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ORIGINAL ARTICLE

Prevalence and pathology of fish trematode *Opisthorchis felineus* in domestic cats in Mymensingh, Bangladesh

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Abstract

Background: *Opisthorchis felineus* infection is important both for health of cats and health of people. Objective of the research was to determine the prevalence of *Opisthorchis felineus* and the pathological lesions caused by *Opisthorchis felineus* infection in domestic and stray cats in Mymensingh district, Bangladesh.

Methods: A total of 36 cats were examined. The study was carried out in the Department of Parasitology and the Department of Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Results: Out of 36 examined cats, only 30 (83.00%) were infected with *Opisthorchis felineus*. A lower prevalence was observed in young cats <1 year old (66.66%) followed by adult cats >1 year (91.66%). Older cats were 5.5 times more susceptible to *Opisthorchis felineus* infection than that of young cats. Females (85.00%) were 1.30 times more susceptible to *Opisthorchis felineus* infection than that of males (81.25%). The prevalence of *Opisthorchis felineus* was very high all the year round. The rate of infection was 92.00%, 83.33% and 72.72% during summer, rainy and winter seasons respectively. At necropsy, the affected liver was apparently normal in size and shape. But in one case, paler and cream-colourcd area were found on the surface of liver. This liver was infected with 376 *Opisthorchis felineus*. Microscopically, fatty changes and mild hepatitis were detected.

Conclusion: The present study indicates that *Opisthorchis felineus* infection in domestic and stray cats is a problem irrespective of age, sex and season of the year.

Key words: *Opisthorchis felineus*, prevalence, pathology, domestic and stray cat

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Introduction

Opisthorchis felineus infection in cats is important both from health of cats and public health point of view. Humans and animals receive infection by ingestion of raw or insufficiently cooked fish. The young flukes travel to the liver by the bile ducts. *Opisthorchis* is very common in its endemic areas. Most infections are inapparent. In severe infections, the young flukes cause main damage, their cuticular spines abrade the bile ducts that lead to thickening with papilioma formation and the development of cysts, containing flukes, adjacent to the ducts. In *Opisthorchis felineus* infections, emaciation, jaundice and ascites are the symptoms. The enlarged nodular liver is often palpable (Urquhart *et al.*, 1996). *Opisthorchis felineus* living in human liver give rise to jaundice and cholangiocarcinoma (Jacobs, 1985). Cholangiocarcinoma is a cancer with high mortality due to its aggressive nature and resistance to therapy. The Opisthorchiidae liver flukes have been recognized as a risk factor of Cholangiocarcinoma (Kovshirina *et al*., 2019).

A few investigations were done on the prevalence of *Opisthorchis felineus* in cats (Samad and Rahman, 1998; Shaikh *et al*, 1982) in Bangladesh. However, prevalence of *Opisthorchis felineus* in cats in association with their age, sex, season and pathological lesions caused by *Opisthorchis felineus* in cats have yet to be studied in Bangladesh. Therefore, an attempt was made to record a complete prevalence of *Opisthorchis felineus* and to determine gross and microscopic pathology caused by *Opisthorchis felineus* infection in domestic and stray cats in Bangladesh.

Materials and methods

A total of 36 domestic and stray cats were collected from various regions of Mymensingh district, Bangladesh from July, 2006 to June, 2007. The experiment was based on fecal, autopsy and histopathological examinations.

Fecal samples (10-15g) were taken directly from rectum early in the morning. Fecal examinations were performed by following direct smear and different concentration methods such as centrifugation and saturated salt solution floatation technique (Soulsby, 1982). A small amount of fecal material was taken in a clean glass slide. The fecal material was mixed with a small amount of normal saline and smeared on the glass slide for direct fecal smear examination. Five grams of feces was mixed with distilled water in a centrifuge tube. The mixture was sieved into another test tube. The tube was centrifuged in 1500 rpm for three minutes. The pellet in the centrifuged tube was taken by a dropper on a clean glass slide and examined under microscope. Five grams of feces was mixed with Sodium Chloride saturated salt solution in a test tube. The mixture was sieved into another test tube and filled fully with floatation fluid. The test tube was covered with a cover slip. The cover slip was taken after 10 minutes and placed on a clean glass slide and examined under microscope (Soulsby, 1982). The fecal samples were examined under microscope in various magnifications (10X, 40X and 100X).

The livers of euthanized cats were examined thoroughly for detection of gross lesions and collection of parasites. The collected parasites were taken on a clean slide. Permanent slides were prepared according to the procedure described by Cable, 1957. The parasites were identified according to the keys and description given by Soulsby, 1982 and Yamaguti, 1961. The suspected liver parts were taken for histopathological examination as per standard method (Luna, 1968).

The prevalence of *Opisthorchis felineus* was computed by using the formula described by Thrushfield,1995. The odds ratio was calculated by using the formula given by Schlesselman, 1982.

