

Owner perception, zoonotic potential and public health significance of intestinal parasitism in pet cats of Bangladesh

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ABSTRACT:

Recently, the popularity of cats as a pet is increasing in Bangladesh specially in megacities where keeping large pets is difficult. However, this popular pet is being affected by various intestinal parasitism that may threaten public health by spreading zoonotic parasitic diseases. But surprisingly, no comprehensive study has been documented yet detailing the status of parasitic infections in Bangladeshi domestic cats and their public health importance. Therefore, the study was conducted to evaluate the prevalence of intestinal parasitism in household cats in Dhaka, Bangladesh to find out the associated risk factors and evaluate the perception of cat owners on the zoonotic potential of the associated diseases. Questionnaire based survey was conducted among the cat owners to reveal their perception on parasitic diseases and potential health hazards. Besides, five hundred seventy nine (579) feline fecal samples were examined following standard techniques to explore the status of parasitic infection in cats. The overall prevalence of endoparasitic infection in domestic cats was 77.4% (448/579). Concurrent infections with two or more parasites were recorded in 68.2% cats. The most commonly detected parasites were *Toxocara cati* (71.9%), *Taenia* spp. (64.3%), *Toxoplasma gondii* (40.2 %), *Isospora* spp. (27.7%), *Ancylostoma* spp. (26.8%), *Strongyloides* spp. (15.4%), *Sarcocystis* spp. (13.6%), and *Dypillidium* spp. (10.7%). Age, environment and habit were identified to be important risk factors for the parasitic infections in cats. Increased parasitic burden was related to the age of the host and environment. Youngs were more susceptible to parasitic infections than adults. Cats with a habit to go outside frequently were found to harbor more parasitic infections. Only 30.2% of pet owners used prophylactic anthelmintic to their cats on regular basis. Less than 5% of the owners knew about the zoonotic potential of some parasites from cats. In conclusion, present study revealed a comprehensive scenario of parasitic infections in pet cats in Bangladesh for the first time. This high parasitic burden evident from this study could pose a potential threat to public health. Therefore, consideration should be given to the use of anthelmintics and education of the pet owners.

Keyword: *Feline parasitic zoonoses, Domestic cat in Bangladesh, Cat diseases in Bangladesh, etc.*

INTRODUCTION:

In Bangladesh, the cat has become a popular pet in recent years especially in megacities where keeping large pets is difficult due to limitations in spaces. However, the popular pet is being affected by various diseases among which gastrointestinal parasitism ranks as one of the main causes of morbidity and mortality in domestic cats [1]. In many parts of the world, the intestinal parasites of cats receive considerable attention because cats serve as reservoirs, carriers and transmitters of several pathogens, including parasites, which are considered zoonotic and a number of them are of significant public health concern [2]. Cats are highly susceptible to a variety of parasitic infections because of their free roaming habit. The different variety of parasites found in cat can be detrimental to their health and the humans in the vicinity [3] or even to other people who accidentally come into contact with infective stages of parasites [4]. Although internal parasites cause mostly chronic asymptomatic types of infections, they can cause clinical diseases in cats depending on the burden and pathogenicity of the parasites. Of the feline intestinal parasites, *Toxoplasma gondii*, *Giardia duodenalis*, *Cryptosporidium* spp., *Sarcocystis* spp., *Echinococcus multilocularis*, *Toxocara cati*, *Ancylostoma* spp. and *Strongyloides* spp. have zoonotic potential [4]. Among them ascarids and hookworms are particularly important because they commonly cause larva migrans in humans [5]. On the other hand, *Toxoplasma* and *Cryptosporidium* oocysts cause abortion and diarrhoea in humans, respectively [3]. Although cats are often considered family members by their owners, it is important to emphasize that they may be vectors of intestinal parasites. The feline intestinal parasites have an oral-fecal transmission cycle and a

