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ORIGINAL ARTICLE

Prevalence of gastro-intestinal parasitic infections of cats and efficacy of antiparasitics against these infections in Mymensingh sadar, Bangladesh

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Abstract

Background: Gastro-intestinal parasitic infection in cats is a major concern for public health as they have zoonotic importance. The present research was conducted to determine the prevalence of gastro-intestinal parasitic infection in cats and evaluate the efficacy of antiparasitics against these infections in different areas of Mymensingh Sadar between December, 2018 to May, 2019.

Methods: The fecal samples were examined by simple sedimentation and stoll's ova counting method for detection of eggs/cysts/oocysts of parasites. The efficacy of antiparasitics against the parasitic infections in cats was evaluated.

Results: The overall prevalence of gastrointestinal parasites was 62.9% (39/62) and the mixed parasitic infection was 20.9% (13/62). The prevalence of *Toxocara cati* and *Ancylostoma tubaeforme* infections were 17.7% and 6.5%, respectively. The prevalence of *Taenia pisiformis* infection was 3.22%. However, the prevalence of *Isospora felis, Toxoplasma gondii* and *Balantidium coli* infections were 4.8%, 3.2% and 6.5%. The prevalence of infection was significantly ($P<0.008$) higher in kitten than that in adult cat. The efficacy of albendazole, fenbendazole against single helminth infection was 100%. However, the efficacy of the drug was reduced against mixed helminth infection. The efficacy of metronidazole, pyrimithamine plus sulfadoxine was 100% against single protozoa infection but the efficacy of the drug was reduced against mixed protozoal infection

Conclusions: Kittens should be dewormed with effective anthelmintics as they are more vulnerable to parasitic diseases. The *T. cati, A. tubaeforme, T. gondii* prevalent in cats are zoonotic and owners awareness need to be increased to prevent human infections

Keywords: Toxocara cati, Ancylostoma tubaeforme, Toxoplasma gondii, Sedimentation, Stoll's method

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Introduction

Cat is gaining popularity as pets in many countries including Bangladesh. The wide variety of parasites found in cat can be detrimental to their health and to humans in the vicinity (Krecek *et al*., 2010) or when people accidentally come into contact with infective stages of parasites (Smyth, 1995). Environmental contamination with cat feces harboring various infective stages of parasites such as eggs, larvae or oocysts act as a leading source of infection to livestock and human (Bentounsi *et al*., 2009). Human can be infected through the ingestion of eggs, cysts or oocysts via contaminated food-stuffs or water, hands, inhalation of dust, and/or by penetration of larvae through the skin (Lee *et al*., 2010a). Roundworms such as *Toxocara spp* is the most common intestinal parasites of cats with an estimated prevalence of 25% to 75%, and often higher in kittens (AAFP, 2006). Cats are also being infected with zoonotic hookworm and tapeworm. In protozoal infection in cats, is mostly caused by *Isospora spp. Isospora spp* infections usually causes no problems in adult cats, but the parasite can cause significant disease in kittens. Cats are also being infected with *Toxoplasma gondii* and it causes abortion in pregnant woman or congenital anomalies of the foetus (Dubey, 1989). *Toxoplasma sp* infection is common worldwide while around 25-30% world human populations have antibodies to it and this infection has been demonstrated in all domesticated animals (Levine, 1985).

