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PREVALENCE AND PATHOLOGY OF ARTHROPOD INFESTATION IN DOMESTIC AND STRAY CATS IN BANGLADESH

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ABSTRACT

This study was designed to determine the prevalence and pathology of potential arthropods of the domestic and stray cats (*Felis catus*) that had not received veterinary care and had no known exposure to insecticide application and other form of medication. In doing so, 36 domestic and stray cats were taken from Mymensingh district, Bangladesh. The research work was carried out during the period of July 2006 to June 2007 in Mymensingh district, Bangladesh. In the 36 examined cats, overall 32 (88.89 %) cats had arthropod infestation. The rate of infestation was *Ctenocephalides felis felis*, 86% (31 out of 36), *Demodex cati*, 11% (4 out of 36) and *Linguatula serrata*, 14 % (5 out of 36). Slightly higher rate of *Ct. felis felis* infestation was found in kittens (90%) followed by adults (84.61%). There was similar age prevalence of *D. cati* and *L. serrata* infection in kittens and adults. Females (90%) were 2.07 times more susceptible to *Ct. felis felis* infestation than males (81.25%). The rate of arthropod infection did not vary greatly over seasons. But in *L. serrata* infection, there was higher prevalence in summer (27.27%) than rainy (11.11%) and winter (6.25%) seasons. Grossly, demodectic mange was characterized by alopecia, epidermal scaling, scab formation and denudation of the skin mostly found in the ear and the neck. The legs and the abdomen were also affected. At histopathology, sections of mite were found in the hair follicles of the skin along with folliculitis (two cases). Pneumonia was found both grossly and microscopically in lungs of five cats but it was very difficult to correlate with the presence of small number of *L. serrata* organisms.

Key words: Arthropod, prevalence, pathology, domestic and stray cat

INTRODUCTION

Arthropod infestation is common in cats. Arthropod infestation can lead to life threatening anemia in young and debilitated cats. Arthropods are capable of disease transmission (Soulsby, 1982). Cat fleas cause minute papules and pruritus as a result of flea hypersensitivity that is known as “military dermatitis” (Thoday, 1979). Besides, cat fleas are responsible for severe asthmatic problem in human when cat and human live in the same living room (Jacobs, 1985). Demodecosis lead to alopecia, thickened and wrinkled skin with a “mousy odor” in cats (Jacobs, 1985). The adults of *L. serrata* apparently feed on respiratory mucosal cells and blood and cause impairment of respiration and obstruction of the nasal passages in carnivores. People living in the Middle East, India, Africa, Southeast Asia, and the East Indies are sometimes infected with the larvae of *L. serrata* by eating raw glands of cattle, sheep, and goats that have the larvae. People may suffer from irritation in their nose and throat. Deaths have been reported due to blocked air passages (Bowman, 2000). In addition, Kelly *et al.* (2005) and Shaw *et al.* (2004) noticed that cat fleas served as carriers of emerging human pathogens, *Rickettsia felis*, *Bartonella henselae* and *B. clarridgeie* in New Zealand and in the UK respectively.

In Bangladesh, there is no published report on the prevalence and pathology of arthropod infestation in domestic and stray cats. Thus, an attempt was made to find out the occurrence of arthropods in relation to their age, sex, and season and to show the gross and microscopic changes produced by the parasites.

MATERIALS AND METHODS

The study was carried out from July, 2006 to June, 2007 in Mymensingh district, Bangladesh. A total of 36 domestic and stray cats (indigenous breed) were collected from Mymensingh district, Bangladesh. The experiment was based on direct examination of the skin, skin scrapings, fecal, autopsy and histopathological examination. Ectoparasites were