major component for the spread of these parasites is the shedding of oocysts or cysts and eggs or larvae into the environment [6]. The transmission of zoonotic agents could be through indirect contact with animal secretions and excreta, contaminated water and food, or through direct contact with the animal [7]. Now-a-days, the cat is getting popular as pet animal due to their comparatively small size and requirements. These household cats are kept in very close vicinity to humans in a family. Especially, the children have the habit of playing with pet or even with the environment where cat stool may be present. All these together enhance the chances of human beings to acquiring zoonotic parasitic infections from their own cats. But surprisingly, there is no comprehensive information regarding the status of parasitic infections in Bangladeshi domestic cats and their public health importance. Therefore, the study was conducted to evaluate the prevalence of endoparasites in household cats in the capital city of Bangladesh, the megacity Dhaka that is popularly known for its pet cat population, to point out the associated risk factors and evaluate the knowledge of cat owners about the zoonotic potential of some parasites.

2. MATERIALS AND METHODS

Study location and period: This study was conducted during the period from July 2015 to June 2017 on feline patients visiting the Teaching Veterinary Hospital, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh for treatment purpose.

Study animals and subject: The study animals included individual feline patients irrespective of age, sex, breed, etc. The information collected on each animal included age (cats

less than 6 months old; 6 months – 1 year old, 1-2 years old, 2-3 years old and 3-5 years old and cats more than 5 years old), gender (males and females), breed (native, cross breeds and pure breed) and habitat (indoor cats and outdoor cats).

In addition, cat owners were subjected to a questionnaire-based survey to reveal their perception on parasitic diseases and potential health hazards.

Sample collection and analysis: Feline stool samples were collected with the permission and assistance of the owners. A total of 579 fresh stool samples were collected from 579 household cats during the study period. The collected stool samples were put in clean, wide-mouthed container with tight fitting lids and sealed in plastic bags and kept at 4°C for a maximum of 24 hours before processing. The collected stool samples were processed and examined for the presence of GI parasites by using standard direct smear and formalin ethyl acetate concentration technique [8]. Briefly, samples were stained with both normal saline and 0.85% iodine and examined using 10× magnification followed by examination under 40× magnification with light microscope (Olympus CX40, USA). In addition, permanent trichrome staining technique was also applied for the identification of intestinal protozoa. The slides were examined under oil immersion at 100× magnification using light microscopy. Detection of GI parasites was determined on the basis of morphological characteristics of specific species under microscopic examination [9]. Each sample was examined and the result was considered as positive when at least one parasite egg or cyst/oocyst was observed.

Questionnaire survey: Owners were asked to fill in a questionnaire and all of them provided information about the cats' health, anthelmintic treatments provided, the treatment frequency per year, knowledge about parasitic zoonosis, source of information, etc.

Statistical Analysis: The data entry and analysis were carried out using Microsoft Excel 2016 and the STATA 14.2 program for Windows. Pearson's Chi-square (X²) test was carried out to test for significance between prevalence of parasite in the host, species and type of infections. The level of statistical significance was set at $p < 0.05$ for each test.

3. RESULTS

The overall prevalence of endoparasites in Bangladeshi domestic cats was 77.4% (448/579) [Figure-1]. As high as 68.2% (395/579) of cats were infected with multiple species and 31.8% (184/579) with only one species of parasite. The most commonly recorded parasites infecting cats were *Toxocara cati* (71.9%), *Taenia* spp. (64.3%), *Toxoplasma gondii* (40.24%), *Isospora* spp. (27.7%), *Ancylostoma* spp. (26.8%), *Strongyloides* spp. (15.4%), *Sarcocystis* spp. (13.6%), and *Dypillidium* spp. (10.7%) [Figure-2].

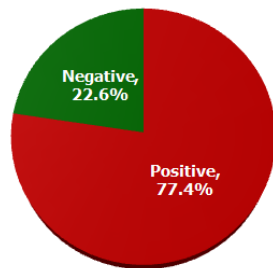


Figure-1: Overall prevalence of parasitic infection in Bangladeshi household cats.

