

Detection of Intestinal Parasites in Domestic Cats in Mosul City, Iraq

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Abstract

Gastrointestinal parasites are a major source of disease in cats in the tropics, and are a major cause of public health problems in many parts of the world. This study was conducted to investigate the intestinal parasites of domestic cats and infection rates according to age of the animal. Fifty fecal samples collected from domestic cats in Mosul city during the period from October 2019 Until the end of January 2020. Eleven species of intestinal parasite were identified in the feces of domestic cats included three genera of Nematodes: *Toxocara cati* (16%), *Toxascaris leonina* (8%), *Ancylostoma tubaeforme* (8%), two genera of Cestodes: *Taenia taeniformis* (4%), *Diphylobothrium latum* (2%) , one genus of the Trematodes: *Schistosoma intercalatum* (2%) and five species of intestinal protozoa: *Isospora felis* (32%), *Isospora rivolta* (28%), *Cryptosporidium* spp. (10%), *Entamoeba coli* (12%), *Toxoplasma like oocyst* (6%). The total infection with intestinal parasites was (64%). The highest rate of infection was *Isospora felis* (32%), followed by *Isospora rivolta* (28%). This is the first record of *Isospora* genus in the Mosul city, also recorded in this study for the first time in Iraq, the infection of cats with the parasite *Schistosoma intercalatum* (2%) and the infection with *Entamoeba coli* (12%) is the first record in the Mosul city. No significant differences were observed in the infection rates with different parasites between the age groups of animals and between the types of infection with different species of intestinal parasites in domestic cats.

Keywords: Intestinal parasites, Nematodes, Protozoa, Domestic cats, Mosul city.

الكشف عن الطفيليات المعوية في القطط المنزلية في مدينة الموصل

الخلاصة

تعد طفيليات المعدة والأمعاء مصدرا رئيسيا للأمراض في القطط في المناطق الاستوائية ، وهي السبب الرئيسي لمشاكل الصحة العامة في العديد من أنحاء العالم. أجريت هذه الدراسة لمعرفة الطفيليات المعوية التي تصيب القطط المنزلية ومعرفة نسب الإصابة بالأنواع المختلفة من هذه الطفيليات وعلاقتها مع عمر الحيوان، وذلك من خلال فحص (50) عينة براز تم جمعها من القطط المنزلية في مدينة الموصل خلال الفترة من شهر تشرين الأول 2019 ولغاية نهاية شهر كانون الثاني 2020 . أظهرت الدراسة الحالية تحديد 11 نوعا من الطفيليات المعوية في براز القطط المنزلية وشملت ثلاثة أجناس من الديدان الأسطوانية هي : *Toxocara cati* (16%)، *Toxascaris leonina* (8%)، *Ancylostoma tubaeforme* (8%) ، و جنسان من الديدان الشريطية هي: *Schistosoma intercalatum* (2%) و *Diphylobothrium latum* (2%) و *Taenia taeniformis* (4%) و جنس واحد من المتقويات : *Schistosoma intercalatum* (2%) وخمسة أنواع من الأولي المعوية هي: *Isospora felis* (32%)، *Isospora rivolta* (28%)، *Cryptosporidium* spp. (10%)، *Entamoeba coli* (12%)، *Toxoplasma like oocyst* (6%).

أظهرت النتائج نسبة الإصابة الكلية بالطفيليات المعوية كانت (64%) . و أعلى نسبة إصابة كانت بالطفيلي *Isospora felis* (32%) تلتها الإصابة بالطفيلي *Isospora rivolta* (28%) وبعدها هذا التسجيل الأول بهذا الجنس في مدينة الموصل، كما سجلت في هذه الدراسة ولأول مرة في العراق إصابة القطط بالطفيلي *Schistosoma intercalatum* (2%) وكانت نسبة الإصابة بالطفيلي *Entamoeba coli* (12%) وبعدها التسجيل الأول في مدينة الموصل. و لوحظ انعدام الفروقات المعوية في نسب الإصابة بالطفيليات المختلفة بين الفئات العمرية للحيوانات وبين أنماط الإصابة بالأنواع المختلفة من الطفيليات المعوية في القطط المنزلية.

