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A study of the Prevalence of Toxoplasma gondii in Cats in Some Region of Nasiriyah City, Southern Iraq.

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Abstract

This study aimed to determine infection rate of Toxoplasma gondii in Al-Nasiriyah / Iraq, in some regions. A total of 100 fecal samples were collected from cats , including samples from cats shelters and local domestic cats. Oocysts were identified using standard laboratory methods, including the direct wet smear method and flotation technique. According to the findings, the infection rate was 30% of all samples, but it climbed to 35.71% in February without being statistically significant. The infection rate was higher in female cats (33.96%) than in male cats (25.53%). The cats shelters had a higher infection rate than local domestic cats 32.5% vs 28.33%, respectively, which not statistically significant. The study concludes that conventional method for diagnosing T. gondii in cats was efficient, and the infection of T. gondii in cats was increased in moderate and cold months.

Key words: Toxoplasma gondii, cats, local, female

الملخص

هدفت هذه الدراسة إلى تحديد معدل الإصابة بطفيلي Toxoplasma gondii في بعض مناطق الناصرية / العراق. تم جمع 100 عينة براز من القطط، شملت عينات من قطط في المحميات وأخرى من قطط منزلية محلية. تم التعرف على الأكياس البيضية باستخدام الطرق المختبرية القياسية، بما في ذلك طريقة المسحة الرطبة المباشرة وتقنية التعويم. أظهرت النتائج أن معدل الإصابة الكلي بلغ 30% من إجمالي العينات، وقد ارتفع خلال شهر فبراير إلى 35.71%، دون وجود فروق معنوية . كما كانت نسبة الإصابة في الإناث أعلى من الذكور، حيث بلغت 33.96% مقابل 25.53% على التوالي. وُجد أن معدل الإصابة في القطط الموجودة في المحميات كان أعلى من القطط المحلية، بنسبة 32.5% مقابل 28.33% على التوالي، وذلك أيضاً دون وجود فروق ذات دلالة إحصائية. خلصت الدراسة إلى أن الطرق التقليدية لتشخيص Toxoplasma gondiiفي القطط كانت فعالة، وأن معدل الإصابة يزداد خلال الأشهر المعتدلة والباردة.

الكلمات المفتاحية: التوكسوبلازما غوندي ، القطط المحمية ، المحلية ، الاناث

Introduction

Toxoplasma gondii is an intracellular coccidian parasite that causes toxoplasmosis, a zoonotic illness (1,2). *T.gondii* belongs to the Class Sporozoa, Subclass Coccidia, Family Sarcocystidae, Subfamily Toxoplasmatinae, and Phylum Apicomplexa (3; 4). (5) states that toxoplasmosis is a common protozoan disease. *T. gondii* is named after the mouse Ctenodactylus gundi, which was isolated for the first time in 1908; (6, 7) Although it can essentially infect any type of nucleated cell in its hosts, it preferentially uses one depending on the infection phase and developmental stage.

Toxoplasmosis is a protozoan illness that is widespread and millions of oocysts are excreted daily in the feces of cats, the only

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known definitive host for this parasite, which sporulates and spreads across the environment (8). Globally, there are notable differences in the disease's prevalence (9). For example, the frequency of toxoplasmosis may reach 60% in some populations in Europe, whereas it may approach 90% in certain demographic groups in highly endemic regions, such as parts of Africa (10). *T. gondii* is thought to infect at least one-third of the world's population, making it one of the most prevalent parasite illnesses globally (11). According to (12), the regions with the greatest documented rates of toxoplasmosis are Africa, the Middle East, Southeast Asia, Central Europe, Latin America, and Eastern Europe.). In stray cats in Kurdistan, Iraq. The impact of toxoplasmosis on Iraqi public health can be lessened by conducting additional research to develop a more accurate epidemiological profile, improve surveillance systems, and carry out focused interventions (13).

Tachyzoites, cysts, and oocysts are among their several forms (14). The first type is a trophozoite, which is 4-6 microns long and 2-3 microns wide. It has a karyosome in the center of its crescent-shaped nucleus (2). Tachyzoites, which are vulnerable to proteolytic enzymes, are frequently eliminated during gastric digestion (15). Bradyzoites are parasites that are produced when various proteolytic enzymes in the host's stomach break down digested tissue cysts (16).

The third stage, oocysts, are found in the cat's intestines and are usually expelled in the feces. They can withstand temperatures of 24°C for 10 months or 37°C for 28 days, especially if they have sporulated (17,18). Cats that consume any of the three infectious stages of *T. gondii* tachyzoites, bradyzoites, and sporozoites—shedding oocysts (19, 20). According to (21), this parasite is global and does not have host specificity.

