RESEARCH ARTICLE

Detection of Toxoplasma Gondii in Cats and Seroprevalence in Women

Fadia A. A. Al-Khayat

Abstract

This study aimed to investigate the potential threat of domestic and stray cats to public health in transmitting the toxoplasmosis. One hundred and sixty samples (40 blood samples from owner, 40 blood samples from non owner women, 40 fecal samples from their cats, and 40 fecal samples from stray cats) were analyzed. All blood samples were subjected to IgM, IgG rapid test for toxoplasmosis detection, while the fecal samples from cat were subjected to microscopic examination for the presence of the oocyst using direct wet mount as well as flotation method. The results revealed the total infection rate in women was 23.75% (19/80) with significant differences between cats owner (30.00%) and non- cats owner (17.50%). The IgG antibody was detected in 68.42% (13/19) amounting 8/19 (42.10%) in cats owner and 5/19 (26.31%) in non-cats owner, and the presence of both IgG and IgM antibodies was recorded in 6/19 (31.57%) of the infected women (21.05% and 10.52% for cats owner and non-cats owner, respectively). The total infection rate for cats was 16.25% (13/80), with highly significant differences $p<0.001$ between domestic cats (10.00%) and stray cats (22.50%).

Keywords: Domestic and stray cats, Serological method, Toxoplasmosis, women

Ind J Vet Sci and Biotech (2022): 10.48165/ijvsbt.18.4.28

Introduction

Toxoplasmosis caused by an apicomplexan obligate intracellular protozoan parasite Toxoplasma gondii, is a zoonotic disease of public health concern (Jenkins et al., 2015). In humans, it is a life-threatening disease (Abdel-Rahman, 2017). The importance of this infection lies in a woman of child-bearing age, where the infection in a pregnant woman results in a miscarriage or a disabled child is borne (Decavalas et al.,1990; Zhou et al., 2013). For people with a weak immune system, toxoplasmosis can lead to acute and fatal toxoplasmosis resulting from encephalitis (Cuomo et al.,2013) as cats are the definitive host and have been very popular as companion pets in most parts of the world.

The epidemiological studies showed that half of the population is infected and classified as asymptomatic (Liu et al., 2012), while some areas of the world showed more than 60% infection rate for toxoplasmosis (Flegr et al., 2014). Sexual reproduction of parasite occurs in Felids as definitive hosts and asexual reproduction occur in the intermediate host (Weiss & Kim, 2013). Cats shed approximately 1 billion oocysts upon their initial infection; thus, they are the main source of infection (Tenter et al., 2010). In humans, most healthy people who are infected with toxoplasmosis are asymptomatic, while in others, symptoms include bodyache, headache, swollen lymph nodes, fever and fatigue. In cats, clinical toxoplasmosis includes depression, anorexia, weight loss, fever, and diarrhea (Dubey & Prowell, 2013; Khan et al., 2017).

There are several methods to diagnose the infection in humans, viz., biological, serological, histological, or molecular methods. Serological methods measure the levels of different antibodies that rise or fall with time after infection. IgM test is used to determine recent infection while IgG determines past infection. Traditional methods usually used for oocyst detection in fecal samples of cats include the direct wet mount and flotation methods (Villard *et al.*,2016). The present study's objective was to detect the infection rate of Toxoplasma gondii in cats and their women owners of Baghdad city to know the potential threat of cats for humans.

Department of Basic Sciences, College of Dentistry, Baghdad University, Baghdad, Iraq

Corresponding Author: Fadia A. A. Al-Khayat, Department of Basic Sciences, College of Dentistry, Baghdad University, Baghdad, Iraq, e-mail: fadia.khayat@codental.uobaghdad.edu.iq

How to cite this article: Al-Khayat F.A.A. (2022). Detection of Toxoplasma Gondii in Cats and Seroprevalence in Women. Ind J Vet Sci and Biotech. 18(4), 136-138.

Source of support: Nil

Conflict of interest: None.

Submitted: 20/04/2022 **Accepted:** 10/08/2022 **Published:** 10/09/2022

Materials and Methods

Ethical Statement

The current study was approved by the Ethics Committee of College of Dentistry, University of Baghdad (253821). The samples collection was done according to the recommendation of the committee, and consent was obtained from all participants.

Study Design

The study was conducted in Baghdad city, Al-kerkh province from August 2020 to May 2021.

A total of 80 blood samples (40 samples from cat owner and 40 samples from non cat owner) were collected using capillary tubes from adult women who were not pregnant and women who had not faced a miscarriage. At the same time, 80 samples of cat feces (40 domestic and 40 stray cats) were collected for microscopic examination to detect the presence of oocysts of Toxoplasma gondii, signalment and history of cat raising was recorded. The cat owners filled out a questionnaire including the breed, age, sex, and type of the cat food, whether the cat received raw meat, whether the cat was allowed to go out, and the date of sampling.