Introduction

Gastrointestinal parasites are a major source of disease in cats in the tropics, and are a major cause of public health problems in many parts of the world (1). Cats act as (vector, storage, and final) hosts for many intestinal parasites of humans (2,3). Domestic cats are among the causes of many common diseases between humans and animals, which cause severe health problems (4,5).

Although many countries have adopted preventive and curative measures, intestinal parasites such as roundworms (6), and protozoa (7) are usually detected by different techniques for detecting parasites in cat fecal samples. (8,9), where these animals play an important role in the transmission of parasites to humans and other animals by excreting eggs and larvae of worms, cysts and oocysts of intestinal protozoa in their faeces and thus have a major role in environmental pollution (10,11).

Cats also play a key role in the epidemiology of common pathogenic parasites, such as *Ancylostoma caninum*, *Ancylostoma braziliense* (12), *Toxocara* spp., *Dipylidium caninum* (2,13), *Cryptosporidium* spp. and *Giardia* spp. (14,15).

Many researchers have been interested in studying the most important types of intestinal parasites that infect cats, their prevalence and diagnosis. For example, in China, the rate of infection of cats with intestinal parasites was recorded at a total rate of 41.39% (16), and in the Kashan in Iran, (17) recorded infecting stray cats with different species of intestinal worms and protozoa, with a total infection rate of (95.6%).

In Iraq, (18) recorded the infection of domestic cats and stray cats in the Diwaniyah with ten different species of stomach and intestine parasites, with a total infection rate (47.77%), and in the Kirkuk, (19) recorded that stray cats were

infected with (*Toxocara canis*, *Ancylostoma caninum*, *Toxocara cati* and *Ancylostoma tubaeforme*) with a total infection rate 77.08%. In Mosul, (20) isolated different species of parasitic worms from stray cats, with a total rate (90.9%). (21) recorded infection of stray cats with *Cryptosporidium* spp. (52%). In view of the seriousness of these intestinal parasites to domestic cats and the common diseases they cause between cats and humans, and to strengthen studies on cats infected with intestinal parasites in the Mosul. The aim of this study is identification of intestinal parasites in domestic cats in Mosul city.

Materials and methods

Sample collection

The study included the examination of fifty fecal samples collected randomly from domestic cats, whose ages ranged between (< 1 year) and (> 1 year), from both sexes. The samples were collected from October (2019) to the end of January (2020), from different areas of Mosul city. Samples were collected in nylon claves, were placed in clean plastic bottles, on which the animal number, sex, and date of obtaining the sample were recorded and transferred to the Parasitological Research Laboratory at the College of Veterinary Medicine, for laboratory examinations.

Macroscopic examination:

A macroscopic examination of fecal samples was performed to observe any worms if present (10).

Microscopic examination:

Several methods used for the purpose of diagnosis:

Direct Smear Method (22), Direct smears with the addition of iodine stain (23), Cold Modified Acid-Fast Stain (24), Sheather's Sugar

Flotation (25,26,27), Sedimentation Method (28).

Eggs, larvae of nematodes, cestodes, trematodes, cysts and oocysts of intestinal protozoa were diagnosed by measuring the sizes of eggs, larvae and oocysts of parasites using a micrometre of the ocular lens (22,29,30).

Measurements and photography

The sizes of helminth eggs, cysts and oocysts of protozoa were measured using an ocular micrometre, and calibration was performed with a stage micrometre with magnification powers of 40 X and 100 X (22).

Statistical analysis

The results obtained using SPSS were analyzed using Chi-square at the level of significance ($p < 0.05$), (31).

Results and Discussion

The results showed that the total infection rate with the intestinal parasites in domestic cats in Mosul city was 64% by examining fifty fecal samples of both sexes and different ages. In this study, 11 species of intestinal parasites were diagnosed, the highest was *Isospora felis* (32%), followed by *Isospora rivolta* (28%), this is the first recording of these two species in Mosul. While the lowest rate was (2%) for each of *Schistosoma intercalatum* and *Diphyllobothrium latum*. *Schistosoma intercalatum* was recorded for the first time in cats in Iraq in this study, and the infection rate with *Entamoeba coli* was (12%), and this is the first recording in Mosul. Table (1).

