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# Assessment of Toxoplasma gondii Contamination in Cat Feces

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**Abstract.** A study in district Buner, Khyber Pakhtunkhwa, aimed to determine the prevalence of Toxoplasma gondii in cat feces. 243 fecal samples were collected and examined for intestinal parasites at Abdul Wali Khan University Mardan. Of these, 58 samples (23.86%) were positive for T. gondii oocysts. Samples were collected over five months from November 2016 to March 2017, with varying prevalence rates: 20% in November, 25.7% in December, 22.5% in January, 25.9% in February, and 21.9% in March. This was the first study of its kind conducted in district Buner.

**Keywords:** Toxoplasma gondii, Cat feces, Prevalence, Intestinal parasites, Oocysts.

## 1. Introduction

The obligatory intracellular protozoan parasite Toxoplasma gondii is the cause of toxoplasmosis. Its life cycle is intricate and includes both asexual and sexual phases. Because they carry the parasite's sexual stage in their digestive systems, which leads to the production of oocysts that are excreted as feces, cats are the ultimate hosts. Acting as intermediate hosts, humans, and other warm-blooded animals contract the disease by consuming tissue cysts found in undercooked meat or by coming into contact with oocysts from tainted food, drink, or dirt. The prevalence of T. gondii infection varies globally. Studies have revealed higher incidence in some regions, such as Serbia and Poland, where up to 60% of the population may be affected [1]. Conversely, prevalence rates tend to be lower, at about 10%, in other places, such as the USA [2]. Eating contaminated meat, consuming oocysts from contaminated sources, or congenital transmission from an infected mother to her fetus are only a few of the ways that humans might get T. gondii [3]. Immunocompetent adults commonly experience either modest flu-like indications or none at all after infections. However, in immunocompromised patients, such as those with HIV/AIDS or on immunosuppressive medicines, toxoplasmosis can create key neurological antagonistic effects, for example encephalitis [4]. Typically, serological testing that searches for antibodies against the parasite is used to diagnose toxoplasmosis. For severe instances, treatment options include pyrimethamine and sulphonamide; for pregnant women, spiramycin is used to prevent congenital toxoplasmosis. Clindamycin may be used for acute flares of toxoplasmic chorioretinitis or toxoplasmic encephalitis.

Preventive measures include cooking meat thoroughly, washing fruits and vegetables, and avoiding contact with cat feces. Pregnant women and immunocompromised individuals should take extra precautions to reduce the risk of infection. To evaluate the environmental loading of Toxoplasma gondii oocysts and the analytical sensitivity of microscopic detection of these organisms based on the frequency of shedding by owned and unowned cats.

## 2. Literature Review

Wallace [5] examined Toxoplasma gondii oocysts that were discovered in the feces of six of the 1,023 stray or unwanted cats tested. This was the first report of T. gondii being isolated from cat feces in their natural environments. T. gondii antibodies were identified in 20% of the 522 cats tested using the dye test. Only 7% of 202 sexually immature cats (under six months) possessed the antibodies, compared to 29% of 320 cats older than six months. Dubey, et al. [6] studied T. gondii oocysts were discovered in the feces of seven cats out of the first 541 that were checked when the 1,000 cats' feces were inspected. These seven cats' dye test results revealed different antibody titers. These strains' oocysts and cysts were tested in mice for pathogenicity and infectivity; the cysts proved to be less pathogenic than the oocysts. In cats, cross-immunity between these strains and a reference strain was shown.