Toxoplasmosis Detection in Women

The detection of *T. gondii* infection in women was based on lateral flow chromatographic immunoassay for the simultaneous detection and differentiation of IgM anti-T. gondii and IgG anti- T.gondii using a commercial Combo rapid test cassette for whole blood, serum and plasma (BIOZEK medical, No.70). The positive result demonstrated by the appearance of two colored lines for control and test line region (Marques et al., 2015).

Oocysts Detection in Cat Fecal Samples

Two groups of cats were used for the study. Group one included 40 domestic cats of different breeds aged between 1–4 years old, including 13 females and 27 males. The second group included 40 stray cats from different breeds of the same age, including 19 females and 21 males. About 5 grams of fresh feces were collected from each cat in sterile cup. Iodine stains have been used to detect the presence of an oocyst in direct smears. One gram of cat feces was emulsified then filtered through gauze several times, centrifuged at 1000 rpm for 3 min, floated in saturated saline solution after washing for 3 times with deionized water, then a drop of the float was examined under the microscope at 400X and 100X magnifications using the ocular micrometer (Zeiss Company, Germany) for the presence of oocysts. Diagnosis was done according to typical morphological characteristics and standard specifications of Toxoplasma oocyst. Unsporulated oocyst are semi-spherical to spherical and are 10x12 µm in diameter. Sporulated oocyst are semi-spherical to oval and about 11x13 µm in diameter; each contains two ellipsoidal sporocysts 6x8 µm (Dubey and Prowell, 2013).

Statistical Analysis

All statistical analyses were performed using SPSS software (v17.0; SPSS Inc.). Differences of $p<0.05$ were considered significant and $p<0.01$ were considered highly significant

Table 1: Infection rate of toxoplasmosis in women

Women	Samples No.	Positive No.	P-value
Cats owner	40	12 (30)	0.004 S
Non-cats owner	40	7(17.5)	
Total	80	19 (23.75)	

Results and Discussion

The results indicate significant differences ($p<0.05$) in T. gondii infection (Table 1), in cats owner women (30.00%), compared to non cats owner women, (17.50%) with an overall infection rate 23.75% (19/80).

The total seroprevalence of T.gondii IgG antibody was shown in 13 women out of 19 (68.42%), including 8 (42.1%) and 5 (26.31%) for cats owner and non cats owners, respectively giving evidence of previous exposure. No seroreaction of IgM antibody was recorded except with IgG antibody, which gives evidence of current and past infection with 21.05% for cats owner and 10.52% for non cats owner having a significant difference ($p<0.05$).

Highly significant differences ($p<0.001$) were recorded in the infection rate between domestic and stray cats. Four out of 40 domestic cats recorded a positive result indicating an infection rate 10.00%, while in stray cats, 9 positive cases were recorded out of 40 with infection rate 22.50%. The overall 16.25% infection rate was recorded (Table 3)

The results indicated that toxoplasmosis infection in women (23.75%) was less than in previous studies. In a study in Al-Muthanna province, the infection rate with toxoplasmosis in pregnant women reached 44.5% (Al Se´adawy, 2010). Similarly, in Nineveh province, a study indicated the rate of toxoplasmosis was 32–43% (Ehsan, 2013).

The results showed that a higher rate of chronic (IgG antibodies) and acute infection (IgM with IgG antibodies) was recorded among the cats owner women. A study showed out of the total infection rate 8.00%, IgM detection rate was 11.00%, while IgG was 44% (Alsaide et al., 2019). Seroprevalence results of a study conducted in Basra, Iraq showed 2 patients were positive for IgM (1.13%) while 20 (11.3%) patients out of 177 were positive for IgG antibodies.

A lower rate of infection (10.00%) in domestic cats than stray cats (22.5%), with a highly significant difference, may be due to a healthy diet in domestic cats which were not allowed to roam outside compared to stray cats which can eat birds and rodents (Ali, 2018). Owning cats was associated with toxoplasmosis in women. This was in contrast to some previous studies (Andiappan *et al.,* 2014; Wam *et al.,* 2016),

Table 2: Seroprevalence of IgM and IgG in women

Women	*Positive No.*	*Sero reaction IgM*	*Sero reaction IgG*	*Sero reaction IgM & IgG*	*Total Rate%*
Cats owner	12	0	8(42.1%)	4(21.05.%)	63.16
Non cats owner	7	0	5(26.31%)	2(10.52%)	36.84
Total	19	0	13(68.43%)	6 (31.57%)	100
	P-value				0.036 P<0.05 significant

Cats	*Samples No.*	*Positive No.*	*Rate%*	*p-value*
Domestic	40	4	10.0	p<0.001 HS
Stray	40	9	22.5	
Total	80	13	16.25	

where exposure to other sources of infection, such as eating infected meat that is not well cooked or exposure to the soil contaminated with millions of oocyst may result in infection.

Conclusion

The present investigation showed a higher prevalence rate of toxoplasmosis infection in women having cats and on the other hand, the infection rate was higher in stray cats as compared to domestic cats, which indicated cats can act as a source of infection to humans.