Table (1) Infection rates of intestinal parasites in 50 fecal samples of cats in Mosul city

Parasite species	Infected cats	% Infection
<i>Toxocara cati</i>	8	16
<i>Toxascaris leonina</i>	4	8
<i>Ancylostoma tubaeforme</i>	4	8
<i>Taenia taeniaeformis</i>	2	4
<i>Diphyllobothrium latum</i>	1	2
<i>Schistosoma intercalatum</i>	1	2
<i>Isospora felis</i>	16	32
<i>Isospora rivolta</i>	14	28
<i>Cryptosporidium</i> spp.	5	10
<i>Entamoeba coli</i>	6	12
<i>Toxoplasma like oocyst</i>	3	6

Depending on the sizes and shapes of eggs and larvae of worms, oocysts and cysts of protozoa, different species of worms and intestinal protozoa were diagnosed in domestic cats (Figure1)

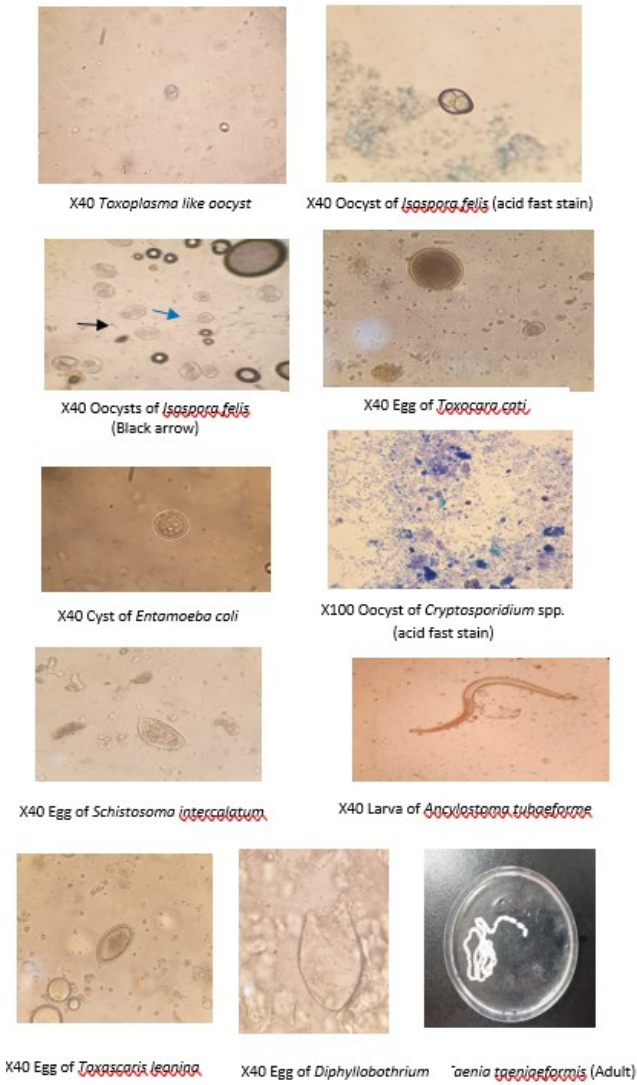


Figure (1) Eggs, larvae of worms, oocysts and cysts of intestinal protozoa in domestic cats.

The results indicated that the infection rate in group age (< 1 year) was (78.94%) of the total 19 samples examined, while in group age (> 1 year) the infection rate was (54.83%) of the total 31 samples examined, there was no significant difference in infection rates among different age groups, table.(2)

Table (2) Infection rates of intestinal parasites in domestic cats according to age.

Age	Examined cats	Infected cats	% Infection
< 1 year	19	15	78.94
> 1 year	31	17	54.83
Total	50	32	64.00

There is no significant difference at the level of significance (P<0.05).

