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# RESEARCH ARTICLE

# PREVALENCE OF *TOXOPLASMA GONDII*, *TOXOCARACANIS* AND OTHER INTESTINAL PARASITES AMONG DOGS AND CATS IN EKITI STATE NIGERIA

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**ABSTRACT**

Numerous parasites can be found in dogs and cats, and they have been linked to the human spread of zoonotic illnesses. In Ekiti State, 160 dogs and 25 cats were tested for parasites in a community-based cross-sectional study.Freshly passed stools from dogs and cats were collected and examined for intestinal parasites by modified sucrose floatation technique. The overall prevalence of parasite from dog and cat were 40 and 20 % respectively. The prevalence of parasite among dogs were 32.8%, 21.9 %, 35.9%, 1.6 % and 7.8 % for *Toxoplasma gondii, Toxocaracanis, Ascarislumbricoides, Trichuristrichuria* and *Hookworm* respectively while for cats 60 % and 40 % for *Hookworm* and *Entamoebahistolytica*. The seroprevalence of *Toxoplasma gondii* in male and female dogs were 61.9 % and 38.1 % respectively. The seroprevalence of *A. lumbrocoides*in male and female dogs were 56.5 % and 43.5 % respectively; seroprevalence for *T. trichuria* in male dog was 100 % and none was detected in female dog, seroprevalence for hookworm in male and female dogs were 40.0 % and 60 % respectively, while seroprevalence for hookworm in male and female cats were 66.7 % and 33.3 % respectively; seroprevalence for *E. histolytica* in female dog was 100 % and none was detected in male cat. No *Toxoplasmagondii*and*Toxocaracanis* were detected in cats. The potential risk factors for transmission of toxoplasmosis, toxocariasis and other intestinal parasitesidentified in the study area include the keeping of free range dog and cat, improper handling and disposal of dog and cat faeces andlivestock manure, and consumption of untreated water. There should be increase in awareness campaigns on toxoplasmosis, toxocariasis and other intestinal parasites among people this would help in providing more information to enable informeddecision making about disease control and to empowerwith knowledge to curb transmission from animalsto man**.**



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# INTRODUCTION

Some of the most significant and well-known zoonotic infectious illnesses that are spread from companion animals to humans worldwide are caused by parasites. Ingestion of dirt is a typical mode of exposure for infections caused by Toxoplasma gondii and Toxocara spp., which can cause ocular and systemic diseases. Toxoplasmosis, caused by Toxoplasma gondii, is one of the world's most common parasitic infections, infecting most genera of warm-blooded animals. It is the most prevalent infection in humans involving about 50 per cent percent of the world population (Torgerson and Mastroiacovo, 2013) causing congenital, ocular, and cerebral infections in HIV infected and other immunocompromised people (BahiaOliveira *et al*., 2018). Felines are definitive hosts while non-feline vertebrates, including humans, act as intermediate hosts of the parasite (Sudan *et al*., 2013).

Dogs have been implicated in the transmission of more than 60 zoonotic infectious diseases (Macpherson, 2005). They harbour a wide range of gastrointestinal parasites including; *Taenia* spp*, Echinococcus* spp*, Dipylidium caninum*, *Toxocara canis*, *Ancylostoma* spp, *Giardia* spp, and *Cryptosporidium* spp (Perera *et al.,* 2013). These parasites constitute a potential source of human infection from environment contaminated with dog faeces harbouring various infective stages of these parasites and which may persist in the environment for long periods of time (Degefu *et al*., 2011). The existence of cats and dogs is a potential risk factor of the toxoplasmosis, toxocariasis and other intestinal parasites disease's spreading to their surroundings, other animals and human beings. The efforts to prevent and control the disease should be done in order to prepare outbreak of the disease. Therefore, the data about the prevalence of *toxoplasma gondii, toxocara canis* and other intestinal parasites are necessary to be evaluated for early warning to prevent the outbreak.

In Nigeria, there is little information available on the prevalence of *Toxoplasma gondii, Toxocara canis* and other intestinal parasites in dogs and cats. More studies are needed to determine the parasite among the dogs and cats population in Nigeria and epidemiological data are needed to develop effective control measures for zoonotic parasites. The objective of this study was to determine the prevalence of *Toxoplasma gondii, Toxocara canis* and other intestinal parasites in dogs and cats in Ekiti State Nigeria.

# MATERIALS AND METHODS

Ekiti State is situated entirely within the tropics. It is located between longitudes 40°51′ and 50°451′ East of the Greenwich meridian and latitudes 70°151′ and 80°51′ north of the Equator. It lies south of Kwara and Kogi State, East of Osun State and bounded by Ondo State in the East and in the south, with a total land Area of 5887.890sq km. Ekiti State has 16 Local Government Councils. By 1991 Census, the population of Ekiti State was 1,647,822 while the estimated population upon its creation on October 1st 1996 was put at 1,750,000 with the capital located at Ado-Ekiti. The 2006 population census by the National Population Commission put the population of Ekiti State at 2,384,212 people.

