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# INTESTINAL HELMINTH INFECTIONS AND RISK FACTORS IN COMPANION CATS OF DHAKA, BANGLADESH

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**Abstract:** The present study was intended to determine the prevalence and associated risk factors for parasitic infection in companion cats from Dhaka, Bangladesh. A total of 216 fecal samples of companion cats from Dhaka city were collected. A questionnaire survey was conducted among the cat owners to collect various data on the companion cats viz. age, breed, food, clinical issues, behavior etc. Double centrifugal flotation technique was used to process the fecal samples. In total 70 fecal samples of cat were found to be infected with at least one helminth parasite. Hookworms showed the highest prevalence (9.26%) followed by *Trichuris vulpis* (7.41%), *Dipylidium* spp. (6.02%) and *Toxocara cati* (4.63%). Parasitic infections were prevalent among the cats aged one to two years old (71.43%). Local breed cats were more prone to parasitic infections (67.14%). Outdoor access (70%), irregular deworming (50%) and providing homemade food (70%) were significantly associated with high prevalence of parasitic infections ($P < 0.05$). The maximum helminth positive cats were found to have irregular bowel movement or constipation (22.86%) and sneezing (22.86%) ($P=0.000$). The maximum helminth infected cats showed aggression towards other animals (34.28%). Behaviors such as scratching furniture's (17.14%) and excessive vocalization (15.71%) were also common among the infected cats. A total of 182 (84.26%) cat owners had idea about zoonosis whereas 34 (15.74%) were unaware of it. The owners who knew about zoonosis, their cats were mostly free of infection (93.15%). Pet owners' alertness towards cats' behavior, clinical symptoms, prophylactic measures and overall hygiene management may be operative to lower the possibility of zoonotic transmission of parasites.

***Key words:*** Cat, companion, fecal, intestinal helminths, Dhaka

## INTRODUCTION

Pets can act as friends, exhibiting absolute and nonjudgmental affection for their owners (Hill *et al.* 2008). Cats are considered as widely accepted companion animal. It is conceivable that companion animals normally get proper care, love and affections from their owners. But it is also a fact that there

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is scarcity of evidence-based findings to validate this conjecture whether the pets get proper care or sometimes their health issues are simply overlooked (Howell *et al.* 2016). From thousands of years, dogs, cats, rabbit and man have lived together and shared mutual benefits. This share of home can be detrimental to the human if proper measures are not taken. It is already established that household pets constitute an important reservoir of pathogens and play a direct role in transmitting zoonotic diseases (Dada *et al.* 1979; Kornblatt and Schantz 1980). A wide variety of helminth parasites are found in cats comprising several species are of zoonotic importance (Laberthe *et al.* 2004). Rabbani *et al.* (2020) found nematodes viz. *Toxocara cati*, *Toxascaris leonina*, *Ancylostoma* sp., cestodes viz. *Diphylobothrium* sp., *Dipylidium caninum* and protozoan oocysts viz. *Isospora felis*, *Isospora rivolta* and *Eimeria* spp. in companion and stray cats in Lumajang, East Java, Indonesia. Young cats and dogs are often infected by feline roundworms specifically *T. cati* and *Toxocara canis*. Infection with *T. cati* or *T. canis*, termed as toxocariasis, generates joint stiffness, intestinal disorders, emaciation and growth retardation (Lee *et al.* 2014). Samad (2011) reported *Ancylostoma tubaefoeme*, *Dirofilaria immitis*, *T. cati*, *Toxoplasma gondii* and *Paragonimus westermani* as commonly found parasites in cats in Bangladesh. There are some recent reports from Bangladesh on the occurrence of intestinal helminths and other diseases in cats and dogs such as Yadav *et al.* (2017), Sah *et al.* (2019), Barua *et al.* (2020), Mehedi *et al.* (2020), etc.

The purpose of this study was to determine the prevalence of parasites in companion cats in Dhaka city and identify risk factors for such infections. One of the objectives of the present study was to assess the knowledge among the cat owners regarding the zoonosis and their general practices like deworm their companion cats. These data may help pet owners as well as veterinary practitioners and policy makers to take the necessary measures to control the flourish of parasites among cats and human and also convenient for zoonotic diseases control program.