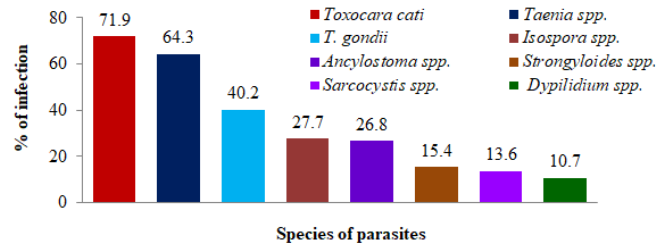


Figure-2: Species prevalence of helminthic and protozoan parasites of household cats of Bangladesh

The risk factors associated with the parasitic infection in Bangladeshi household cats were age, breed and housing systems. Age was found to be one of the important risk factors for parasitic infection in cats although no significant variation was observed. However, the prevalence of infection was reduced with the increased age. Kittens below 6 months of age were found to be highly vulnerable to GIT parasitic infection in comparison to adults. As high as 84.5% prevalence of GIT parasitic infection was recorded in kittens below 6 months of age followed by 77.8% in young (over 6 months but below 1 year), 77.6% in 1-2 Years, 74% in 2-3 years, 69.3% in 2-3 years and 77.9% in cats older than 5 years [Figure-3].

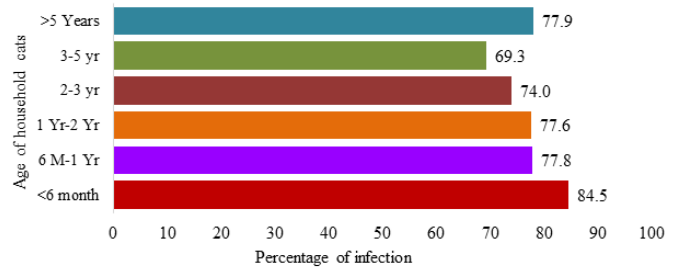


Figure-3: Age-wise prevalence of helminthic and protozoan parasites in Bangladeshi household cats

In addition to the age, breeds of cats and housing habit were found to be important risk factors for parasitic infection in cats. Native breeds (Bangladeshi local cats) were found to harbor lowered parasitic loads than that of cross breeds and pure breeds. As high as 80.4% and 79.1% GIT parasitic infections were recorded in pure breeds and cross breeds cats, respectively in comparison to 72.9% of that in native breeds. Of the predisposing factors influencing the prevalence and infection rate of GIT parasites in cats, housing patterns were found as the most important one that impacted significantly on the prevalence of parasitic loads in domestic cats ($P < 0.001$). All of the cats (100%) with a habit of going outdoor were found to be infected with one or more species of GIT parasites where as 56.2% of indoor cats (never been outdoor) were found to harbor the parasitic infection. However, sex of the animals was found not to influence the parasitic infection significantly. Cats of both sexes were almost equally (male 75.1% vs female 79.8%) affected by GIT parasites [Figure-4].

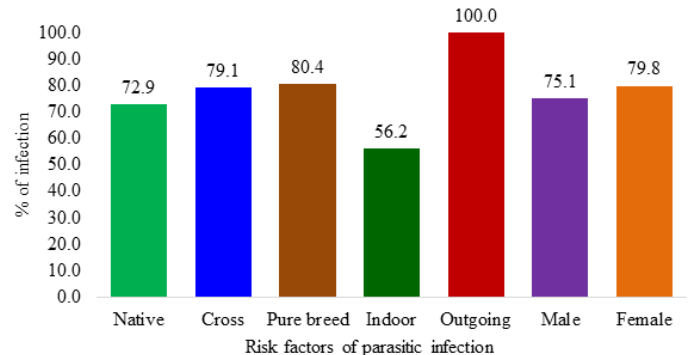


Figure-4: Risk factors for parasitic infection in Bangladeshi household cats. Indoor; cats with no habit to going outside, outdoor; cats with habit to going outside, Native Breed:

Bangladeshi local cats, Pure breeds; any breeds other than native cats, Cross Breed: Breed resulted from mating native breed and pure breeds of cats

Seasonal variation in GIT parasitic infection in household cats of Bangladesh did not produce any significant difference. Cats are found to be infected similarly all over the year although numerical variation was observed where a little higher prevalence was detected in Rainy season (80.2%) followed by summer (78.3%) and winter (73.5%) [figure-5].