**Study design and Sample collections:** With the informed consent of dogs and cat owners, interviews were conducted using a semi-structured questionnaire to obtain information on the dog's and cat's age, sex, breed and location. One hundred and eighty-five samples from dogs and cats were collected. Faecal samples were collected from the dog and cat, the animals were of different age, sex, breed and location. The fecal samples were collected directly from the rectum of each animal with the use of a disposable hand glove, prior to stool collection, animals were identified, restraint and the perineum thoroughly prepared by cleaning with water to prevent contamination, the samples were transported to the parasitology laboratory located in the national veterinary research institute for further analysis.

**Laboratory Procedures:** Fecal samples of stray and household cats and dogs (n = 185) were subjected to the sucrose flotation procedure for concentrating cysts/oocysts of parasites (Coklin et al., 2007). Six to eight grams of each sample were dissolved into 50 mL PBS until a homogeneous suspension was prepared. Then, the suspension was passed through three layers of gauze to eliminate large particles. The fecal suspension was centrifuged at 800×g for 5 min. For isolating cysts/oocysts, 50 mL PBS was added to the sediment. After complete mixing, 25 mL of suspension was layered gently over 20 mL of 1 M sucrose solution (specific gravity 1.13) in a 50 mL cleaned conical tube to form two completely distinct phases. The tubes were centrifuged at 800×g for 5 min at 4◦C. The interface and the upper layer of the sucrose were collected by a disposable pipette to a 15 mL clean conical tube. Then, the collected supernatant containing the purified cysts/oocysts of parasites was recentrifuged and washed three times with PBS to remove the residual sucrose and observed under a binocular microscope at 100× magnification.

# RESULTS

Table 1 shows the overall prevalence of parasite from dog and cat. The prevalence for parasite is 40 and 20 % respectively.

**Table 1. Overall Prevalence of Parasite from Dog and Cat**

| Animal | Dog | Cat |
|---|---|---|
| | N (%) | N (%) |
| Parasite | 64(40.0) | 5(20.0) |
| No Parasite | 96 (60.0) | 20 (80.0) |
| **Total** | **160(100.0)** | **25(100.0)** |

Table 2 shows the distribution of parasites among dogs and cats. The prevalence of parasite among dogs were 32.8%, 21.9 %, 35.9%, 1.6 % and 7.8 % for *Toxoplasma gondii, Toxocara canis, Ascaris lumbricoides, Trichuris trichuria* and *Hookworm* respectively while for cats 60 % and 40 % for *Hookworm* and *Entamoeba histolytica*.

**Table 2. Distribution of Parasite among Dog and Cat**

| Parasite Type | Dog | Cat |
|---|---|---|
| | N (%) | N (%) |
| *Toxoplasma gondii* | 21(32.8) | - |
| *Toxocara canis* | 14 (21.9) | - |
| *Ascaris lumbricoides* | 23(35.9) | - |
| *Trichuris trichuria* | 01(1.6) | - |
| *Hookworm* | 05(7.8) | 03(60.0) |
| *Entamoeba histolytica* | - | 02(40.0) |

The demographic characteristics of 160 dogs and 25 cats were shown in table 3a. They were categorized into 4 age groups, two breeding groups (local and foreign), and two geographic locations of rural and urban. The seroprevalence of *Toxoplasma gondii* in male and female dogs were 61.9 % and 38.1 % respectively. *Toxocara canis* were detected in 42.8 % of males and 51.2 % of females dogs respectively. The seroprevalence of *T. gondii* infection of dogs living in urban and rural areas were 76.2 % and 23.8 % respectively. Seroprevalence of *Toxocara canis* of dogs living in urban and rural areas were 64.3 % and 35.7 % respectively. The seroprevalence of *T. gondii* infection in the three age groups of the dogs; 2-3years, 4-5years and 6-7years were 28.8 %, 38.1 % and 38.1% respectively, while that of Toxocara canis were 21.4%, 42.8% and 35.8%. The prevalence of *Toxoplasma gondii* was higher in urban 16 (76.2%) than in rural residents (23.8 %). The seroprevalence of *Toxoplasma gondii* and *Toxocara canis* in foreign dogs were 9.6% and 21.5 % respectively while 90.4 % and 78.5 % local dogs respectively. No *Toxoplasma gondii* and *Toxocara canis* were detected in cats (Table 3a).