Research on identifying cat oocysts with Toxoplasma infectivity. They noticed that when adult cats were fed either trophozoites or Toxoplasma cysts, their feces simultaneously showed signs of infectivity and oocyst appearance. In addition, infectivity and oocysts were noted concurrently in kittens given Toxoplasma cysts. After sporulation, which was impacted by oxygenation and temperature, oocysts became contagious. It has been discovered that some substances work well as preservatives for oocyst sporulation and infectiousness. Dubey, et al. [7] conducted an investigation into the frequency of T. gondii infections in felines. Of the 34 cats tested, 79.4% had antibodies to T. gondii, but their feces did not contain oocysts. From the tissues of 17 of the seropositive cats, T. gondii was recovered. Zhang, et al. [8] investigated the prevalence of T. gondii antibodies in Guangzhou, China's home and stray dogs. The prevalence was 21.3% overall, with stray dog prevalence being greater than home dog prevalence. In both groups, there was no discernible variation in the infection rates between male and female dogs. Zaki [9] measured the seroprevalence of T. gondii infections in South-West Pakistani food animals. Of the cattle and sheep, 25% and 2.5%, respectively, tested positive for antibodies, but none of the goats or chicks did.

These studies highlight the prevalence and transmission of T. gondii in cats and other animals, as well as the importance of preventive measures to reduce the risk of infection in humans.

## 3. Material and Method

### 3.1. Study Area and Study Population

The study was carried out in Khyber Pakhtunkhwa's (KP) District Buner. The district of District Buner is located in Pakistan's Khyber Pakhtunkhwa (KP) province. Because of its position and surrounding natural beauty, it is Khyber Pakhtunkhwa's most attractive district. The entire region is 1,865 km2, and there are 271/km2 of people living there.

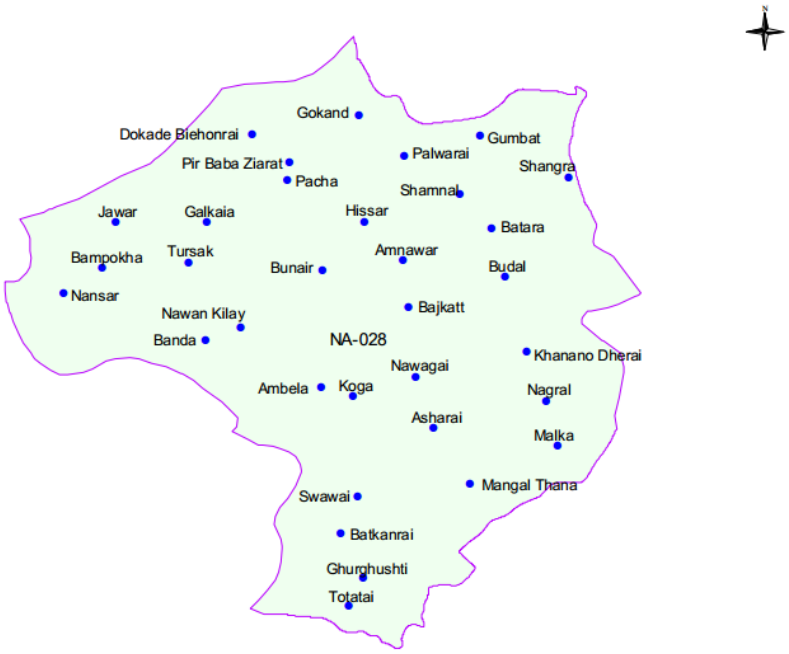


**Fig. 1.** Study area

This study was carried out to find out the prevalence of T. gondii oocyst in cat feces of District Buner, Pakistan from November 2016 to March 2017. Cat feces were sampled by a simple wet mount method to find out the prevalence of Toxoplasma gondii oocyst (Herrmann 2012).

### 3.2. Fecal Sample Collection

Toxoplasma gondii oocyst present in cat feces. A total of 243 cat feces samples were collected from different localities (Nawagai, Sura, Agarai, koza nawagai, Kankowai, etc.) of District Buner. Samples were collected from

both pets and stray cats. Gloves were used for the collection of cat feces because many certain parasites, fungus, viruses, pathogenic bacteria, as well as a lot of germs present in feces that cause certain diseases in the human body. Usually, cats excrete feces in soil, feces were collected in a small laboratory beaker and preserved in 10% formalin. For fresh samples, formalin is not necessary because formalin may destroy oocysts. But commonly 10% formalin is used as a preservative. Microscopy of fecal samples was performed in the parasitology laboratory [10,11].

