarding Toxoplasmosis Among Health Care Professionals

This study included a total of 70 health professionals; 47 had high school or technical education (46 CHA and 1 EDCA) and 23 had superior education (13 physicians and 10 nurses). Regarding patient guidance about toxoplasmosis during routine activities; 70.2% (33/47) of professionals in group 1 stated that they do not talk about toxoplasmosis with their patients, while 60.9% (14/23) of the professionals in group 2 routinely advised patients regarding toxoplasmosis. A significant difference was observed in this conduct when comparing the two groups of health professionals ($p<0.001$). Among professionals with less than five years of experience; 87.5% (21/24) of participants in group 1 did not approach their patients concerning toxoplasmosis. Awareness of this zoonosis increased with the time of practice in this group ($p=0.0186$). On the other hand, 66.7% (12/18) of the professionals in group 2 advised patients about toxoplasmosis. No association was found between the length of professional experience and the practice of guiding toxoplasmosis in group 2 ($p=0.4689$).

Regarding the perceptions of the professionals in group 1 about the concept of Single Health, the majority strongly agreed with the following statements: "Human, animal and environmental health are inseparable" (44.7%), "Primary care professionals have the role of guiding contact with animals to reduce the risks for their patients" (72.3%), "Animals kept in a semi-domiciled way (with access to the street) are a risk factor for toxoplasmosis" (61.7%), "Home gardens may represent a risk for the transmission of toxoplasmosis" (34.0%), The consumption of extensively raised meats (free-range) may be a risk for the transmission of toxoplasmosis" (42.6%). In addition, 40.4% disagreed that pregnant patients should not have contact with animals; and 34.0% that immunosuppressed patients should not have contact with animals (Table 1).

Table 1. Knowledge and perceptions of community health agents and endemic disease combat agents in primary health care units in Rio de Janeiro city regarding toxoplasmosis from the perspective of One Health, surveyed between October 2023 and January 2024.

Statements	N	%
Human, animal and environmental health are inseparable:		
- Strongly disagree	11	23.4
- Partially disagree	3	6.4
- Neither agree nor disagree	6	12.8
- Partially agree	6	12.8
- Totally agree	21	44.7
Pregnant patients should not have contact with animals:		
- Strongly disagree	19	40.4
- Partially disagree	9	19.1
- Neither agree nor disagree	7	14.9
- Partially agree	6	12.8
- Totally agree	6	12.8
Immunosuppressed patients should not have contact with animals:		
- Strongly disagree	16	34.0
- Partially disagree	10	21.3
- Neither agree nor disagree	9	19.1
- Partially agree	7	14.9
- Totally agree	5	10.6
Primary Care professionals have the role of guiding contact with animals to reduce risks for their patients:		
- Strongly disagree	0	0.0
- Partially disagree	1	2.1
- Neither agree nor disagree	8	17.0
- Partially agree	4	8.5
- Totally agree	34	72.3
Animals kept semi-domiciled (with access to the street) are a risk factor for toxoplasmosis:		
- Strongly disagree	3	6.4
- Partially disagree	3	6.4
- Neither agree nor disagree	5	10.6
- Partially agree	7	14.9
- Totally agree	29	61.7
Home gardens can pose a risk for toxoplasmosis transmission:		
- Strongly disagree	5	10.6
- Partially disagree	4	8.5
- Neither agree nor disagree	14	29.8
- Partially agree	8	17.0
- Totally agree	16	34.0
The consumption of extensively farmed meat (free-range) can be a risk for toxoplasmosis transmission:		
- Strongly disagree	3	6.4
- Partially disagree	3	6.4

Regarding the specific knowledge of higher education professionals, most participants in group 2 correctly identified *T. gondii* as a protozoan (73.9%), the causative agent of toxoplasmosis. However, there was a noticeable lack of knowledge about the parasite's life cycle. Specifically, 30.4% of physicians and nurses incorrectly believed that cats shed oocysts throughout their lives, and 39.1% thought that the oocysts were infectious immediately after being released (Table 2).