The seroprevalence of *A. lumbrocoides* among age brackets of 2-3, 4-5 and 6-7 yrs in dogs were 39. 1%, 43.5 % and 17.4 % respectively; the seroprevalence of Hookworm among age brackets of 2-3, 4-5 and 6-7 yrs in dogs were 60.0 %, 20.0 % and 20.0 % respectively. Seroprevalence for *T. trichuria* among age bracket of 2-3 yrs was 100 % and no *E. histolytica* was detected among the age brackets. The seroprevalence of Hookworm among age brackets of 2-3 and 4-5 yrs in cats were 33.3 % and 66.7 % respectively while for E. histolytica were 50 % and 50 % among age brackets of 2-3 and 4-5 yrs respectively.

**Table 3a. Prevalence of *Toxoplasma gondii and Toxocara canis* in relation to the animal demographics**

| | No Examined *T. gondii* (n=21) | | No Positive (%) *T. canis* (n=14) | | | |
|---|---|---|---|---|---|---|
| | Dog (n=160) | Cat (n=25) | Dog | Cat | Dog | Cat |
| **Age (yrs)** | | | | | | |
| >=1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-3 | 44 | 06 | 05(28.8) | 0 | 03(21.4) | 0 |
| 4-5 | 78 | 13 | 08(38.1) | 0 | 06 (42.9) | 0 |
| 6-7 | 38 | 06 | 08 (38.1) | 0 | 05(35.7) | 0 |
| **Sex** | | | | | | |
| Male128 | 19 | | 13(61.9) | 0 | 06(42.9) | 0 |
| Female32 | 06 | | 08(38.1) | 0 | 08(57.1) | 0 |
| **Breed** | | | | | | |
| Local | 115 | 16 | 19 (90.5) | 0 | 11(78.6) | 0 |
| Foreign | 45 | 09 | 02(9.5) | 0 | 03(21.4) | 0 |
| **Location** | | | | | | |
| Rural | 51(31.9) | 07(28.0) | 05(23.8) | 0 | 05(35.7) | 0 |
| Urban | 109(68.1) | 18(72.0) | 16(76.2) | 0 | 09(64.3) | 0 |

The seroprevalence of *A. lumbrocoides* in male and female dogs were 56.5 % and 43.5 % respectively; seroprevalence for *T. trichuria* in male dog was 100 % and none was detected in female dog, seroprevalence for hookworm in male and female dogs were 40.0 % and 60 % respectively, while seroprevalence for hookworm in male and female cats were 66.7 % and 33.3 % respectively; seroprevalence for *E. histolytica* in female dog was 100 % and none was detected in male cat. The seroprevalence of *A. lumbrocoides* in local and foreign dogs were 82.6 % and 17.4 % respectively; seroprevalence for *T. trichuria* in local dog was 100 % and none was detected in foreign dog, seroprevalence for hookworm in local dogs were 5 (100.0) and none was detected for *E. histolytica.* The seroprevalence of foreign cat was 2 (100 %) and none were detected in *A. lumbrocoides, T. trichuria and E. histolytica* The seroprevalence of *A. lumbrocoides* in rural and urban dogs were 23.8 % and 76.2 % respectively; seroprevalence for *T. trichuria* in rural was 100 % and none was detected in urban for dog, seroprevalence for hookworm in rural and urban dogs were 25 % and 75 % respectively and none was detected for *E. histolytica* in rural and urban. The seroprevalence of *E. histolytica* urban in cat was 2 (100 %) and none were detected in *A. lumbrocoides* and *T. trichuria* .

# DISCUSSION

The general frequency of parasites in cats and dogs. For parasites, the prevalence is 20% and 40%, respectively. Comparable to research conducted elsewhere, the total prevalence of parasites detected in this investigation indicated a very high level of infection. Helminthiasis can increase the severity and incidence of infections by intracellular parasites because it induces a decreased Th1 response and an elevated Th2 response. This is in addition to variables related to the comparable routes of transmission of these parasites that may favor coinfection. Hernández et al. (2010) address the possibility of a synergistic immunological response to helminthiasis during pregnancy. Such immunomodulation is also seen during pregnancy. According to a prior study (Gallagher et al., 2005), patients who co-infect with helminths are more likely to contract malaria, which raises the possibility of pregnancy-related problems and injury to the fetus. According to Imhoff-Kunsch and Briggs (2012), epidemiological research on helminth infections frequently link infection to low birth weights in neonates (Table 1). The high prevalence of Ascaris spp. found in dogs (34.9%) in this study is comparable to the prevalence (31%), which was reported in North-eastern India by Traub et al. (2002).