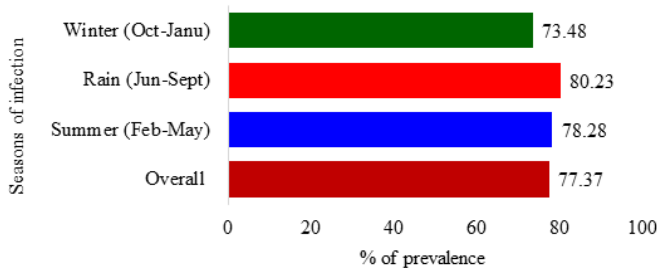


Figure-5: Seasonal prevalence of parasitic infection in Bangladeshi household cats

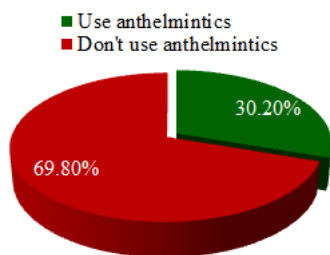


Figure-6: Proportion of Bangladeshi cat owners habituated to regular use of anthelmintics in cats

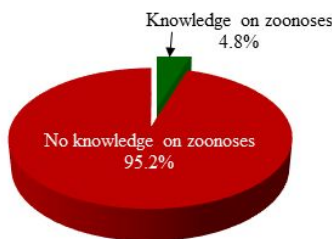


Figure-7: Proportion of Bangladeshi cat owners with or without knowledge on parasitic zoonoses

The use of prophylactic anthelmintic treatment by the owners of Bangladeshi household cats was relatively low. Only 30.2% of pet owners used prophylactic anthelmintic to their cats on regular basis for the prevention of helminthic infection in their pets [Figure-6]. The most commonly used anthelmintics were either pyrantel pamoate (75.4%) or the combination of praziquantel with pyrantel pamoate (24.6%). Parasites with zoonotic potential were detected in 78.6% of stool samples which were positive for either one or more species of the zoonotic parasites like *Toxocara cati*, *Taenia spp.*, *Sarcocystis spp.*, *T. gondii*, *Ancylostoma spp.*, *Strongyloides spp.* etc. However, only 4.8% of the owners knew about the zoonotic character of some parasites from cats [Figure-7]. There was highly significant difference between knowledge on parasitic zoonoses and use of anthelmintic in pet cats ($p < 0.000$). The sources of information about parasitic zoonoses from cats were vets (82.1%), followed by the media (17.9%)

4. DISCUSSION

The results of the study showed that the prevalence of GI parasitic infections among household cats of Dhaka city in Bangladesh is very high. Despite strong evidence indicating the endemicity of several zoonotic species as reported in the present study, knowledge on the prevalence of zoonotic parasites in cats in a megacity like Dhaka is largely lacking. In

fact, no comprehensive report was found to justify the study findings in Bangladesh context. As many of the identified GI parasite species can have significant public health implications, it is important to have an understanding of regional parasite burden so that public health effects can be minimized. Therefore, the study documents the ever first comprehensive report on the endoparasitic diseases in household cats in Bangladesh with special emphasis on their zoonotic potentials. As of the present study findings, the overall prevalence of feline intestinal parasites was 77.4%, which is no doubt an alarming high level that requires an effective anti-parasite control program to help minimize the immediate public health risks.