For the types of infection with intestinal parasites in domestic cats, the study showed that the single infection was (37.50%), the double infection was (21.87%), while the mixed infection with three or more types recorded (40.62%), there was no significant difference in types of infection with different species of intestinal parasites, table (3).

Table (3) Types of infection with intestinal parasites in domestic cats.

Type of infection	Infected cats	% Infection
Single infection	12	37.50%
Double infection	7	21.87%
Mixed infection	13	40.62%
Total	32	64.00

There is no significant difference at the level of significance (P<0.05).

The current study revealed that domestic cats in the Mosul city were infected with different species of parasitic worms and intestinal

protozoa, the total percentage of infection was (64%), the results were in agreement with (32) who recorded (67%) of infections with intestinal parasites in stray cats. The results were low compared to those (17,19,20) who referred to infection of stray cats with internal parasites (97.3%), (77.08%), (90.9%) respectively. While the results were higher than those (16,18,33,34,35) who recorded the infection of domestic and stray cats with intestinal parasites with a total rate (41.39%), (47.77%), (48.7%), (41%), and (24.5%) respectively. The differences in the obtained species and genera of intestinal parasites and their percentages may be due to agents may mainly include the climate, type of rearing (domestic, stray cats), age and sample size of examined animals, season, temperature and relative humidity of the study area, treatment methods, medicines used, techniques used for examination of the samples), (36).

Eleven species of parasitic worms and intestinal protozoa with different infection rates were diagnosed in domestic cats. The highest was *Isospora felis* (32%), followed by *Isospora rivolta* (28%). These two species were the first recording in Mosul city, *Cryptosporidium* spp. (10%), *Entamoeba coli* (12%), the results were in agreement with (37,38), cats also were infected with *Toxoplasma* like oocyst (6%), and the result was slightly higher than (16), who recorded (3.06%). Infection of cats with intestinal parasites occurs by ingesting food and water contaminated with helminth eggs, larvae, cysts and oocysts of protozoa, then excreting them into the environment through feces, causing environmental pollution, as cats play a major role in transmitting these parasites to the human (39).

The study also showed that domestic cats were infected with three genera of nematodes. *Toxocara cati* (16%), the results were in agreement with (16,40), while the findings were in contrast to (20,35,41) results who mentioned that cats were infected with *Toxocara cati* (40%),

(13%), (6.45%) respectively. The cats bury their feces in the soil, which increases the possibility of *Toxocara cati* eggs spreading, as these eggs have the ability to resist environmental conditions and can remain infectious for many years that lead to infection of children who play in contaminated gardens with these eggs due to contaminated soil and lack of hygiene (42). Also, cats were infected with *Toxascaris leonina* (8%), the results were close to (18,19) who recorded (6.97%), (6.25%) in the Diwaniyah and Kirkuk cities respectively. Cats were also infected with *Ancylostoma tubaeforme* (8%), this result was less than (18, 19,20), who recorded infection of cats with *Ancylostoma tubaeforme* (23.25), (22.92%) and (30%), respectively. The difference in infection rates may be due to the different geographical area, environmental conditions, numbers and types of cats examined, and the different methods used in diagnosis.

The study revealed that cats were infected with *Taenia taeniaeformis* (4%), the result was in agreement with (18), who recorded infection of cats with *Taenia taeniaeformis* (4.65%), the study also showed infection of cats with *Diphyllobothrium latum* (2%), the result was less than (19) who recorded 6.25%. The current study indicated that domestic cats were infected with *Schistosoma intercalatum* (2%), this is the first recording in cats in Iraq, while (43) referred to the infection of cows in Nineveh Governorate with *Schistosoma intercalatum*, these worms are common in humans and ruminants such as sheep and cows, and in other pets.

Conclusions

We conclude from this study that domestic cats were infected with different species of intestinal parasites: *Isospora felis*, *Isospora rivolta*, *Entamoeba coli*, which were the first recording in Mosul city. The study also revealed that cats were infected with *Schistosoma intercalatum*, this was the first recording in cats of Iraq.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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