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collected by hand picking and by using tools. In case of fleas, a flea comb and in case of lice a brush and a lice comb were used. Skin scrapings were taken from the suspected areas by using glycerinized scalpel until oozing for recovery of mites. The scrapings were boiled gently by adding 10% potassium hydroxide and examined under microscope using 10x magnification (Hendrix and Robinson, 2006). Fecal samples (10-15g) were taken from freshly voided fecal pad early in the morning. Fecal examinations were performed by following direct smear and concentration techniques (Soulsby, 1982). The respiratory tracts of dead or euthanized cats were examined thoroughly for detection of gross lesions and collection of parasites. The collected arthropod parasites were preserved in glycerin alcohol in separate vials for each host. Permanent slides of arthropods were prepared according to the procedure described by Cable (1957). Arthropods were identified by using keys and description given by Soulsby (1982) and Wall and Shearer (1997). The skin of the cats was examined thoroughly for gross lesions. Suspected parts of the skin and respiratory tracts were collected. The collected parts were sent for histopathological study as per standard method (Luna, 1968).

The prevalence of ectoparasites was computed by using formula described by Thrushfield (1995). Odds ratio was calculated by using formula given by Schlesselman (1982).

RESULTS AND DISCUSSION

Overall 32 (out of 36) cats (88.89%) were infected with one or two or three species of arthropods (Table 1). This finding is in conformity with earlier finding of Akucewich *et al.* (2002) in the USA who found 92.5% flea infestation in cats. On the other hand, Rataj *et al.* (2004) in Slovenia documented 34. 65% cats were infested with mites and lice. In this study, recorded species were *Ct. felis felis* (86%), *D. cati* (11%) and *L. serrata* (14%) (Table 1). These findings are similar to that of Cruz *et al.* (2001) in Mexico, Visser *et al.* (2001) in Germany and Koutinas *et al.* (1995) who recorded 92.3%, 91.6%, and 97.4% *Ct. felis felis* infestation respectively in cats. On the other hand, Shaikh and Huq (1984) in Bangladesh and Coman *et al.* (1981) in Australia detected 51.4% and 16% prevalence of *Ct. felis* respectively in cats. A few data is available to explain the prevalence of *Demodex* sp. infection in cats. However, Samad *et al.* (1979) found demodectic mange in cattle in Bangladesh. Vecchio and Abramo (1999) reported *D. cati* in a cat from Italy. On the other hand, Sotiraki *et al.* (2001) found no *D. cati* from 161 cats in Greece. In case of *L. serrata* infection, Altas and Tasan (1999) found 1.43% prevalence of *L. serrata* in cats from Turkey. Rahman *et al.* (1971) found 45% prevalence of *L. serrata* from dogs in Bangladesh. *L. serrrata* nymph from cattle and goats of Bangladesh was recorded by Rahman *et al.* (1980). Immature linguatulosis in a Murrah buffalo was reported from Bangladesh by Chowdhury and Dewan (1967). Soulsby (1982) stated that animals having poor condition or chronic debilitating disease are more susceptible to flea infestation. Vecchio and Abramo (1999) found *D. cati* infection in a cat with feline immunodeficiency virus in Italy. In this experiment, the collected cats had poor health. So overall higher rate of infection could be due to poor health, poor hygienic condition, immunosuppressive diseases, breed of cats, environmental factors and method of study.

Demodectic mange was detected on the skin of two (5.55%) cats. Grossly, the lesions were characterized by alopecia, epidermal scaling, scab formation and denudation of the skin. The lesions mostly found in the skin of the ear and neck (Figure 1). The legs and abdomen were also affected. At histopathology, sections of mite were found in the hair follicles of the skin. There was evidence of folliculitis characterized by perifollicular infiltration of neutrophils and lymphocytes (Figure 2). These findings are similar to the description given by Jones *et al.* (1996) and Soulsby (1982). In five cases, pneumonia was found both grossly and microscopically. At post-mortem examination, the lungs parenchyma showed intense hemorrhage and congestion in all the cases but in two cases small white spots were found on the surface of the lungs (Figure 4). Microscopically, there were interstitial pneumonia characterized by thickening of inter-alveolar septa and some alveoli were filled with exudates containing mononuclear cells (Figure 5). But these lesions in the lungs are very difficult to correlate with the presence of small number of *L. serrata* organisms. In this experiment only pathological and parasitological examination was done. If microbial and other tests were done then confirmed cause of pneumonia could have identified.