Regarding the *T. gondii* transmission, most professionals in group 1 identified direct contact with infected cats/animals as the main transmission route (78.7%). On the other hand, the alimentary and transplacental routes were the most reported by group 2; 78.3% and 69.6%, respectively. When comparing the responses regarding the transmission routes of *T. gondii* between the groups, a significant difference was observed ($p<0.001$). Most professionals in both groups answered that pork meat may contain *T. gondii* cysts, 63.8% in group 1 and 82.6% in group 2. Other responses included poultry and beef as also likely to harbor *T. gondii* tissue cysts. It is worth noting that, in both groups, fish meat was mentioned as a possible source of cysts of this parasite; 4.3% and 8.7% in groups 1 and 2, respectively. Overall, no significant difference was found between the responses from groups 1 and 2 ($p=0.1007$). Domestic cats were most identified as the main

Table 2. Knowledge about the etiology and biology of *T. gondii* of physicians and nurses from primary health care units in Rio de Janeiro city surveyed between October 2023 and January 2024.

Questions	N	%
Causative agent of toxoplasmosis:		
-Bacterium	3	13.0
- Helminth	1	4.3
-Virus	0	0.0
-Protozoan	17	73.9
- I'd rather not answer	2	8.7
For approximately how long these animal(s) releases *Toxoplasma gondii* oocysts through the feces:		
- 5 days	4	17.4
- 15 days	5	21.7
- 60 days	4	17.4
- For a lifetime	7	30.4
- I'd rather not answer	3	13.0
From how long in the environment these oocysts become infectious:		
- Immediately after your release	9	39.1
-12 hours	4	17.4
- 24 hours	1	4.3
- 48 hours	6	26.1
- I'd rather not answer	3	13.0

source of oocyst elimination through feces in both groups, reported by 76.6% of the professionals in group 1 and 100.0% of those in group 2. However, participants in group 1 also reported other species such as pigeons (21.3%), rats (21.3%), and dogs (17.0%) as capable of releasing *T. gondii* oocyst in the environment, a less frequent fact in group 2. Thus, a significant difference was observed between the responses of groups 1 and 2 (p=0.0432) (Supplementary Table 2).

Most professionals in both groups fully agreed on the following measures to prevent toxoplasmosis: consuming only filtered or treated water (85.1% and 91.3%), avoiding raw or undercooked meat (70.2% and 95.7%), not sharing kitchen utensils between raw and ready-to-eat foods (57.4% and 69.6%), washing vegetables and fruits with sanitizing products before consumption (83.0% and 95.7%), washing hands after handling raw meat (89.4% and 100.0%), not providing raw or undercooked meat to pets (66.0% and 73.9%), avoiding contact with litter in public parks (51.1% and 78.3%), avoiding contact with cat feces (85.1% and 82.6%), cleaning cat feces daily from litter boxes (91.5% and 82.6%), and keeping cats at home in the patient's family (38.3% and 69.6%)."

Additionally, most professionals disagreed with the following statements: avoiding contact with cats (46.8% and 69.6%), not touching or petting cats (68.1% and 78.3%), and getting rid of the cat if one is present in the household (83.0% and 91.3%). No significant difference was observed between the answers of groups 1 and 2 regarding these statements (p>0.05) (Supplementary Table 2).

However, a significant difference was found between the groups regarding household insect control (group 1 – 70.2%; group 2 – 34.8%) and the daily use of repellent (group 1 – 44.7%; group 2 – 21.7%) as prophylactic measures against *T. gondii* infection (p<0.05) (Supplementary Table 2).