Although number of pet cats are increasing rapidly in Bangladesh especially in the big cities, but detail information on prevalence and the risk factors of intestinal parasitism in pet cats are not available. To control parasitic infections in cats and the zoonotic transmission of this parasite in human being, knowledge on prevalence and the risk factors of these parasitic infections is essential. In developed countries the principles of control of gastro-intestinal parasites are mainly based on proper practices of hygiene, management, biosecurity and protective treatment (Radostits *et al*., 2000). In Bangladesh, these are not always possible and mostly dependent on the anthelmintics to control the parasitic infection of cats (Rahman, 1997). A good number of anthelmintics and antiprotozoal drugs against a wide range of helminths and protozoa, respectively, are available in local market of Bangladesh. The commonly available drugs in Bangladesh market are albendazole, fenbendazole, triclabendazole, ivermectin, piperzine citrate, metronidazole etc. Fenbendazole with praziquantel was reported to be 100% effective for the removal of *Anchylostoma sp*., *Toxocara sp.* and *Taenia spp* (Corwin *et al*., 1984). The efficacy of albendazole against *Ancylostoma spp* in infected cats and the efficacy of mebendazole with levamisole in infected cats were 100% and 89.3% respectively (Zu *et al*., 1992). The efficacy of metronidazole were 90-100% against protozoal infections in cats (Garanayak *et al*., 2017). The trade anthelmintics and antiprotozoal drugs such as Tab. Fenvet® (Fenbendazole), Tab. Alben DS® (Albendazole), Tab. Peraclear® (Fenbendazole), Bol. Dirovet® (Metronidazole), Tab Malacide® (pyrimithamine+sulfadoxine), Tab. Renamet® (Metronidazole), Tab. Anamet® (Metronidazole) etc should be evaluated for the treatment of feline parasitic infections. The comparative efficacy of some anthemintics against common helminths had been investigated mostly in indigenous cattle, sheep, goat etc with varied level of efficacy (Hossain and Ali, 1998; Hanif *et al.,* 2003; Hossain *et al.,* 2004; Khalid *et al.,* 2004; Hossain *et al.,* 2005). However, there is scant reports on the efficacy of anthelmintics in cats. Therefore, the objectives of this study were to determine the overall prevalence of parasitic infections, identify the risk factors for parasitic infections and evaluate the efficacy of various anthelmintic and antiprotozoal drugs against these infections in cat.

Materials and Methods

Study period and study area

This study was carried out using household cats in different areas of Mymensingh Sadar from December 2018 to May 2019. A total of 62 fecal samples of cats were collected purposively irrespective of their age and sex. The cats were also divided into three age groups such as kittens of ≤ 6 months (n = 30), the young cats of > 6 months to 1 year (n = 20) and the adult cats of > 1 year (n = 12). About 10 grams of faeces from each cat was collected from the top of the freshly voided faecal mass with necessary precaution to avoid cross contamination.

Fecal Examination

The fecal samples were examined by simple

sedimentation technique and stoll's ova counting method for detection of the eggs of the gastrointestinal helminthes and cysts/oocysts of the protozoa. The eggs of the helminth parasites and the cysts/oocysts of the protozoa were identified by their characteristic morphological features (Soulsby, 1982; Thienpont *et al*., 1986).

Anthelmintic/antiprotozoal drug trial against the parasitic infections

Cats infected with single and mixed infections of helminth and protozoa were treated by available anthelmintics (Bol. Fenvet®, Tab. Alben DS®, Tab. Peraclear® and antiprotozoal drug (Bol. Dirovet®, Tab. Renamet®, Tab. Anamet®) in Bangladesh.

Data analysis

The data analysis for the determination of prevalence and risk factors analysis of parasitic infection of cats was done by Epi info software version 7.2.2.16. Odds ratio was calculated according to the formula given by Schlesselman (1982).

Results

Overall prevalence of gastro-intestinal parasites

Fecal samples of 62 cats were examined of which 62.9% (39) were found to be infected with one or more species of gastro-intestinal parasites (Table 1). Six different species of gastro-intestinal parasites were identified by their characteristic (ova/cyst/oocyst).Two species of nematodes (*Toxocara cati*, *Ancylostoma tubaeforme*), one species of cestode (*Taenia taeniaeformis*) and three species of protozoa (*Isospora felis, Toxoplasma gondii* and *Balantidium coli*) were identified (Table 1 and Figure 1). The prevalence of *T. cati, A. tubaeforme, T. taeniaeformis, I. fells, T. gondii* and *B. coli* were 17.74%, 6.45%, 3.22%, 4.83%, 3.22% and 6.45%, respectively. The prevalence of *T. cati* (17.74%) was the highest whereas *T. taeniaeformis* and *T. gondii* (3.22%) was the lowest. Mixed infection with two or more gastrointestinal parasites was detected in 20.96% (13) cats (Tables 1 and 2).

Risk factors analysis of gastro-intestinal parasitic infections according to age and sex

The risk of parasitic infections was 6.6 times higher ($P<0.008$) in kittens than that in adult (Table 5).