The prevalence of endoparasite in pet cats of Dhaka city was associated with age (84.5% in kittens less than 6 months of age), breeds (80.4% in pure breeds and 79.1% in cross breeds vs 72.9% in native breeds) and access of cats to outside (100% in outgoing vs. 56.2% in indoor). These findings are similar to those obtained in previous studies [10-12]. But the true prevalence may be much higher because stool samples were collected once only and egg/cyst shedding is intermittent. In addition, the samples were collected from the cats visiting the clinics for treatment purpose. The most likely reason for the high parasite burden is the lack or absence of anthelmintic treatments and the access of cats to contamination sources. McGlade et al. 2003 found that for each anthelmintic treatment given in a year, the risk of parasitism decreases by 0.2 times [10]. The prevalence found by this study is higher than in countries from west Europe, America and Australia, but lower than in countries from Middle East [13-18]. However, we could not compare our findings in Bangladesh context since our study was the first of its kind that studied the GIT parasites in household cats in Bangladesh and their zoonotic potentials. Surprisingly, most of cats (68.2%) in this study was found to be infected with one or more GIT parasites having zoonotic potential even if almost all of their owners (>95%) did not know the risk of being infected by the zoonotic parasites.

The most prevalent parasite in cats was found to be *T. cati* (71.9%), which is known to be the most common intestinal roundworm in cats, and has been implicated in zoonotic disease in humans [3]. Its prevalence was correlated with age (young cats), and habitat (outgoing cats). *Taenia spp.* was the second most prevalent parasite (64.3%) and it was also correlated with the age (young age) and habitat (outgoing cats). Other helminthic parasites recorded in this study included *Ancylostoma spp.* (26.8%), *Strongyloides spp.* (15.4%), *Dypilidium spp.* (10.7%). All of the species were found to affect the cats of young age irrespective to sex and a habit to going outdoor. However, the occurrence of *Dypilidium spp.* was related to the existence of flea on cats or associated history of flea infection.

In this study, we recorded as high as 68.2% of cats infected with either one or more species of protozoan parasites namely, *Isospora spp.*, *Sarcocystis spp.* and *T. gondii* among which later two have huge zoonotic potentials. The prevalence observed by us was higher than that recorded in different countries for example 12% in Chile [19] or 3% in England [20]. In cats without clinical signs in Europe, the prevalence of *Isospora spp.* infection is reported as between 6.3% and 30% [14], in Australia between 4.5% and 5.6% [6], and in USA between 0.2% and 9.7% [16]. The higher prevalence of protozoan parasites in cats recorded in our study is expected. The humid and subtropical climate of the study area may be very much favorable to have the higher infection of the protozoan oocyst. In our study, eggs of *Toxocara cati*, *Taenia spp.*, *Sarcocystis spp.*, *T. gondii*, *Ancylostoma spp.*, *Strongyloides spp.*, *Dypilidium etc.* found are proven zoonotic agents. But

surprisingly, almost none of the owners was aware of the zoonotic potentials of the parasites. Less than 5% of owner knew about the public health hazards that might be arisen from the feline GIT parasites. Moreover, only 30.2% of the owners practiced prophylactic anthelmintic treatments for their cats that was another indication of lack of awareness about the importance of parasite control in both cats and human hosts. This ignorance of owners clearly indicates that there is requirement of public health education and awareness building program for the pet owners of Bangladesh.

CONCLUSION:

Present study reveals high prevalence of endoparasites in household cats from Dhaka city with potential zoonotic parasites that may create serious public health hazards. The results of this study suggest that the cat may contribute significantly to the environmental burden of these zoonotic agents and remain as a continuous source of infection to the environment to disseminate the zoonotic parasitic diseases. The findings of this study should alert field veterinarians, researchers and human health workers in the region on the possibility of infections in human. Further epidemiological studies should be conducted to ascertain the incidence of such zoonotic parasites in cats by more sensitive diagnostic test.

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