Table 1. Prevalence and pathology of arthropod infestation in cats (n = 36) in Bangladesh

Arthropod species	Prevalence		Parasite burden		Location in the host
	No. of cats infected	Percentage (%) of infected cats	Range	Mean ± SD	
Ct. felis felis	31	86 %	1 - 7 (per square inch)	35.1 ± 66.7	Skin
D. cati	4	11 %	1 – 3 (per focus)		Skin (hair follicles)
L. serrata	5	14 %	1 - 4	2.25 ± 1.5	Larynx to lungs
Overall	32	88.89 %			
Parasite identified	Organ affected	Pathological condition	No. of cats affected	Percentages (%) of infection	
D. cati	Skin	Demodectic mange	2	5.55%	

n = Total number of cats examined, SD = Standard Deviation

In case of *Ct. felis felis* infestation, higher prevalence was recorded in kittens (90 %) than adult cats (84.61 %). In *D. cati* infestation, 10% kittens were affected whereas the rate is 11.53% in adults. Slightly higher infection rate was found in adults (15.38%) followed by kittens (10%) in *L. serrata* infection. (Table 2). Similar findings were stated by Vecchio and Abramo (1999) and Soulsby (1982). Soulsby (1982) stated that flea infestation was more common in older cats and demodecosis was evident after 3-9 months in dogs. Vecchio and Abramo (1999) described a 10 year old cat with demodecosis in Italy. Age prevalence of *L. serrata* can not be compared due to paucity of relevant literature. Slightly higher prevalence of *Ct. felis felis* infection in kittens may be due to frequent contact with their mothers. Moreover, the variation in the prevalence of infection may be due to certain immunological phenomena, source of infection and such other factors.

Table 2. Age prevalence of *Ct. felis felis*, *D. cati* and *L. serrata* in the cats of Bangladesh

Arthropod species	Age groups	No. of examined cats	Infection of cats	
			Number	Percentage (%)
Ct. felis felis	Kittens (<6 months)	10	9	90 %
	Adult (>6 months)	26	22	84.61 %
	Overall	36	31	86 %
D. cati	Kittens (<6 months)	10	1	10 %
	Adult (>6 months)	26	3	11.53 %
	Overall	36	4	11 %
L. serrata	Kittens (<6 months)	10	1	10 %
	Adult (>6 months)	26	4	15.38 %
	Overall	36	5	14 %

