Toxoplasmosis, Prevalence of *Toxoplasma gondii* Parasitic in Domestic Cats in Al-Marj City - Libya

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**Abstract.**

During this study, 54 fecal samples were examined from domestic cats in the city of Al-Marj during the period between May to July (2022). These fecal samples included all age groups, as they were divided into two groups, the first age group (one month - 11 months) the second age group (12 months - 8 years), and it included the two breeds (Arabic and Persian). Where the cat fecal samples were applied to Flotation Technician, and it was analyzed in the laboratory of the Higher Institute of Medical and Technical Sciences - Al-Marj. This study showed the total prevalence of *Toxoplasma gondii* parasite among domestic cats, which was (11%), of different ages and breeds of the cats, where the number of samples infected with this parasite is 6 samples from the total number of samples which is 54 samples. The prevalence of the *Toxoplasma gondii* in female higher than male was (11%, 10%). During the age groups the prevalence of infection with Toxoplasma parasite in the first age group (1 - 11 months) was (6.90%) and the second age group (12 months - 8 years) was (16%). The prevalence of the parasite in the Arab strain was higher than that of the Persian strain (16.66% - 9.75%) respectively.

**Key words:** *Toxoplasma gondii*, Domestic Cats, laboratory, Al-Marj - Libya
داء المقاوسات، معدل انتشار طفيل المخوسة الغوندية في القطب المنزلية

مدينة المرج - ليبيا

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الملخص:

خلال هذه الدراسة تم فحص 54 عينة براز من القطب المنزلية المتواجدة داخل المنازل في مدينة المرج خلال الفترة الواقعة ما بين بداية شهر مايو إلى نهاية شهر يوليو للعام 2022، هذه العينات شملت كل الفئات العمرية، حيث تم تقسيمها إلى فئتين عمريتين، الفئة الأولى من عمر ( شهر - 11 شهرا) والفئة العمرية الثانية (12 شهرا - 8 سنوات) وشملت السلالتين (العربية والفارسية). حيث طبنت على عينات براز القطب طريقة الطفو بالحلول السكري (Sucrose Flotation Technician) وتم تحليلها في مختبر المعهد العالي للعلوم الطبية والتقنية - المرج، وتعتبر هذه الدراسة من أوائل الدراسات التي بمنى انتشار هذا الطفيل في Toxoplasma gondii بكسبت الإصابات بطفيل Toxoplasma gondii في السلالة العربية أعلاً من السلالة الفارسية وشكلت نسبةً (9.75% ، 16.66%) كانت عالية Toxoplasma gondii على التوالي. هذه الدراسة بان نسبة الإصابة بطفيل جداً في القطب المنزلية مقارنةً بالدراسات الأخرى التي تمت في الدول المجاورة العربية وبقى دول العالم وهذا ما توصلت إليه هذه الدراسة.

الكلمات المفتاحية: المخوسة الغوندية، القطب المنزلية، المعامل، المرج - ليبيا.
Introduction.

The Parasites cause various health problems for humans and animals, among these parasites are protozoa, which are considered the pathogens, and among these protozoa is sporozoa, due to their wide distributions [1]. Toxoplasmosis is one of the more common parasitic that the distribution worldwide and another disease caused by infection with the obligate intracellular parasite called *Toxoplasma gondii* that infects a variety of hosts including humans, domestic and wild animals [2]. *Toxoplasma gondii* was first observed in (1900) in part of the spleen and bone marrow of Sparrow finches on the Chinese island of Java, after that the final description of this parasite was given by the two scientists Nicolle and Manceaux in (1908). While working at the Pasteur Institute in Tunisia and discovered a single-celled organism It lives in the tissues of one of the hamster-like rodents known as *Ctendodactylus gundi*, Which lives in North Africa in Tunisia [3]. The name of *Toxoplasma gondii* was by Nicolle and Manceaux (1908), based on the crescent shape of the Tachyzoites In Greek toxo that mean arc and the plasma that mean form. The medical importance of *Toxoplasma gondii* remained unknown until 1939, when it was identified in tissues of a congenitally infected infant, in 1948 led to the recognition that *Toxoplasma gondii* is a common parasite of warm-blooded hosts with a worldwide distribution [4] and [5].

Toxoplasmosis its worldwide distribution, the parasite found in Almost every country of the world and in all warm-blooded animals including humans, and considered to be the most successful known parasite because the ability to manipulate the immune system and Establish a chronic infection [6].

About one-third of the world’s human population infected with the Parasite, the successful of the parasite to transmission to human due to its efficient the ingestion of tissue cysts in undercooked infected meat or the ingestion of Oocysts in contaminated vegetables and water [7].

Wild and domestic cats play important role in the spread of *Toxoplasma gondii* infections by shedding resistant Oocysts in the environment, hence serving as a significant source of Infection for food animals and humans [8]. The spread of infection increases in warm and humid areas, while it decreases in cold and dry areas and the prevalence of the parasite increases in people who constantly come in to contact with the soil, and who eat undercooked meat. Toxoplasmosis is transmitted to humans by eating contaminated raw fruits or vegetables or drinking water contaminated with oocysts that cats excrete with their faces [9].