Felidae have a sexual cycle, whereas all warm-blooded animals have a two-stage asexual cycle (22). Millions of oocysts are released every day in the feces of cats, the only known definitive host for *T. gondii*, which sporulates and spreads throughout the environment via both the sexual and asexual life cycles (8). Oocysts sporulate after being released into the environment and can infect more hosts (2). These are extremely resistant to environmental influences and can endure for a year or more (22). While domestic cats only have oocyst shedding 1-3 weeks after the initial infection, feral cats may occasionally experience it throughout their lives (23). Soil chemistry, temperature, texture, and other geological and environmental factors have a major impact on T. gondii oocyst survival (24).

Oocysts can be excreted in the feces for a few days after a cat has an initial infection (22). Typically, sporulation takes one to seven

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days, depending on factors including temperature and aeration (25). Animals, especially household pets like dogs, cats, and birds, are known to transmit this parasite (26). By using direct microscopy to find tachyzoites or tissue cysts, *T. gondii* can be diagnosed directly (27).

Materials and methods

One hundred fecal samples were taken from cats in the Nasiriyah regions, including samples from domestic cats of both sexes and cats in protected shelters. From October 2024 until February 2025, a study was carried out. Clean plastic containers were used to store the feces samples. The remainder of the sample was moved to the College of Veterinary Conventional Examinations' Parasitology Laboratory. Oocysts were detected using standard laboratory techniques based on direct wet smear and flotation techniques for laboratory diagnosis. The parasite was recognized based on its morphological characteristics following treatment with potassium dichromate. Oocysts in feces are used to diagnose cats (28).

Laboratory methods

Direct wet smear:

After mixing 1 gram of excrement with 10 milliliters of regular saline solution (0.9%), the particle suspension was removed using gauze and put on a sanitized slide with a cover slide. The slide was examined under a microscope with low (100) and high (400) magnification in order to find *T. gondii* oocysts (29 and 30).

Flotation technique:

Ten milliliters of water were added to about one gram of fecal material, which was then filtered through gauze. The mixture was centrifuged and allowed to settle until the supernatant was transparent. The sediment was thoroughly mixed with saturated sodium chloride and centrifuged at 1500 rpm for 10 minutes while the supernatant was disposed of in a centrifuge tube without disturbing the sediments. The oocysts stuck to the cover slip after floating to the top. Using a low (100) and high power (400) microscope, the cover slip was inverted on the glass slide and examined for *T.gondii* oocysts (31).

Results and discussion

A study recorded a total of 100 samples collected to reveal the prevalence of toxoplasmosis in some regions in Al-Nasiriyah. Total infection rate reached 30%. The rate of infection recorded in our study is less than that of (32) in stray cats in Baghdad (66%) and also less than the result of (33) in India (55.2%). On the other hand, the rate of infected cats in our study was higher than that of (34) in Malaysia and higher than the results of (35) in district Buner in Pakistan, who recorded a total ratio of (23.86%). Our results are also higher than those of (36) and (37), who found ratios of (0.59%) and (1.3%),

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respectively. The differences in infection rate may depend on the number of samples and the sampling seasons.

The parasite was detected by microscopy and identified by morphological characteristics (Figs. 1, 2).

The results of the *T. gondii* infection rate showed an increase in infections during the months of February and November with a rates of 35.71% and 35%, respectively ($P<0.05$) compared to other months of the study, , without significant differences (Table 1). These results are exactly similar to the results of (35) in the Buner district in Pakistan, who recorded an increased ratio in the same mentioned months compared to the other months; their results were 25.9% and 25.7% in February and November, respectively.

This may be attributed to the cold climatic conditions during these months, which are favorable for the growth and development of oocysts, in comparison to the moderate or warmer environmental conditions in other months (38, 35).

Sporozoites develop in oocysts after (1–5) days of exposure to oxygen and appropriate environmental temperature and humidity. Sporulated oocysts can survive in the environment for months to years and are resistant to most disinfectants (39).

Regarding the rates of *T. gondii* infection in cats in the current study areas based on the sex of the cats, a higher infection rate was observed in female cats compared to males, although there were no significant differences between the two sexes. Female cats recorded an infection rate of 33.96% compared to 25.53% in males with no significant difference (Table 2). It may be due to the number of samples or the health status of the females during the pregnancy and lactation season. The increased rate of female cat infection with *T. gondii* in comparison to male cats was agreed as recorded (33%) in Baghdad.

On the other hand, a higher rate of *T. gondii* infection was observed in exotic (pet) cat breeds compared to local breeds in different regions Thi qar , with rates of 32.5% and 28.33%, respectively. However, there were no significant differences between the two cat breeds under study. This may be due to the increasing popularity of raising exotic cats in Iraq and the lack of proper healthcare provided by some households, making them more susceptible to infection compared to local breeds (34).