## MATERIAL AND METHODS

*Study settings:* This cross-sectional study was conducted randomly selected areas of Dhaka city [23°45′50″N 90°23′20″E] during September 2020 to February 2021.

Through an online survey, researchers searched for people who used to keep cats as companion animal. Through the online exploration, 356 people was listed who had cats as pet. The researchers excluded 140 cat owners from the list as they had multiple cats. Research assistants interviewed 216 single cat owners around different areas of Dhaka city and collected 216 cat fecal samples in total.

*Questionnaire survey and stool sample collection:* Volunteers of the project provided a questionnaire to the cat owners to fill data about their pets. Based upon the questionnaire survey, variables were divided into six categories, such as age, breed, outdoor access, behavior, deworming and the food supplied. The risk factors were arrayed on the basis of the variables.

The volunteers provided stool pot to each cat owner. The container was marked with date, area and cat ID. Cat owners were requested to put at least 10-grams of stool of their cats into the pot. Collected samples were transported within two hours of collection to the Parasitology Laboratory, Department of Zoology, University of Dhaka. Afterwards, the samples were refrigerated at 4°C. The samples were placed into Styrofoam boxes. The samples were processed within three hours from the time of sampling.

*Laboratory screening:* Centrifugal flotation technique (Bowman 2009) was applied to process the samples. Sheather's sucrose ($C_{12}O_{22}O_{11}$) solution with a 1.27 specific gravity was used. Five grams of each fecal sample was taken to analyze using the sugar solution (Source followed: CDC. *Stool Specimens - Centrifugal Flotation for Intestinal Parasites.* URL https://www.cdc.gov/dpdx/diagnosticprocedures/stool/specimen_cf.html). The samples were microscopically examined using 10X objective. Parasites were identified based on morphology to the family, genus and in possible cases up to species level (Soulsby 1982; Taylor *et al.* 2007). A cat was considered positive if at least one parasitic constituent (cyst, ova, proglottid or larva) was detected.

*Statistical analysis:* IBM SPSS statistical software package, version 20.0 (IBM, Armonk, New York) was used to perform all statistical analyses. Chi-square test was used to compare proportions. A P-value < 0.05 was considered as statistically significant.

## RESULTS AND DISCUSSION

*Helminth infections in cats:* In the present study, no protozoan parasite was documented. In a number of studies, young cats are assessed to be frequently infected with enteric parasites specifically with ascarids, coccidians, *Giardia* spp. etc and hookworms, whipworms, lungworms and cestodes especially taeniid infections appear to be mostly prevalent in adult cats (Mircean *et al.* 2010; Becker *et al.* 2012; Riggio *et al.* 2013). In the present study, 70 stool samples were found to be infected with at least one helminth parasite and 146 stool samples were free of any parasitic infection (Fig. 1). *Dipylidium* spp., *Toxocara cati*, *Toxascaris* spp., *Trichuris vulpis* and hookworm were identified from the fecal samples of the companion cats. Coinfection with *Dipylidium* spp. and hookworm showed the lowest prevalence (1.85%) (Fig.1). Hookworm was

recorded (9.26%) as the maximum prevalent parasite group, followed by *T. vulpis* (7.41%) and *Dipylidium* spp. (6.02%).

Parasites can be transmitted to human from cats in a number of conducts. Companion animals can act as the source of parasite stages which are infective to humans. Pets can act as reservoirs of parasites and thus directly can infect the owners or human members of the family through close contact or may infect the via intermediate host or paratenic hosts and arthropod vectors (Marx 1991). The canine and feline zoonotic enteric parasites of public health significance comprise *T. cati* and *T. canis* and the hookworms (Baneth *et al.* 2016). In the present study, hookworm showed the highest prevalence (9.26%) (Fig. 1). Though prevalence of *T. cati* was comparatively low (4.63%) but there is a possibility that the percentage could be higher as in the present study, number of stool samples was limited. Genchi *et al.* (2021) found *T. cati* as the most prevalent parasite species (25.6%) followed by Ancylostomatidae (9.9%).