DISCUSSION

Overall, the comparative analysis of knowledge regarding toxoplasmosis among high school level and superior-education health professionals in Rio de Janeiro city revealed that most had only partial knowledge about the transmission and prevention of this parasitosis. Similar findings have been reported in Maringá/PR[9], Cascavel/PR[8], and Recife/PE[13], Brazil, where researchers assessed the knowledge of various professionals working in primary health units. However, as in the studies, health professionals in Rio de Janeiro city were still unaware of some important points of the epidemiology of toxoplasmosis. In addition, most high school-level health professionals did not provide guidance on toxoplasmosis in their routine. It is important to highlight that the roles of community health agents and endemic disease control agents include strengthening the bond between multidisciplinary primary care teams and the community, monitoring specific groups, such as pregnant women and immunosuppressed patients, home visits, and health information and education[25]. Given this close contact with the population; the results of the present study point out the importance of training and updating these professionals about the prevention of zoonoses, such as toxoplasmosis.

Regarding the high school level health professionals in group 1, it was observed that the guidance on toxoplasmosis during patient care increased with years of experience. Conversely, a study of health workers at a hospital in Namwala District, Zambia, found that knowledge of toxoplasmosis decreased with years of experience[10]. Considering the results obtained in the present study, the training and updating related to toxoplasmosis mentioned above should be planned and executed continuously, and regularly to contextualize the awareness regarding toxoplasmosis by these professionals in the communities they have been working[26].

Superior education health professionals exhibited deficits in specific knowledge regarding the etiology and biology of *T. gondii*. For example, most participants in group 2 incorrectly stated that cats shed oocysts for life and that these oocysts are immediately infectious upon release. Domestic cats are known to shed *T. gondii* oocysts through feces for a period that varies between 14 and 21 days after primary infection, developing later immunity[27]. In addition, oocyst sporogony, which occurs in the environment under ideal conditions, occurs after a minimum period of 24 hours[28]. In another study conducted in Niterói/RJ, Brazil, superior education professionals from primary health units demonstrated adequate specific knowledge regarding the diagnostic management of *T. gondii* infection in their patients[15]. Based on the obtained results, undergraduate curricula for health professionals, particularly in Medicine and Nursing, appear to prioritize knowledge related to clinical management and patient diagnosis over foundational parasitology. Therefore, incorporating subjects focused on basic parasitology and zoonoses could serve as a valuable strategy to address these educational gaps.

Regarding the routes of transmission of toxoplasmosis, there was a clear difference between the most frequent responses in groups 1 and 2. Most professionals in group 1 associated the transmission of the parasite with direct contact with cats. This profile was also observed among health professionals in Durango City/Mexico[18]. In Niterói city/RJ[15], Brazil, it was observed that most professionals from two health units associated more appropriately the *T. gondii* transmission with contact and ingestion of oocysts present in cat feces. It is worth noting that direct contact with cats is not a risk factor for toxoplasmic infection, since oocysts need a period in the environment to become infective[29-30].

In group 2, the superior education professionals, there was a higher frequency of associating *T. gondii* transmission with food and transplacental routes. Research on knowledge regarding toxoplasmosis among health professionals carried out in Nigeria and Morocco also identified a higher frequency of association between the transmission of the protozoan through the food route[16,19]. Other studies have highlighted the recognition of the transplacental transmission route

of *T. gondii* by health professionals from the United States and Brazil[8,12,14,17]. Given the complexity of the epidemiological chain of *T. gondii* infection, the findings of this study underscore the need to incorporate content on the parasite's multiple transmission routes into official documents and guidelines for healthcare professionals. Additionally, these resources should provide clear strategies for preventing transmission.

Regarding foodborne transmission, most professionals correctly identified pork as a significant source of T. gondii infection. Although other mammals and poultry, such as cattle and chickens, can also serve as intermediate hosts and harbor tissue cysts, pigs are among the most epidemiologically important species.[31]