Differences in lifestyle and diet play an important role in explaining shedding variation between free-ranging unowned domestic cats, owned domestic cats, and wild felids. Domestic cats are probably the major source of contamination since oocyst formation is greatest in domestic cats (40).

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Our result was in contrast with that of (34), who noticed that the rate of infected stray cats in Malaysia was higher than that of pet ones. The difference in results between studies may be due to the difference in the care programs, especially for pet cats, depending on the country of study.

Conclusions:

The total rate of cat Toxoplasmosis infection relatively high in Nasiriyah regions especially in female pet cats specifically in moderate and cold months. It is essential to provide cats with proper health care and a food from reliable sources. Regular veterinary care is also necessary for domestic cats.

Conflicts of interest

There are no conflicts of interest.

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Table 1. Rate of infection by *T. gondii* in cats according to study months.

Month	Number of samples	Number of infected samples	Ratio of infected samples (%)
October	15	3	20
November	20	7	35
December	15	3	20
January	22	7	31.81
February	28	10	35.71
Total	100	30	30
X^2		**2.13**	
P value		**0.711(NS)**	

NS: No significant differences at P<0.05)

Table 2. Rate of infection by *T. gondii* in cats according to Cat gender **.**

Sex of cats	Number of samples	Number of infected samples	Ratio of infected samples (%)
Female	53	18	33.96
Male	47	12	25.53
X^2		**0.843**	
P value		**0.359(NS)**	

NS: No significant differences at P<0.05)

Table 3. Rate of infection by *T. gondii* in Locally Cats and Cats shelters

Breed of cats	Number of samples	Number of infected samples	Ratio of infected samples (%)
Locally cats	60	17	28.33
Sanctuary Cats	40	13	32.5
X^2		**0.198**	
P value		**0.656(NS)**	

NS: No significant differences at P<0.05)

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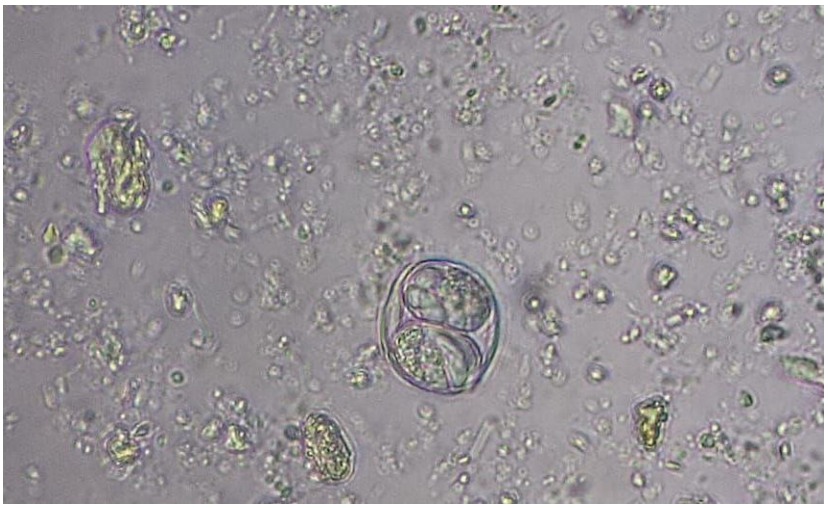

Figure 1.Sporulated oocyst of *Toxoplasma gondii* 40X.

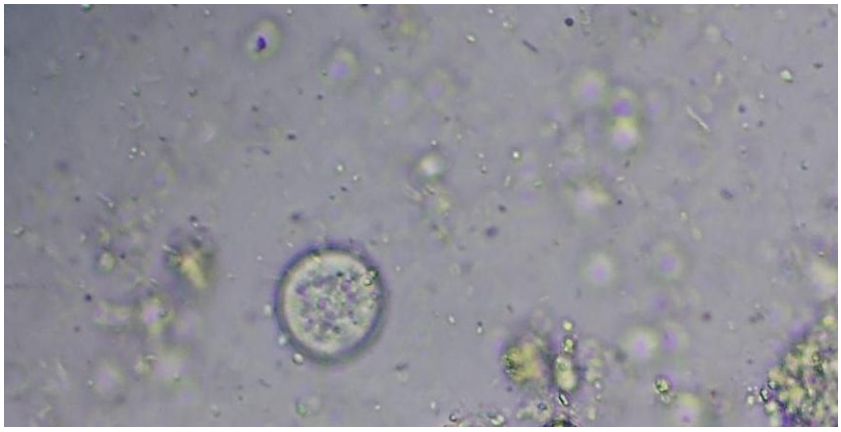

Figure 2.Non-sporulated oocyst of *Toxoplasma gondii* 40X.