### 3.3. Direct Wet Mount Method

The traditional diagnostic method used for Toxoplasma gondii has been wet mount with microscopic visualization of T.gondii oocyst on slide preparations from cat feces. The stool sample was put into a glass slide for microscopic examination. All samples were observed microscopically for the presence of T.gondii oocyst. The specimens were diagnosed to find whether T.gondii were present or not, using three microscopic objectives lens, 10x, 40x, and 100x. At the beginning of the screening of slides, the 10x objective was used. When T.gondii was detected by this objective, higher magnification objectives (40x and 100x with emersion oil) were used to observe it in more detail.

### 3.4. Principle

1. To diagnose severely contaminated specimens quickly.
2. To assess the motility of the organism.
3. To identify organisms that permanent stain techniques could miss.

### 3.5. Materials

1. Coverslips
2. Microscopic slides
3. Stool sample
4. 10% formalin
5. Plastic pipette or dropper
6. Wooden stick
7. Gloves
8. microscope

### 3.6. Microscopic Examination

Properly mix stool samples in 10% formalin or normal saline or in simple distilled water with a wooden stick. Take a small amount of sample with a plastic pipette, Apply the drop of sample to a small area on a clean microscope slide. Remove any gross fibers and particles. Put two or three drops of the sample on the slide. Add a small quantity of iodine solution to the specimen then mix it with a wooden stick. Place the cover slip on the slide. After preparing the slide we examined the slide under the microscope to isolate Toxoplasma gondii oocysts.

## 4. Results

A total of 243 samples of cat feces were collected from district Buner. Samples were collected from different localities (Nawagai, Sura, Agarai, koza nawagai, Kankowai, etc.) of District Buner during the period of November 2016 to March 2017.

58 fecal samples (23.86%) were positive Out of 243 samples. Out of 243 samples, 58 samples were positive for oocysts of Toxoplasma gondii showing a percentage of 23.86%. The total samples were collected in five months (November, December, January, February and March). Overall five months prevalence is (23.86

In November 20 fecal samples were collected. Out of 20 samples, 4 samples were positive for shedding oocyst of T.gondii, showing 20% prevalence in November. In November the prevalence rate is low (20%) as compared to other months [12,13].

66 fecal samples were observed in December. Out of 66 samples, 17 samples (25.7%) were positive for T.gondii oocyst. Both sporulated and unsporulated oocysts were observed. In January 62 fecal samples were observed. 14 samples (22.5%) were positive out of 62 samples. In some infected samples sporulated oocysts were observed but several infected samples had unsporulated oocysts.

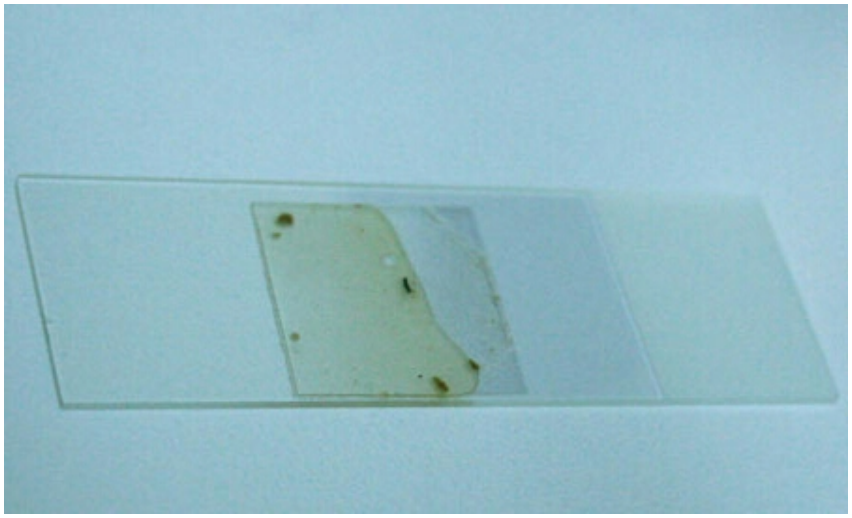

**Fig. 2.** Fecal sample microscopic glass slide

In February month 54 fecal samples were observed to detect T.gondii oocyst. Out of 54 samples, 14 samples (25.9%) were positive shedding T.gondii oocysts. The highest prevalence rate showing in February (25.9%). Both sporulated and unsporulated oocysts were observed.