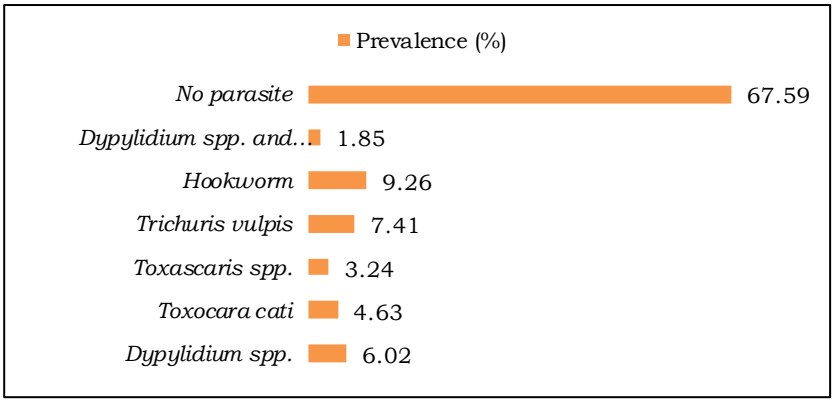


Fig. 1. Prevalence of intestinal helminths in companion cats in Dhaka

*Age group of cats and risk of infections:* The highest prevalence of helminth infections was found among the cats aged one-two years (71.43%) (P= 0.005) followed by < one year (21.43%). The age group of three-four years was least vulnerable to helminth infection (7.14%) (Table 1). The maximum prevalence was observed among the cats aged one to two years' old (Table 1), which agrees with the findings of Szwabe and Błaszkowska (2017). They found higher infections in cats older than 12 months of age (17.7%) than in cats aged < 12 months (10.3%). On the contrary, Genchi *et al.* (2021) found higher prevalence of infections in cats aged < one year (49.8%; P < 0.001) than in cats aged between one and five years (36.8%; P < 0.001). In this study, only 30 cats were < one year of age and other 186 cats were between one to four years old (Table 1). As the result is

analyzed based on one sample, there could be a bias. According to Villeneuve *et al.* (2015), prevalence of some organisms could be higher than detected due to intermittent shedding of ova and the possibility that some infections may have been prepatent at the time of sample collection. In this study, monoparasitic infections were confirmed in most of the stool samples. Coinfection of *Dypylidium* spp. and hookworm (1.85%) was low (Fig. 1). Cossío *et al.* (2021) found the maximum occurrence of monoparasitic infections in cats (55.50%) followed by double infections (36.69%) and triple infections (14.04%).

*Breed, food intake and outdoor access of cats and related risk of helminth infections:* In respect to breed of the pet cats, the local breeds were found to be more helminth positive (67.14%) than the pure or mixed breeds (32.86%) (P=0.002) (Table 1). It may be due to individual immunity. Seroprevalence of *T. gondii*, a protozoan parasite, varies by cat breed (Must *et al.* 2017) but there is lack of documents that can confirm the breed specific immune response.

Food is another important variable which controls the transmission of helminth parasites. The cat who took canned food (mostly Lara and Whiskas) as staple food, among them 92 (63.01%) cats were free of infection. Infection was the maximum among the cats who were provided with regular homemade food like boiled rice, milk, boiled fish and chickens (P=0.000) (Table 1). Raw fish and chicken increase the risk of parasitic infection and homemade foods sometimes increase the risk of nutritional deficiencies especially for essential amino acids, calcium, phosphorus and vitamin D (Bhowmik *et al.* 2020).

In the present study, the cats which had access to both indoor and outdoor were found to be more infected (70.00%), while 91.78% indoor cats had no helminth infection (P=0.000) (Table 1). Beugnet *et al.* (2014) identified outdoor access as a risk factor of parasitic infections. They explained that access to the outdoors was particularly connected to the presence of parasites; this could be interrelated to the predatory way of life of cats and intake of rodents and small birds, which can transfer *T. cati*

*Anthelminthic drug use and low risk of helminth infections in cats:* Most of the owners (who used to provide anthelminthic treatments to their pets) used delentin suspension to treat worms and albon oral suspension to treat bacteria. Deworming medication showed significant influence on helminth infection (P=0.000). During the survey, it was found that twelve cats which never received deworming drugs, all were positive for at least one helminth parasite. Among the regular anthelminthic drug receivers, the maximum was helminth negative (86.30%) (Table 1). A study in Hungary showed that cats which were dewormed by anthelmintic drugs were significantly less infected than cats which were not dewormed (Capari *et al.* 2013).