Age related prevalence of gastro-intestinal parasites

Significant variations in prevalence of parasitic infections were observed in cats of different age groups (Table 3). The overall prevalence of intestinal parasites were found to be 76.66% in kittens (≤6 month age) and 60.00% in young (>6 month to 1 year) cats. The prevalence of gastrointestinal parasitic infection was found to be 33.33% in adult (>1 year) cats. In kittens (≤6 months), the highest infection was caused *by T. cati* (23.33%), followed *by I. felis* (10.00%), *A. tubaeforme* (10.00%), *T. taeniaeformis* (6.66%) *B. coli* (3.33%) and *T. gondii* (3.33%). About 20.00% kittens were found to be infected with mixed parasites. In young cats, the highest prevalence of infection was caused by *T. cati* 10.00% followed by *A. tubaeforme* (5.00%), *B. coli* (5.00%) and *T. gondii* (5.00%). No *I. felis* and *T. taeniaeformis* was prevalent. Mixed infection in young cats was recorded as 35%. In adult cats, 16.67% prevalence was recorded for both *T. cati* and *B. coli* (Table 3).

Sex related prevalence of gastro-intestinal parasites

In this study, it was recorded that the prevalence of gastrointestinal parasites was higher in female cats 66.67% than in the female cats 57.69% (Table 4). In both sexes, the highest prevalence was observed in case of *T. cati* 19.23% in male and 25.00% in female. About 15.38%, 7.67%, 11.54%, 23.08% male cats were found to be infected by *I. felis, T. gondii, A. tubaeforme, B. coli* respectively. The lowest prevalence was recorded as 3.85% in cases of *T. taeniaeformis*. About 23.07% male cats were found to be infected with mixed parasites. The female cats were found to be most frequently infected by *T. cati* 25.00% followed *by I. fells* 22.22%, *A. tubaeforme* 11.11% and *B. coli* 11.11%, In case of *T. taeniaeformis* and *T. gondii* the prevalence was same (8.33%). About 19.44% female cats were found to be infected with mixed parasites (Table 4).

Table 1. Overall prevalence of gastro-intestinal parasitic infections in cats

Name of the parasites	Prevalence (n=62)	
	No. of positive	Prevalence (%)
T. cati	11	17.7
A. tubaeforme	4	6.5
T. taeniaeformis	2	3.2
I. felis	3	4.8
T. gondii	2	3.2
B. coli	4	6.5
Mixed infection	13	20.9
Total	39	62.9

Table 2. Prevalence of mixed parasitic infections in cats

Name of the parasites	Mixed infection (n=13)	
	No. of positive case	Prevalence (%)
T. cati, A. tubaeforme	4	10.3
I. felis, T. gondii	3	7.7
B. coli, I. felis	4	10.3
T. gondii, T. taeniaeformis	2	5.1

Table 3. Age wise disribution of gastro-intestinal parasitic infections in cats

Parameter	Name of parasites	No. of positives	Prevalence (%)
Kitten (≤6 month) n=30	*T. cati*	7	23.3
	A. tubaeforme	3	10.0
	T. taeniaeformis	2	6.7
	I. felis	3	10.0
	T. gondii	1	3.3
	B. coli	1	3.3
	Mixed infection	6	20.0
	Total	23	76.7
Young (<6 month to 1 Year) n=20	*T. cati*	2	10.0
	A. tubaeforme	1	5.0
	T. taeniaeformis	0	0.0
	I. felis	0	0.0
	T. gondii	1	5.0
	B. coli	1	5.0
	Mixed infection	7	35.0
	Total	12	60.0
Adult (>1 year) n=12	*T. cati*	2	16.7
	B. coli	2	16.7
	Total	4	33.3

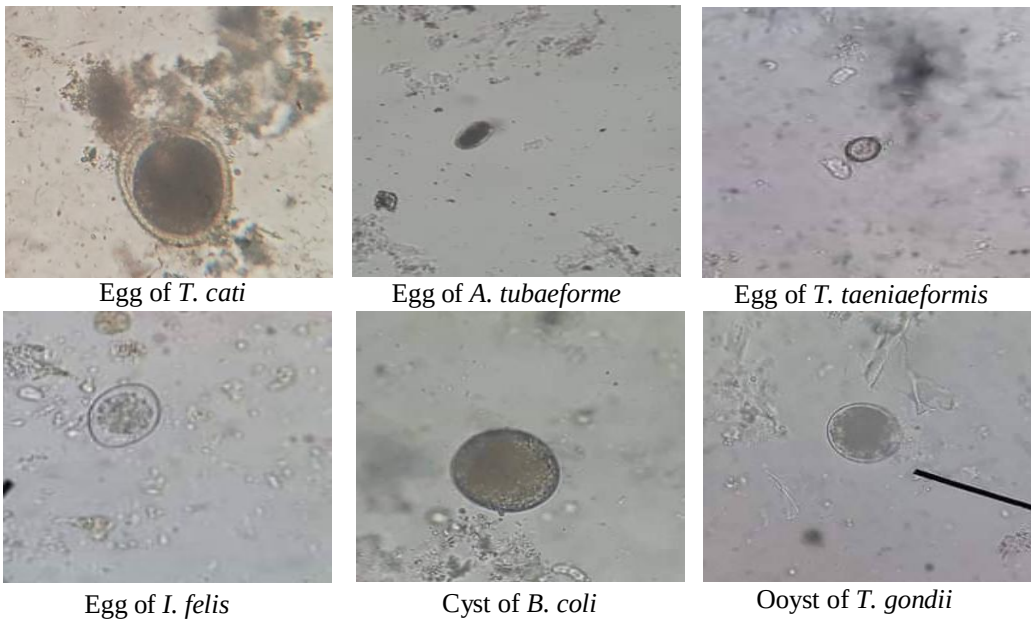
Prevalence of gastro-intestinal parasitic infections of cats