According to Shalaby et al. (2010), dogs may serve as a reservoir host for A. lumbricoides, which raises the possibility of human infection. Dog feces have been reported to contain viable Ascaris and Trichuris spp. eggs that have passed through the gastrointestinal tract (GIT). Multifactorial analysis have indicated that dogs that test positive for Ascaris may have consumed the parasites from feces in their owners' home (Traub et al., 2002). Since dogs are not restricted to their owners' homes, the majority of dog owners were infected with comparable parasites as their dogs, lending credence to the theories on the mechanical role played by dogs in the spread of these parasites to their owners and the community. The most prevalent intestinal parasite among cats was the hookworm species, with an average incidence of 60.0% overall. Similar to what Sowemimo (2007) reported on the prevalence and intensity of gastrointestinal parasites of domestic cats in Ode – Irele and Oyo communities, Southwest Nigeria, Ancylostoma sp. (hookworm) was the most common intestinal parasite reported with a prevalence of 44.1% in a study that involved 83 cats from the Lake Kainji area of Nigeria (Okaeme, 1986). According to Anderson et al. (2003), hookworm is the most often seen intestinal parasite among cats in various regions of the world. This may be a major factor in the frequency of cutaneous larva migrants or creeping eruptions in the human population (Table 2).

According to the study, the prevalence was higher in adult dogs than in young canines. This conclusion is consistent with reports from Yacob et al. (2007) in Ethiopia and Ezeokoli (1984) in Zaria. The current study's much higher prevalence in adults compared to young dogs and cats may be the result of dog owners' tendency to provide their younger dogs with more care, such as deworming and movement restrictions. Additionally, whereas young dogs quickly display clinical illness and draw the attention of their owners, mature dogs are typically carriers and do not show clear clinical signs of the infection. On the other hand, Awoke et al. (2011) found no statistically significant variation in the prevalence rate of gastrointestinal helminth infection between juvenile and adult canines in their Addis Ababa study. This result conflicts with a study by Bobade et al. (1984) from Kafanchan (Plateau state, Nigeria), where young dogs had the highest frequency. The results of the retrospective investigation may be explained by the fact that puppies are more vulnerable to the infection and that dogs contract the ailment from birth. This study found no discernible relationship between sex and the prevalence of intestinal helminth infections, despite the fact that male dogs and cats were more likely to contract the infection. These findings are consistent with data from Sowemimo and Asaolu (2008) and Awoke et al. (2011). It contradicts, however, a study conducted in Owerri, Imo state, by Anosike et al. (2004), which found that the male dogs had a much higher infection rate than the female dogs. The males' greater freedom of movement than the females' was the reason given by Anosike et al. (2004) for their findings. The study's findings demonstrated that breed significantly influenced the occurrence of intestinal parasites in dogs and cats, including toxoplasmosis and toxocariasis. Compared to their foreign breed equivalents, helminth infections were more common in local dog and cat breeds. This result is comparable to that of Awoke et al. (2011), who found that in the Gondar district of Addis Ababa, the prevalence rates for local and cross-breed dogs were, respectively, 10.7 and 4.0%. In comparison to native and exotic breeds, Onyenwe and Ikpegbu (2004) found a noticeably higher incidence in crossbreeds. In their

investigation, Anosike et al. (2004) did not discover any noteworthy variations in breeds. Rather than being a reflection of the sensitivity of the breed, the higher incidence rate among local breeds compared to the foreign breeds in this study is probably primarily due to differences in their care. While foreign breeds may not be as resistant to parasites as local breeds, they are typically housed in confinement and get adequate nutrition, which reduces their exposure to helminth infections and disease susceptibility. It could be the result of receiving timely and effective veterinary care when necessary. Local dog breeds, which are typically less cherished by their owners, are let to wander around in search of food and entertainment (Aiyedun and Olugasa, 2012), exposing them to the infectious stages of various helminths and, depending on the situation, intermediate hosts. The prevalence of *Toxoplasma gondii* was 13.1% while *Toxocara canis* was 8.8 %. There was no *Toxoplasma gondii* found in cats. Dogs may feed on the faces of cats, inadvertently ingesting *T. gondii* oocysts and excreting them in their feces, likely following passive gastrointestinal transit. Dogs may also serve as mechanical carriers for *T. gondii* oocysts and may be a major factor in the spread of this parasite (Fábrega et al., 2020).

# CONCLUSION

The potential risk factors for transmission of toxoplasmosis, toxocariasis and other intestinal parasites identified in the study area include the keeping of free range dog and cat, improper handling and disposal of dog and cat faeces and livestock manure, and consumption of untreated water.

# RECOMMENDATIONS

There should be increase in awareness campaigns on toxoplasmosis, toxocariasis and other intestinal parasites among people this would help in providing more information to enable informed decision making about disease control and to empower with knowledge to curb transmission from animals to man

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