**Table 1. Risk factors of helminth infection in companion cats in Dhaka**

| Variable | Risk factors | Helminth positive (n=70) % | Helminth negative (n=146) % | Total (N=216) % | $X^2$ Value, P-value |
|---|---|---|---|---|---|
| | Below 1 | 15 (21.43) | 15 (10.27) | 30 (13.89) | |
| **Age** | 1-2 | 50 (71.43) | 98 (67.12) | 148 (68.52) | 10.795, 0.005* |
| | 3-4 | 5 (7.14) | 33 (22.60) | 38 (17.59) | |
| **Breed** | Local | 47 (67.14) | 65 (44.52) | 112 (51.85) | 9.699, 0.002* |
| | Pure/mixed | 23 (32.86) | 81 (55.48) | 104 (48.15) | |
| | Indoor | 21 (30.00) | 134 (91.78) | 155 (71.76) | |
| **Outdoor access** | Indoor and outdoor | 49 (70.00) | 12 (8.22) | 61 (28.24) | 89.115, 0.000* |
| | Irregular | 35 (50.00) | 20 (19.69) | 55 (25.18) | |
| **Anthelminthic dugs** | Regular | 23 (32.86) | 126 (86.30) | 149 (68.98) | 69.107, 0.000* |
| | Never received | 12 (17.14) | 0 | 12 (5.55) | |
| **Food** | Home made | 49 (70.00) | 54 (36.99) | 103 (47.68) | 20.672, 0.000* |
| | Cat food | 21 (30.00) | 92 (63.01) | 113 (77.39) | |

*Clinical and behavioral issues and risk of helminth infections:* Table 2 represents the occurrence of helminth infections in enrolled cat's concomitant with several clinical symptoms and behavior profile. The clinical and behavioral symptoms are denoted as potential risk factors behind the helminth infection. Cats with constipation and sneezing symptoms, showed the maximum prevalence of helminths (22.86%) followed by vomiting (11.43%) and diarrhea (10%). Seven helminth positive cats were found with cough and sneezing symptoms (10%) (P=0.000). In total, 120 cats did not show any perceptible clinical symptoms and among those 117 were free of helminth infections.

Varieties of behaviors of the enrolled cats was noted in the present study viz., anxiety issue, scratching furniture, meowing or crying at inappropriate times of the day, repetitive grooming to the extent that fur is rubbed off, aggression towards other animals present inside or outside the house. Prevalence of helminths was high among the cats those showed aggression towards other animals (34.28%) (Table 2). On the other hand, out of 107 cats which did not show any noticeable behavior, 94 (64.38%) were free of helminth infection.

Zanzani *et al.* (2014) conducted a study where dogs and cats were taken to two Veterinary Clinics for routine checkups or immunization. In the most cases, clinical findings were absent. They found only 20.71% of the dogs and 13.43% of the cats with gastrointestinal signs, viz., diarrhea, nausea, vomiting or lack of appetite. Out of them, 44.83% of dogs and 44.44% of cats had intestinal parasites. In this study, the maximum prevalence was recorded in the cats who had symptoms of constipation 16 (22.86%) and sneezing (22.86%) (Table 2). German *et al.* (2017) found winter season as a risk factor for constipation. In this study, all the samples were collected between September to February. In

cold seasons, respiratory tract related issues in human and animals are quite common. Sneezing is a common symptom of upper respiratory infections (URIs) in cats which is often referred to as the "common cold" or the "cat flu". According to PAW PDSA Animal Wellbeing Report (2018), pet owners in United Kingdom were concerned about awkward scratching (49%), being woken up (17%), imploring for foodstuff (17%), aggression (9%) and untimely defecation (8%). Disease, stress, or lack of socialization could be behind these annoying or inconsiderate behavior (Slater *et al.* 2013). In this study, 31 cats were found which showed aggression towards other animals and among them 24 (34.28%) cats were helminth positive (P=0.000) (Table 2). Any type of physical discomfort may initiate anxieties in the cats.