Aims of study.

Due to the spread of *Toxoplasma gondii* parasite all over the world, especially in hot and humid areas, as is the case in Libya and the lack of previous studies of this parasite in Libya. Especially in the Al-Marj city, the health problems this parasite causes to humans and animals, especially pregnant women and newborns, this study aims to:

1- Knowing the prevalence of the parasite *Toxoplasma gondii* among domestic cats living in the city of Al-Marj.
2- Knowing the prevalence of *Toxoplasma gondii* parasite and its relationship during the age group, gender and breeds, during the period of the study in 2022.

**Materials and methods.**

**Study area.**

Al-marj is a city located in Northeastern of Libya (Figure 1), and it is a part of Al-jabal Al-akdar mounting. It is situated on the Plateau at the western edge of the Al-jabal Al-akdar mounting and it is near the Mediterranean coast with a shoreline on the north.

Al-marj is about 106 km west of Albayda city and 95 km east of Benghazi city. The elevation of a geographical location of the study area is 333 meters. The monthly mean minimum and maximum temperature ranges from 6 °C to 35 °C. Al-marj is agricultural land. Its population in 2006 is 185, 848, this is report to Ministry of Housing and Utilities of Libyan government 2006.

![Figure (1): The study area location of Almarj city in the map of Libya [10].](image)

**Sample collection:**

During this study (54) fecal samples were collected from domestic cats in Al-Marj city during the period from May to the July 2022, and the fecal samples collected from the two breeds (Persian and Arabic), as shown in (Figure 2 - 3).

These samples were collected from all ages, where the ages were divided into two age groups, the first age group (1-11 months), and the second age group (12 months - 8 years).

These samples were collected using sterile gloves that are easy to dispose of, and collected from special basins for cat defecation or from the soil after observing the cats until the completion of the defecation process.
Samples were collected in plastic bags, and after the bags were filled and closed well, we recorded the data of the cat feces samples (collection date, stool condition, gender, breed and age) and then keep them in the refrigerator at a temperature of 4°C, until analysis.

**Figure (2):** shows the morphology of the Persian cat  
**Figure (3):** shows the morphology of the Arabian cat

**Fecal Sampling Examination.**

The samples analyzed in the laboratory of the Higher Institute of Medical and Technical Sciences - Al-Marj, where the samples examined with two type of analyzed:

**Macroscopic Examination.**

Which the sample is examined with the naked eye to determine the color of the fecal, the physiological condition of the fecal sample, the presence of any blood in the sample, mucous membranes, or seeing larvae of worms or pieces of tapeworms inside the fecal sample [11]. There are two techniques for microscopic Examination:

**A. Direct Smear Technical:**

It is useful in cases of heavy infections of worms and intestinal protozoa.

**B. Flotation Technical:**

It is a more accurate method for extracting worm’s egg and cysts of intestinal protozoa that are present in fecal samples, and the flotation technique as shown in (Figure 4). This analysis is done by preparing the saturated sugar solution with the specific gravity 1.15, according to what it described [5].
Figure (4): shows the steps for preparing the fecal sample by the sugar flotation technical and preparing it for microscopic examination

Statistical Analysis.

The obtained data for cat fecal samples and their results entered into Microsoft Excel. The data checked for any errors that occurred during the entry, tabulation and analysis of data such as percentage using (Software Microsoft Excel 2010) and then we obtained the following results.

Results.

Prevalence of *T. gondii* according to the examined fecal samples:

During this study, 54 fecal samples collected from domestic cats, the number of infected fecal samples with *Toxoplasma gondii* was 6 infected samples (N=54) from the analyzed samples, and it constituted 11% the infected samples, while the number of un-infected samples analyzed was 48 fecal samples, as shown in Table (1), with a percentage of about 89%.

Table (1): shows the total number of samples and number of infected and un-infected samples during the study.
Prevalence of *T. gondii* according to sex:

During this study, the examined fecal samples of each sex were distributed, where the largest number of the fecal samples was for females, and their number was 34 samples out of the total number (N = 54), as shown in Table (2). Compared to the number of male fecal samples was 20 samples out of the total number of fecal samples, the highest prevalence of infection with *Toxoplasma gondii* among females, samples was 4 samples with a prevalence of (11%), while the number infected fecal sample of males was 2 samples (n = 20) with a prevalence of (10%), as in (Figure 5).

Table (2): shows the number of fecal samples examined from each sex and the number of infected and uninfected samples.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Total Number of Examined Samples</th>
<th>Infected Fecal Samples</th>
<th>Un-Infected Fecal Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Total Number</td>
<td>54</td>
<td>6</td>
<td>48</td>
</tr>
</tbody>
</table>

Figure (5): shows the distribution of infection with *T. gondii* parasite between males and females fecal samples.
Prevalence of *T. gondii* parasite according to the age group:

During this study, it was found that the highest prevalence of infection was for the second age group, there number which were 4 infected fecal samples from the total number of the second age group (n = 25) as shown in Table (3). The second age group the prevalence of infection among the fecal samples was (16%), Compared to the first group, whose number of infected fecal samples was 2 samples (n=29), with a prevalence of infection was (6.90%), as shown in (Figure 6).