Table 4. Sex wise distribution of gastro-intestinal parasitic infections in cats

Parameter	Name of parasites	No. of positives	Prevalence (%)
Male (n=26)	*T. cati*	3	11.5
	A. tubaeforme	2	7.7
	T. taeniaeformis	1	3.8
	I. felis	1	3.8
	T. gondii	1	3.8
	B. coli	1	3.8
	Mixed infection	6	23.1
	Total	15	57.7
Female (n=36)	*T. cati*	8	22.2
	A. tubaeforme	2	5.6
	T. taeniaeformis	1	2.8
	I. felis	2	5.6
	T. gondii	1	2.8
	B. coli	3	8.3
	Mixed infection	7	19.4
	Total	24	66.7

Table 5. Risk factor for gastro-intestinal parasitic infections in cats

Parameter	Parasitic infection		Odds ratio	P-value
	Yes	No		
>6 month to 1year	12	8	3.0 (0.7-13.4)	-
≤6 month	23	7	6.6 (1.5-28.5)	0.008
>1 year	4	8	Reference	-



Egg of *T. cati* | Egg of *A. tubaeforme* | Egg of *T. taeniaeformis*

Egg of *I. felis* | Cyst of *B. coli* | Ooyst of *T. gondii*

Fig 1. Morphological features of eggs/oocyst/cyst of parasites identified in feces from cat under microscope (40x objective)

Efficacy of anthelmintics and antiprotozoal drugs against parasitic infections in cats

The efficacy of anthemintics against single helminth infection was 100% but the efficacy of anthelmintics was 50% against mixed helminth infection (Table 6). The efficacy of antiprotozoal drugs was 100% against single protozoal infection but it varied from 50% to 66.7% (Table 7).

Table 6. Efficacy of anthelmintics against parasitic infections in cats

Parameter	Anthelmintics	Name of parasites	No. of cat treated	No. of cat recovery (%)	No. of cat not recovery	EPG before treatment (Mean)	EPG two weeks after treatment (Mean)
Single infection	Bol. Fenvet®	a	3	3 (100%)	0	200	0
	Tab. Alben DS®	b	3	3 (100%)	0	166.6	0
	Tab. Peraclear®	c	3	3 (100%)	0	133.3	0
Mixed infection	Bol. Fenvet®	a+b	4	2 (50%)	3	750	83.3
		a+c	2	1 (50%)	1	850	33.3

a. Round worm, b. Hook worm, c. Tape worm d. *Isospora sp*

Table 7. Efficacy of antiprotozoal drugs against parasitic infections in cats

Parameter	Antiprotozoal drugs	Name of parasites	No. of dogs treated	No. of dogs recovery (%)	No. of dogs not recovery	EPG before treatment (Mean)	EPG two weeks after treatment (Mean)
Single infection	Bol. Dirovet®	*a*	3	3 (100%)	0	266.6	0
	Tab. Renamet®	*b*	3	3 (100%)	0	150	0
	Tab. Malacide®	*c*	3	3 (100%)	0	300	0
Mixed infection	Tab. Malacide®	*a+c*	3	2 (66.7%)	1	800	25
	Tab.Anamet®	*a+b*	4	2 (50.0%)	2	650	75

a. *Isospora sp*, b. *B. coli*, c.*Toxoplasma sp*

Discussion

This study describes the prevalence and risk factors of intestinal parasitic diseases in cats in Mymensingh Sadar. In this study, 62.90% cats were found infected with one or more species of parasites. Ito *et al.* (2016) and Yang and Liang (2015) reported that 20.8% and 41.4% cats were positive for gastrointestional parasites in Japan and in China, respectively. Samad and Rahman (1998) reported that 100% of cats were infected with one or more species of endoparasites through coproscopy in Bangladesh. On the other hand, Barutzki and Schaper (2003) documented 24.3% protozoa and helminths infections in cats in Germany. The variation among the present and previous studies could be due to the differences in geographic niches, climatic conditions, breeds of cat, environmental hygiene, management factors and methods of study.