Results

Opisthorchis felineus was found in a cat by Rivolta in 1884. The etymology of *Opisthorchis felineus* is Opistho means ‘one after another’ and Orchis denotes ‘testis’ and *felineus* represents ‘the feline host’. The life cycle of the

Opisthorchis felineus involves a fish as the second intermediate host. Thus, cats are commonly infected with *Opisthorchis felineus*. *Opisthorchis felineus* is a lanceolate fluke. *Opisthorchis felineus* possess the vitellaria confined to bands along the lateral edges of the body. The testes of *Opisthorchis felineus* are found in the posterior of the body, one being anterior to the other. The testes of *Opisthorchis felineus* are lobed. The eggs of *Opisthorchis felineus* are 30 by 11 µm (Soulsby, 1982; Urquhart *et al*., 1996; Yamaguti, 1961) (Figure 1).

Out of 36 examined cats, only 30 (83.00%) were infected with *Opisthorchis felineus* (Table 1, Figure 1). A lower prevalence was observed in young cats, <1 year old (66.66%) followed by adult cats >1 year (91.66%). Older cats were 5.50 times more susceptible to *Opisthorchis felineus* infection than that of young cats (Table 2). Females (85.00%) were more (1.30 times) susceptible to *Opisthorchis felineus* infection than that of males (81.25%) (Table 3). The prevalence of *Opisthorchis felineus* was very high all the year round. The rate of infection were 92.00%, 83.33% and 72.72% during summer, rainy and winter seasons respectively (Table 4).

At post-mortem examination, the affected livers were apparently normal in size and shape. But in one case, paler and cream-colored area were visible on the surface of liver. There were 376 *Opisthorchis felineus* organisms in that affected liver (Figure 2).

Suspected liver tissues were sectioned and stained with haematoxylin and eosin. Microscopically, fatty changes and mild hepatitis were detected. In the area of fatty change, the cytoplasm of the affected cells had either a single large or multiple small round empty vacuoles that distended the cell cytoplasm and displaced the nucleus to the periphery. The changes were found centrilobularly or paracentrally. The central veins were congested and dilated. Hepatitis was characterized by the presence of macrophages, lymphocytes and some eosinophils (Figure 3).

Table 1. Prevalence and mean density of *Opisthorchis felineus* in cats in Bangladesh

Name of the trematode	Prevalence (n=36)		Parasite burden	
	Number of infected cats	Percentage of infected cats (%)	Range	Mean ± SD
Opisthorchis felineus	30	83.00	5-376	35.1±66.7

n = Total number of examined cats
SD = Standard Deviation

Table 2. Age prevalence of *Opisthorchis felineus* in cats in Bangladesh

Age groups of the examined cats	Number of examined cats	Infection of cats		Odds ratio
		Number	Percentage (%)	
Young (<1 year old)	12	8	66.66	5.50
Adult (>1 year old)	24	22	91.66	(Adult vs young)
Overall	36	30	83.00	

Table 3. Sex prevalence of *Opisthorchis felineus* in cats in Bangladesh

Sex of the examined cats	Number of examined cats	Infection of cats		Odds ratio
		Number	Percentage (%)	
Male	16	13	81.25	1.30
Female	20	17	85.00	(Female vs male)
Overall	36	30	83.00	

Table 4. Seasonal prevalence of *Opisthorchis felineus* in cats in Bangladesh

Name of the season	Number of examined cats	Infection of cats		Odds ratio
		Number	Percentage (%)	
Summer	13	12	92.00	2.40 (Summer vs rainy)
Rainy	12	10	83.33	1.88 (Rainy vs winter)
Winter	11	8	72.72	4.50 (Summer vs winter)
Overall	36	30	83.00	

Figure 1. *Opisthorchis felineus*: (a) Anterior part, (b) Posterior portion and (c) Ova

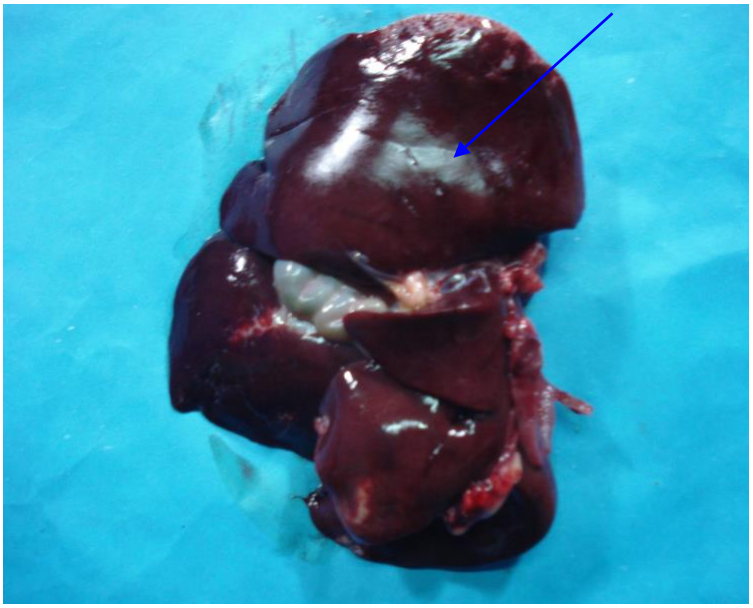

Figure 2. Fatty change (arrow) in the liver of a cat.