Conflict of Interest: Author declares no conflict of interest
Funding: Self-funded.

References

Abdel-Rahman, M.A.M.(2017). Toxoplasmosis in man and animals. Journal of Chemical Enviornment and Health, 3(2), 54–73

Al Se´adawy, M.A.H. (2010). Prevalence of Toxoplasmosis in pregnant women in Al Muthana province / Iraq. *Kufa Journal For Veterinary Medical Sciences*, 1(1), 166-173.

Ali, S.I. (2018). Epidemiological Survey of Toxoplasmosis among Aborted Women in Garmian district, Kurdistan Region, Iraq. *2nd International Conference on the Health & Medical Sciences*, 140–145.

Alsaide, F.M., Elagib, A.A., El-Rayah, I.E., & Hamad, M.N.M. (2019). Immunological and molecular diagnosis of T. gondii infection among aborted women in Sana'a Capital and Capital Trusteeship, Yemen. *International Journal of Medicine Research and Health Sciences*, 8(7), 122-133.

Andiappan, H., Nissapatorn, V., Sawangjaroen, N., Lau, Y. l., et al. (2014). Toxoplasma infection in pregnant women: a current status in Songklanagarind hospital, southern ailand. P*arasite & Vectors*, 22, 239.

Cuomo, G., D'Abrosca, V., Rizzo, V., et al. (2013). Severe polymyositis due to Toxoplasma gondii in an adult immunocompetent patient: a case report and review of the literature. Infection, 41, 859–862.

Decavalas, G., Papapetropouloun, M., Giannoulaki, E., Tzigounis, V., & Kondakis, X.G. (1990). Prevalence of Toxoplasma gondii antibodies in gravidas and recently aborted women and study of risk factors. *European Journal of Epidemiology*, 6, 223-226

Dubey, J.P., & Prowell, M. (2013). Ante-mortem diagnosis, diarrhea, oocyst shedding, treatment, isolation, and geneti typing of Toxoplasma gondii associated with clinical toxoplasmosis in a naturally infected cat. *Journal of Parasitology*, 99, 158-160.

Ehsan, G.Z. (2013). Comparative Study of Hematology Changes and Therapeutical Effect of Toxoplasmosis in Nineveh's women and Small Ruminants. *Basrah Journal of VeterinaryResearch*, 12(1), 1-10.

Flegr, J., Prandota, J., Sovickova, M., & Israili, Z.H. (2014).Toxoplasmosis a global threat.Correlation of latent toxoplasmosis with specific disease burden in a set of 88 countries. Plos one, 9(3), e 90203.

Jenkins, E.J., Simon, A., Bachand, N., & Stephen, C. (2015). Wildlife parasites in a one health world. Trends in Parasitology, 31, 174-180.

Khan, M.U., Rashid, I., Akbar, S., Islam, S., Riaz, F., Nabi, H., Ashraf, K. & Singla, L.D. (2017). Sero-prevalence of Toxoplasma gondii in South Asian Countries. *Review of Scientific and Technical OIE* 36(3), 981-996.

Liu, Q., Singla, L.D. & Zhou, H. (2012) Vaccines against Toxoplasma gondii: Status, challenges and future directions. Human Vaccines & Immunotherapeutics 8(9), 1305-1308.

Marques, B.A., Andrade, G.M.Q., Neves, S.P.F., Pereira, F.H., & Talim, M.C.T. (2015). Systematic review of serological methods used in prenatal screening of toxoplasmosis in pregnant women. Revista Médica de Minas Gerais, 25, S68–S81.

Tenter, I.S., Heckeroth, A.R., & Weiss, L.M. (2010). Toxoplasma gondii: from animals tohumans. *International Journal of Parasitology*, 30, 1217–1258.

Villard, O., Cimon, B., Ollivier, C.L., Fricker-Hidalgo, H., Godineau, N.,et al. (2016). Serological diagnosis of Toxoplasma gondii infection. Recommendation from the French National Reference Center for Toxoplasmosis. *Diagnostic Microbiology and infectious Disease*, 84(1), 22-23

Wam, E.C., Sama, L.F., Ali, I.M., Ebile, W.A., Aghangu, L.A., Tume, C.B. (2016). Seroprevalence of Toxoplasma gondii IgG and IgM antibodies and associated risk factors in women of child-bearing age in Njinikom, NW Cameroon. BMC Research Notes, 9(1), 406.

Weiss, L. M., & Kim, K. (2013). Toxoplasma gondii: The Model Apicomplexan - Perspectives and Methods: Elsevier Ltd..Edn. 2nd, https://doi.org/10.1016/C2011-0-07157-0

Zhou, H., Zhao, Q., Singla, L.D., Min, J., He, S., Cong, H., Li, Y. & Su, C. (2013). Differential proteomic profiles from distinct Toxoplasma gondii strains revealed by 2D-difference gel electrophoresis. Experimental Parasitology 133(4), 376-382.