41 fecal samples were observed in March. Out of 41 samples, 9 samples (21.9%) were positive containing T.gondii oocysts [14,15].

Approximately all month's prevalence is related not a severe difference and among all infected samples shedding sporulated and unsporulated oocysts. Both sporulated and unsporulated oocysts of T.gondii were detected.

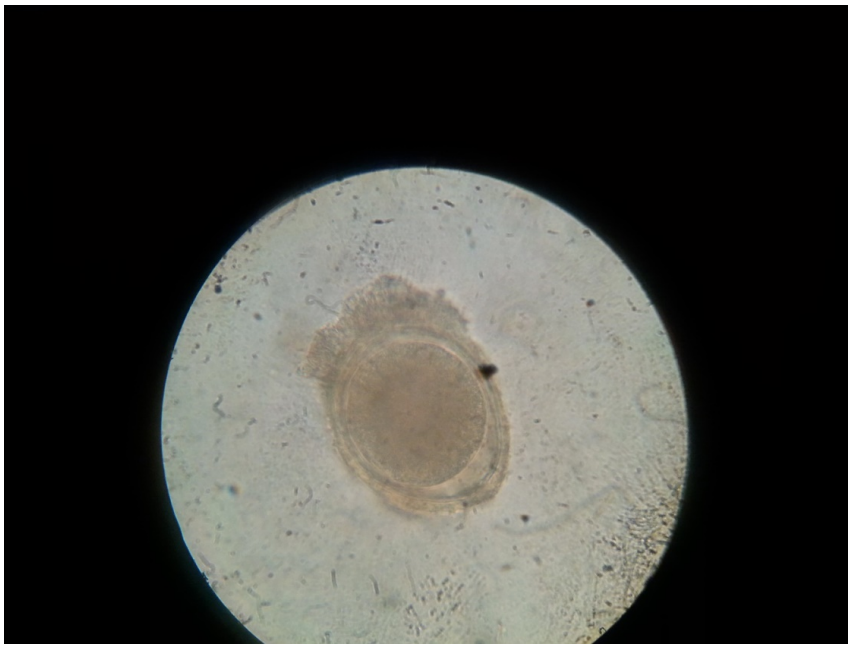

**Fig. 3.** Unsporulated oocyst of Toxoplasma gondii from cat feces

## 5. Conclusion

A total of 243 samples of cat feces were collected from various locations in District Buner, including Nawagai, Sura, Agarai, Koza Nawagai, and Kankowai, between November 2016 and March 2017. Out of these, 58 samples