Although the percentage was low, some professionals in this study claimed that fish meat might contain infective *T. gondii* cysts. In a study conducted in Nigeria, 0.77% of health workers stated that *T. gondii* is capable of infecting fish[16]. It should be noted that *T. gondii* is a parasite of homeothermic animals, i.e. mammals and birds[32-33]. In general, most health professionals in Rio de Janeiro city correctly associate the domestic cat as responsible for the elimination of oocysts in the environment. The recognition of cats as sources of environmental contamination and, therefore, *T. gondii* definitive hosts, was also observed in Juiz de Fora city/MG, Brazil, as well as in Nigeria[16,17]. However, in both groups analyzed, other animals, such as dogs, rats and pigeons, were wrongly incriminated as eliminators of *T. gondii* oocysts in the environment. This mistake was also observed in other studies conducted in Niterói city/RJ, Juiz de Fora city/MG and Durango city/Mexico[15,17,18]. These results underscore the importance of recognizing the zoonotic transmission of *T. gondii,* as well as the biological and epidemiological importance of the different species of other animals in the biological cycle of the protozoan. Additionally, a review analyzing 60 studies from Brazil and other countries identified deficiencies in health professionals' understanding of the *Toxoplasma gondii* life cycle and its modes of transmission. This finding highlights the widespread nature of these knowledge gaps across different regions[34].

In general, the responses of health professionals in Rio de Janeiro city regarding preventive measures against toxoplasmosis were satisfactory. These included proper hygienic-dietary habits and responsible ownership of cats. Such conducts were also mentioned in other studies that evaluated knowledge regarding toxoplasmosis among health professionals in Brazil and the United States[8,12–14]. However, in the present study, the professionals in group 1 mistakenly associated the use of daily repellent and insect control in the home environment as important preventive measures against *T. gondii* infection. Although experimental studies indicate the possibility of mechanical oocyst transport by insects[35], this route of transmission is of little relevance in the epidemiology of toxoplasmosis.

Finally, this study was designed based on the occurrence of laboratory-confirmed cases of animal toxoplasmosis to identify research areas regarding the knowledge of professionals working in basic health units about this parasitic disease in Rio de Janeiro. This criterion was chosen considering the integration between human, animal and environmental health, under the context of One Health for the definition of prophylactic measures against toxoplasmosis. Considering the ineffectiveness of the treatments commonly used in eliminating the parasite in its hosts; the prevention and control of this zoonosis include the adoption of measures that can reduce the chances of infection in human and animal hosts. In the context of the primary health units visited in the present study, it is important that the guidelines provided by health professionals for the prevention of zoonoses also address the care of domestic animals, since they are part of the parasitosis cycle. Thus, the multidisciplinary composition of Primary Care teams, including professionals specializing in animal and environmental health—such as veterinarians, biologists, and ecologists, can play a crucial role in reducing human and animal exposure to the parasite.

It is important to acknowledge certain limitations of this study, including (i) the absence of comparative analysis, as no other studies were identified in the literature that utilized serological screening of pet animals to assess health professionals' knowledge of toxoplasmosis in different locations; (ii) potential bias in self-reported data, as participants' assessments of their knowledge and practices may have been subject to reporting biases, similar to other self-report studies; and (iii) limited generalizability, as the findings apply specifically to these two areas in Rio de Janeiro, Brazil, and may not be directly transferable to regions with different epidemiological conditions or healthcare structures.

CONCLUSION

This study evaluated the serological prevalence of *T. gondii* in pet animals to identify key areas for assessing health professionals' knowledge of toxoplasmosis. The results pointed out that these professionals have only partial knowledge, with the most common errors in questionnaire responses related to the parasite's life cycle and transmission methods. Notably, the role of animals in the context of *T. gondii* infection remains a source of uncertainty for both high school and superior-education professionals. In this context, a multidisciplinary approach emerges as a valuable strategy for building and strengthening knowledge, fostering the integration of human, animal, and environmental health.

Furthermore, this study aims to inspire further research on the theme, which could help elucidate the situation in other parts of the city, the region, and the country, given the complexity of zoonoses and their contextual factors. Since primary healthcare professionals play a direct role in the health dynamics of their communities, their training—particularly through targeted educational programs—could significantly enhance public health outcomes. Therefore, the findings of this study, along with similar research, can serve as a foundation for university professors, extension projects, and health managers in designing educational interventions on this critical theme.

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