Table (3): shows the division of age groups and fecal samples collected from each group, and number of infected and uninfected.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Total of Fecal Samples</th>
<th>Infected Fecal Samples</th>
<th>Un-Infected Fecal Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Age Group (1-11month)</td>
<td>29</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Second Age Group (12month-8yers)</td>
<td>25</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>6</td>
<td>48</td>
</tr>
</tbody>
</table>

![Prevalence of T. gondii according to the age groups](image)

Figure (6): shows the distribution of infection with *T. gondii* between the two age group.

Prevalence of *T. gondii* parasite according to the breed:

This study it was found that the most number of samples infected with *Toxoplasma gondii* was for the Persian breed with number 4 infected fecal samples from the
number of samples \( n = 41 \), as shown in Table (4). Then followed by the Arabic breed whose the numbers of sample were 2 fecal samples were infected \( n=12 \), and the highest prevalence of infection with *Toxoplasma gondii* was in the Arabic breed samples and the percentage was (16%) compared to the Persian breed, which was the percentage of infection was (9.75%), as shown in (Figure 7).

Table (4): shows the number of examined samples from each breed and the number of infected and uninfected fecal samples.

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Examined Fecal Samples</th>
<th>Infected Fecal Samples</th>
<th>Un- Infected Fecal Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arab Breed</td>
<td>12</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Persian Breed</td>
<td>42</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>Total Number</td>
<td>54</td>
<td>6</td>
<td>48</td>
</tr>
</tbody>
</table>

Figure (7): Shows the percentage distribution of *T. gondii* parasite among cat breeds.
Discussion.

Parasitic infection considered are medical important in all over the world, especially in warm regions, as a result of their high impact on humans and animals of diseases, which may reach and develop sometimes and cause death. Toxoplasmosis infected the humans and animals, and causing different degrees of disease. Due to the absence of previous studies, the prevalence of this parasite among domestic cats in Libyan cities, especially the of Al-Marj city, and the natural factors that this city enjoys in terms of climate for the development of this parasite. This study is the first study to detect the prevalence of this parasitic infection *Toxoplasma gondii* among domestic cats in the of Al-Marj city. During this study, 54 domestic cats’ fecal samples examined in Al-Marj city, to investigate the presence of Oocyts of *Toxoplasma gondii* during cat feces samples and the prevalence of infection with *Toxoplasma gondii* parasite through these samples.

We found from the results obtained from the examination that the number of infected fecal samples was 6 samples with the prevalence of infection was (11%). This result does not give an accurate indication of the prevalence of this parasite because there are many techniques that were not applied due to the lack of capabilities during this study, and including serological tests. Results of previous studies in many countries showed that there is a difference in the prevalence of this parasite among cats, as the reports indicated by [12] in China were similar to our study, that the prevalence of *Toxoplasma gondii* among cats was (3.06%) and this result does not agree with results obtained during our study.

In addition, our study does not agree with [13] in Korea, where the prevalence of *Toxoplasma gondii* among cats was (3.1%), Our results obtained during this study do not agree with the results of [14] in Iran, where the prevalence of *Toxoplasma gondii* among cats fecal samples was (6%). Results of our study are close to those of [15] in Beirut- Lebanon, where they indicated in their report that the prevalence of infection with *Toxoplasma gondii* in cat fecal samples was (9.9%), and our results are close to[16] in Arab Egypt. In the Nile Delta, where he indicated in his report that the prevalence of infection was (9%). During this study, the results showed that the prevalence of the *Toxoplasma gondii* in females was higher than that in males, the prevalence of *Toxoplasma gondii* in female samples was (11%) from the total number of females, and the prevalence of infection of males was (10%) from the total number of male samples.

The results obtained during our study are not close to the results of [13] in Korea, where they indicated in their report that the prevalence of infection in males is higher than females, Our results agree with [17] who indicated in their report that the prevalence of infection in females was a higher rate of infection than males, in addition, our results agree with results obtained by [18] in Brazil. The prevalence of the parasite during the age groups, the results obtained from this study showed that the prevalence of *Toxoplasma gondii* during the first age group (one month - 11 months) was (6.90%), and the prevalence of *Toxoplasma gondii* in the second age group (12 months - 8 years) was (16%). Where the highest prevalence was for the second age group, This result is consistent with [18] in Brazil, where they indicated in their report that the second age group whose age is adjacent to the year is more affected than the young age group less than a year, and their prevalence of infection was (26.80%).
12.82%) respectively. Where this phenomenon explained that the older age more infected with toxoplasmosis than the younger age group. During this study, the results obtained showed that there is a relationship between the prevalence of infection with toxoplasmosis and cat breeds, where the Arabic breed was more infected than the Persian breed and the prevalence was (16.66%, 9.75%) respectively. This relationship explained that the Arabic cats tend to hunt and roam between massacres, garbage bags, and hunting the infected mice with toxoplasmosis more than the Persian hunts and are not controlled and forced to stay indoors, as well as the Persian cats, They are the two most common types found inside home in the Al-marj city.

References.


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