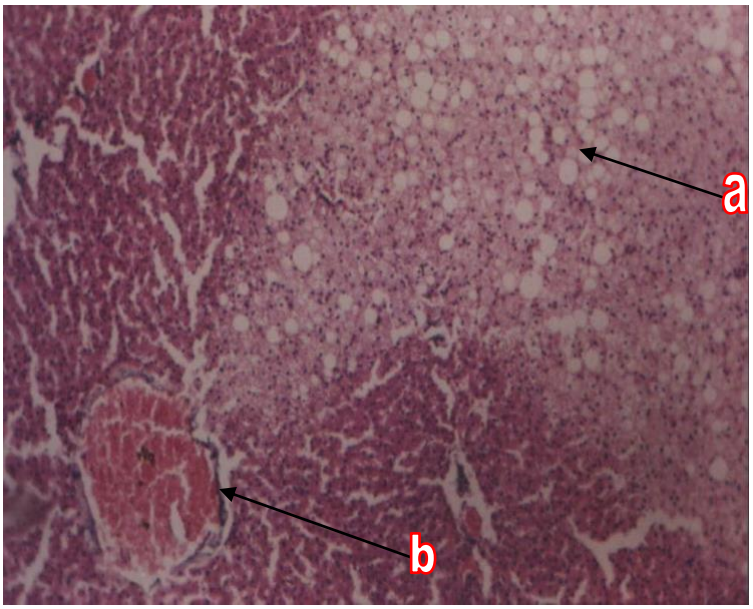

Figure 3. Fatty changes in the liver of a cat: (a) Fatty degeneration and (b) Congested central vein

Discussion

The prevalence of *Opisthorchis felineus* recorded in this study was 83%. But Samad and Rahman (1998); Shaikh and Huq (1984) in Bangladesh recorded 4.55% and 25.71% *Opisthorchis felineus* infection in cats, respectively. Altas and Tasan (1999) in Turkey and Hering-Hgenbeck and Schuster (1996) in Germany found 1.43% and 39.13% infection of *Opisthorchis felineus*, respectively. These differences could be due to availability of natural water sources and fish eating behavior of cats.

Adult cats, aged >1 year old (91.66%) were more infected with *Opisthorchis felineus* than that of young cats <1 year old (66.66%). Robben et a1. (2004) in the Netherlands found highest prevalence of helminths in the kittens and stray cats. Exact reason in the prevalence of infection in different age groups in cats is difficult to explain. But it could be due to an immunological phenomenon. Besides, higher prevalence in the older groups could be due to more exposure to the source of infection.

This study revealed a relatively higher (1.30 times) prevalence of *Opisthorchis felineus* in female (85%) than that of male (81.25%) cats. This finding is very difficult to compare due to unavailability of relevant published literature in cats. Slightly higher prevalence of infection in females than that of males could be due to alteration of physiological condition of cats during pregnancy and lactation. The body resistance in different sexes may have a role in this variation.

A slightly higher prevlence of *Opisthorchis felineus* was recorded during the summer (92.00%) followed by the rainy (83.33%) and the winter (72.72%) seasons. Calculated odds ratio implied that cats were 4.5 and 2.4 times more susceptible to *Opisthorchis felineus* infection in the summer than that of the winter and rainy seasons respectively. But cats were 1.875 times more likely to be infected with *Opisthorchis felineus* in the rainy season than that of the winter season. These results are difficult to compare due to paucity of relevant literature. However, this variation in prevalence could be due to various climatic conditions in different seasons. The differences in the temperature, humidity and other environmental factors could

have contributed to the variation in the infection rate of *Opisthorchis felineus.*

In this investigation, fatty changes and mild hepatitis were found in one cat. Grossly, the lesions were paler than normal hepatic tissue. Microscopically, empty vacules with peripheraly located nucleus were found in hepatocyes along with infiltration of inflammatory cells. Kovner Anna et al. (2019) found fibrosis of liver parenchyma due to chronic infection by *Opisthorchis felineus* in hamsters. Tams (1989) described fatty degeneration of liver parenchyma that occurs as a result of hepatobiliary parasitic infection. Whereas, Jones et al. (1996) stated hyperplastic cholangiohepatitis and cholangiocarcinoma in hepatobiliary parasitic infection. Hepatitis and fatty degeneration in the liver may have occured due to irritation of parasites that lead to cellular degeneration and inflammation.

Conclusion

The present study clearly indicates that *Opisthorchis felineus* infection is a problem irrespective of age, sex and season of the year in domestic and stray cats in Bangladesh. This higher infection rate might cause clinical disease in cats and cause public health risk to humans. Development of sustainable and cost effective prevention and control strategies against *Opisthorchis felineus* is required and to achieve that further investigation is needed.

Conflict of Interest

The authors declared no conflict of interest.

Acknowledgement

None.

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