This investigation revealed that 17.7% of the cats were infected with *T. cati* in the study area. The prevalence *T. cati* infection as observed in this study is lower than the earlier reports which varied from 45.5% to 62.2% in different countries (Sadjjadi *et al.,* 2001; Samad and Rahman, 1998; Sommerfelt *et al.,* 2006) with *T. cati* in cat. On the other hand, some authors reported lower prevalence than this study which varied from 11% to 28.2% (Bahadori *et al.,* 2004; Robben *et al.,* 2004; Baker *et al.,* 1989). The possible cause of this variation might be due to the differences in the climatic condition, method of study and host factors. However, it is known that tropical and subtropical conditions are favourable for the survival and maintenance of *T. cati.* The prevalence of *Isospora* spp. infection was 4.83% in cats. This is lower to the findings of other authors (Yang and Liang, 2015). The prevalence of *T. gondii* infection was 3.22% by faecal sample examination. Similar result was also reported by Yang and Liang (2015). During this investigation the prevalence of infection with *A. tubaeforme* was recorded as 6.45%. Samad and Rahman (1998) in Bangladesh and Baker *et al.* (1989) in South Africa reported 36.4% and 41% prevalence of *A. tubaeforme*, respectively. The prevalence of *T. taeniaseformis* infection was 3.22% in cats. Getahun *et al.* (2012) reported 22.4% prevalence of *T. taeniaeformis* in Bahir Dar town, Ethopia. These differences may be related to the

environmental conditions, hygienic measures, feeding habit of cats and their breeds and habitats. The prevalence of *B. coli* infection was found to be 6.45% which was supported by the findings of Schuster and Ramirez-Avila (2008). The odds of gastrointestinal parasitic infection were significantly higher in kittens than adult cats. This result was in agreement with the findings of other authors (Robben *et al.,* 2004; Baker *et al.,* 1989). The higher prevalence of these nematodes in younger cats might be due to the mode of transmission of the parasites and kittens could be infected transplacentally and transmammarily, which increase the risk of the parasites at an early age, whereas, adult cats may develop immunity, which decrease the establishment, as well as the fertility of the parasites (Soulsby, 1982; Urquhart *et al.,* 1996). No significant difference in the prevalence of infection between male and female cats was observed in this study. These findings are closely related to the report of Sadjjadi *et al.* (2001) in Iran.

In case of cats, the efficacy of anthemintics Bol. Fenvet®, Tab. Alben DS®, Tab. Peraclear® against single infection was 100% against roundworm, hookworm, tapeworm respectively which was also similar to the other report (Zu *et al.,* 1992). But the efficacy of Bol. Fenvet® was 50% against mixed infection of helminths. The efficacy of antiprotozoal drugs Bol. Dirovet®, Tab. Renamet®, Tab. Melacide® was 100% against single infection of *Isospora sp, B. coli* and *Toxoplasma sp*, respectively which was similar to the other reports (Botero *et al*., 1973; Harley *et al.,* 1976). The efficacy of Tab. Melacide® (pyrimithamine+sulfadoxine) and Tab. Anamet®varied from 50% to 66.7% against (*Isospora sp+Toxoplasma sp*) and (*B. coli* + *Isospora sp*) against mixed parasitic infections which was lower than the previous reports (Harley *et al.,* 1976; Botero *et al*., 1973).

Conclusion

Gastro-intestinal parasitic infection is highly prevalent in cats. Albendazole, fenbendazole, and mebendazole containing anthelmintics are highly effective against single helminth infection in cats. Similarly metronidazole, pyrimetamine + sulfadoxine are recommended to treat single protozoal infection in cats. Kittens should be dewormed with effective anthelmintics as they are more vulnerable to parasitic diseases. The *T. cati, A. tubaeforme, T. gondii* prevalent in cats are zoonotic and owners awareness need to be increased to prevent human infections.

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