**Table 2. Clinical and behavioral profile of companion cats in Dhaka and associated risk of helminth infections**

| Risk factors | Helminth positive (n=70) % | Helminth negative (n=146) % | Total (N=216) % | $X^2$ Value, P-value |
|---|---|---|---|---|
| **Clinical profile** | | | | |
| Diarrhea | 7 (10.00) | 4 (2.74) | 11 (5.09) | 114.451, 0.000* |
| Constipation | 16 (22.86) | 6 (4.11) | 22 (10.18) | |
| Vomiting | 8 (11.43) | 5 (3.42) | 13 (6.02) | |
| Lethargy | 4 (5.71) | 1 (0.68) | 5 (2.31) | |
| Bad breath | 2 (2.86) | 1 (0.68) | 3 (1.39) | |
| Cough | 3 (4.28) | 1 (0.68) | 4 (1.85) | |
| Sneezing | 16 (22.86) | 4 (2.74) | 16 (7.41) | |
| Diarrhea and cough | 2 (2.86) | 0.0 | 2 (0.92) | |
| Diarrhea and vomiting | 2 (2.86) | 2 (1.37) | 4 (1.85) | |
| Cough and sneezing | 7 (10.00) | 5 (3.42) | 12 (5.55) | |
| No symptom | 3 (4.71) | 117 (80.14) | 120 (55.55) | |
| **Behavior profile** | | | | |
| Anxiety | 5 (7.14) | 3 (2.05) | 8 (3.70) | 56.198, 0.000* |
| Scratching furniture's | 12 (17.14) | 12 (8.22) | 24 (11.11) | |
| Excessive vocalization | 11 (15.71) | 17 (11.64) | 28 (12.96) | |
| Repetitive grooming | 5 (7.14) | 13 (8.90) | 18 (8.33) | |
| Aggression towards other animals | 24 (34.28) | 7 (4.79) | 31 (14.35) | |
| No complicated behavior | 13 (18.57) | 94 (64.38) | 107 (49.54) | |

**Table 3. Pet owners' knowledge profile regarding zoonosis and related helminth infections in cats in Dhaka**

| | Infection (n=70) % | No infection (n=146) % | $X^2$ Value, P-value |
|---|---|---|---|
| **Idea of zoonosis** | 46 (65.71) | 136 (93.15) | 26.854, 0.000* |
| **No idea of zoonosis** | 24 (34.28) | 10 (6.85) | |

*Knowledge regarding zoonosis among the cat owners:* Through the survey, researchers collected data to find whether the cat owners are cognizant of zoonosis or not. Table 3 represents the data of pet owners' knowledge on zoonosis of that period with the infection found in their respective cats. The result revealed that most of the cats (93.15%) were uninfected of which owners had idea about zoonosis (P=0.000). Lee and Devlin (2021) described that limited awareness regarding zoonotic diseases is one of the risks of disease transmission from pets to human along with other possible factors viz. restricted living spaces. Stull *et al.* (2012) observed low awareness concerning zoonosis among their study population.

## CONCLUSION

Parasitic infections in cats could be a significant public health concern. Pet health is a vital issue to be considered. It has both emotional and real-world values. As a number of parasites which infects cats are zoonotic, therefore, One health approach is essential to check this public health threat. This present study delivered baseline data for pet owners and animal health professionals to develop policies for proper management and control of parasites. Moreover, this data may help public health authorities concerned with zoonotic disease control. Yet small sample size is a limitation of the study. In the future studies, researchers plan to consider larger sample size covering the whole country.

## ETHICAL APPROVAL AND ACKNOWLEDGEMENTS

This study was approved by the Ethical Review Committee, Faculty of Biological Sciences, University of Dhaka. All the cat owners were clearly informed concerning voluntary participation. Written consents were obtained from cat owners for sharing their companion animal's data for the study.

First author received a financial support from University Grants Commission of Bangladesh to run her project. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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