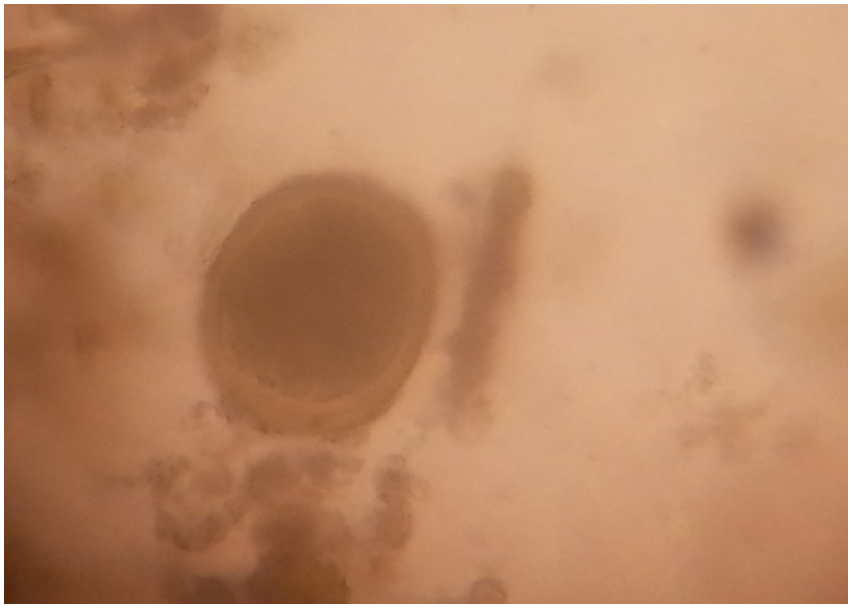

**Fig. 4.** Unsporulated oocyst of Toxoplasma gondii from cat feces

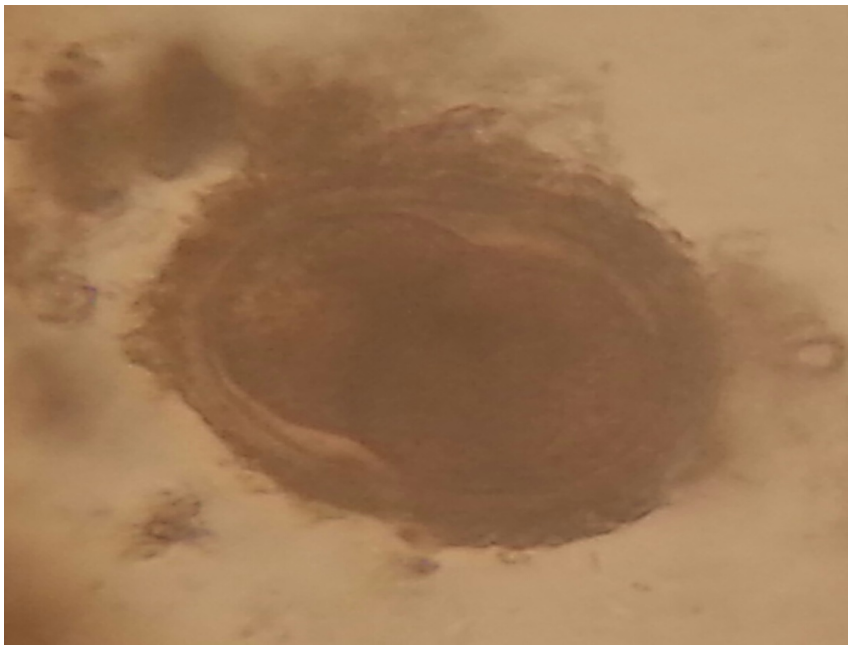

**Fig. 5.** Sporulated oocyst of Toxoplasma gondii from cat feces

**Table 1.** Prevalence of Toxoplasma gondii oocyst from cat feces from November 2016 to March 2017 at Buner (Khyber Pakhtunkhwa)

| Serial No | Month | Total No. of observed samples | Total No. of infected samples | Prevalence (%) |
|---|---|---|---|---|
| 1 | November | 20 | 4 | 20% |
| 2 | December | 66 | 17 | 25.7% |
| 3 | January | 62 | 14 | 22.5% |
| 4 | February | 54 | 14 | 25.9% |
| 5 | March | 41 | 9 | 21.9% |
| 6 | Total | 243 | 58 | 23.86% |

