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%), Anclylostoma spp. (26.8%), Strongyloides spp. (15.4%), Sarcocystis spp. (13.6%), and Dypillidium spp. (10.7%). Age, environment and habitat 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 pets 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 begiven to the use of anthelmintics and education of the pet owners.

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, Anclylostoma 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
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 (40.2%), Isospora spp. (27.7%), Ancylostoma spp., Toxocara cati (71.9%), Taenia spp. (64.3%), Toxoplasma gondii (40.2%), Isospora spp. (27.7%), Ancylostoma spp. 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].
The prevalence of GI parasites recorded in this study included *Ancylostoma* spp. (10.7%), all of the species were found to affect the cats of young age irrespective to sex and a habit to fleas. Other helminthic parasites recorded in this study included *Isospora* spp, *Sarcocystis* spp among which later were proved zoonotic agents. But 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%), *Dipylidium* 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 *Dipylidium* 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, *Dipylidium* 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 of 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 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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