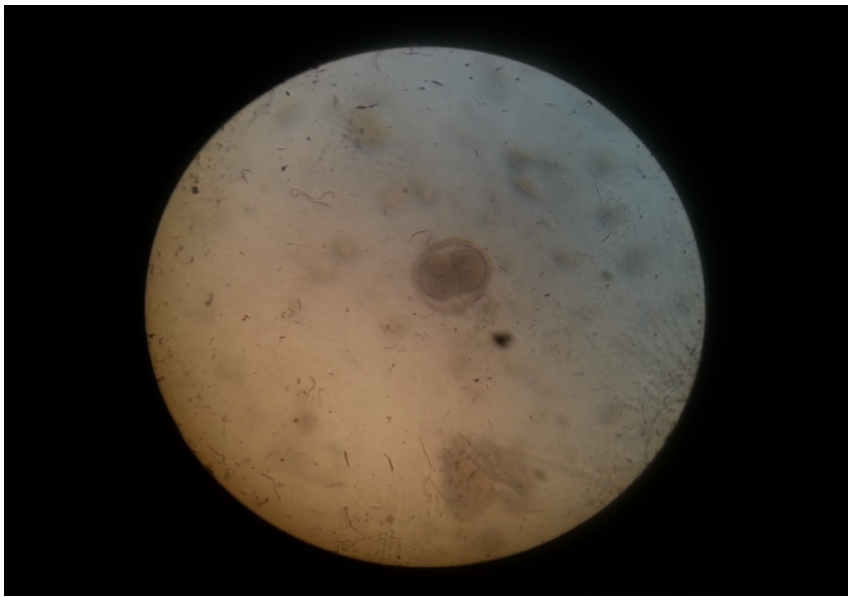

**Fig. 6.** Sporulated oocyst of Toxoplasma gondii from cat feces

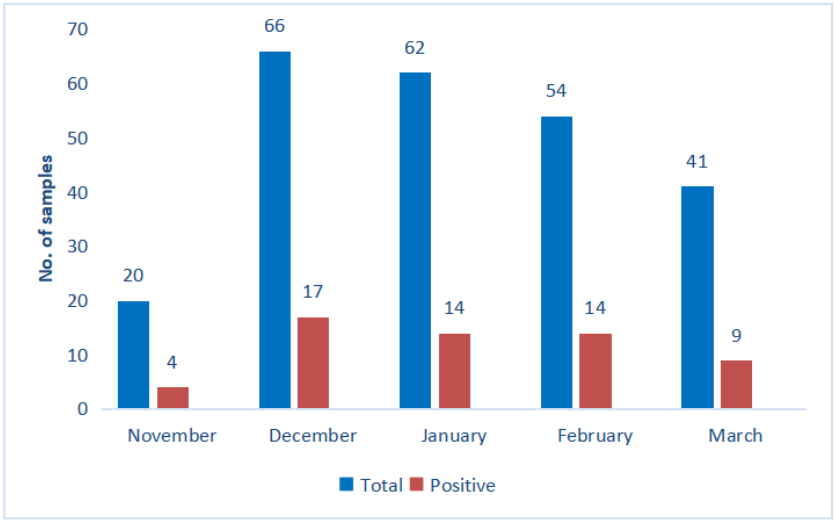


**Fig. 7.** Prevalence of T.gondii oocyst from cat feces in five months (November 2016 to March 2017)

(23.86%) tested positive for Toxoplasma gondii oocysts. This overall prevalence was consistent across the five months.

In November, 20 fecal samples were collected, with 4 samples (20%) testing positive for T. gondii oocysts, indicating a lower prevalence compared to other months. In December, 66 fecal samples were examined, and 17 samples (25.7%) tested positive for T. gondii oocysts. Both sporulated and unsporulated oocysts were identified. In January, 62 fecal samples were analyzed, revealing 14 positive samples (22.5%). Some infected samples contained sporulated oocysts, while others had unsporulated ones. In February, 54 fecal samples were tested, and 14 samples (25.9%) were positive for T. gondii oocysts, showing the highest prevalence rate of the months studied. Both sporulated and unsporulated oocysts were observed. In March, 41 fecal samples were examined, and 9 samples (21.9%) tested positive for T. gondii oocysts.

There was no significant difference in prevalence among the months, and both sporulated and unsporulated oocysts were detected in infected samples.

## 6. Conflict of Interest

The authors declare that there are no conflict of interests, we do not have any possible conflicts of interest.

**Acknowledgments.** None.

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