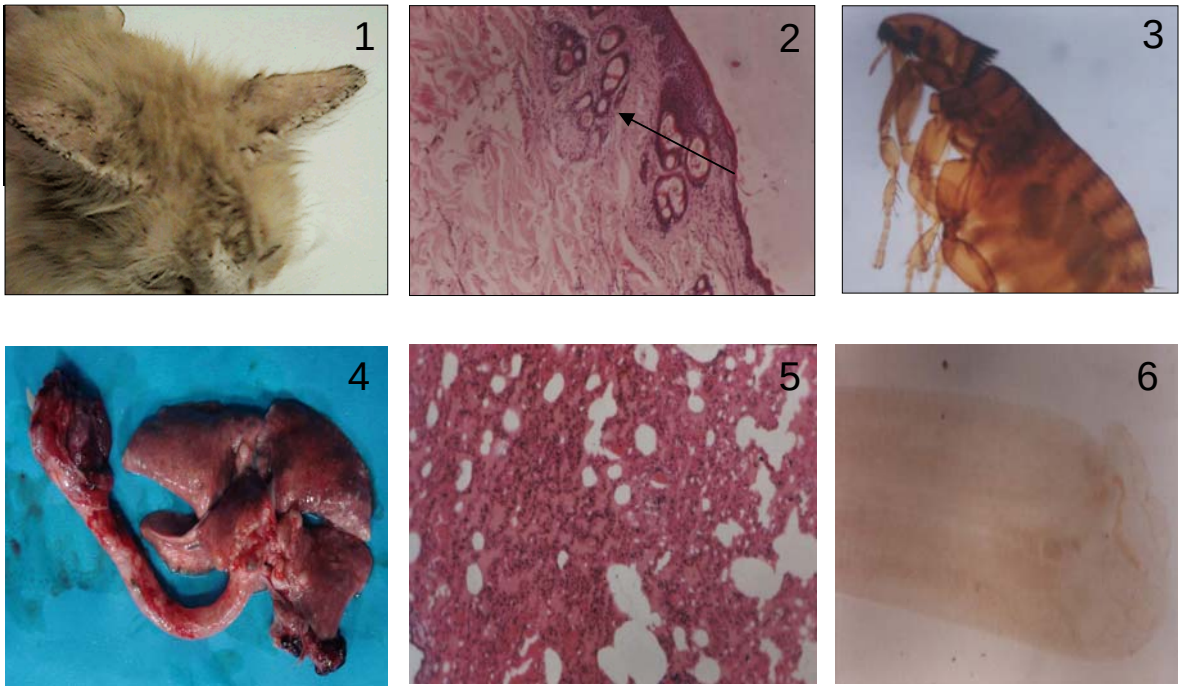

Figure: 1. Alopecia and scab formation on the skin of neck and ear in a cat infested with *D. cati* 2. Demodectic mange on the skin: Section of mite (arrow) 3. *Ct. felis felis* collected from the skin of a cat 4. Hemorrhage and congestion in the lungs of a cat 5. Interstitial pneumonia in the lungs of a cat 6. Anterior portion of adult *L. serrata* showing four prominent hooks.

In all cases females had slightly higher rate (*Ct. felis felis*, 90%, *D. cati* 15% and *L. serrata*, 15%) of infestation than males (*Ct. felis felis*, 81.25%, *D. cati*, 6.25% and *L. serrata*, 12.5%). The odds ratio of females against males was 2.07 in case of *Ct. felis felis* infestation (Table 3). These finding are very difficult to compare due to unavailability of enough related literature in cats. However, Shimada *et al.* (2003) showed that *Ixodes nipponensis* infection was more frequent in castrated male cats in Japan. The exact causes of similar sex prevalence of arthropods are unknown but it may be due to equal body resistance of both the males and females.

Table 3. Sex prevalence of *Ct. felis felis*, *D. cati* and *L. serrata* in the cats of Bangladesh

Arthropod species	Sex	No. of examined cats	Infection of cats		Odds Ratio
			Number	Percentage (%)	
Ct. felis felis	Male	16	13	81.25 %	2.07 (Female vs. Male)
	Female	20	18	90 %	
	Overall	36	31	86 %	
D. cati	Male	16	1	6.25 %	
	Female	20	3	15 %	
	Overall	36	4	11 %	
L. serrata	Male	16	2	12.5 %	
	Female	20	3	15 %	
	Overall	36	5	14 %	

Ct. felis felis infestation was higher in winter season (93.75%) compared to summer (81.82%) and rainy (77.77%) season. Similarly, *D. cati* infestation was more in winter season (12.5%) followed by rainy (11.11%) and summer (9.09%) season. Whereas, *L. serrata* infection was much higher in summer (27.27%) followed by rainy (11.11%) and winter season (6.25%) (Table 4). These findings suggest that there is little seasonal influence on arthropod infestation in cats. Akucewich *et al.* (2002) found more count of *Ct. felis* in June and July than in August and September in the USA. Cruz *et al.* (2001) determined more flea infestation in spring, summer and autumn than in winter. In the experimental areas, temperature ranged from 15˚C (winter) to 35˚C (summer); humidity was about 99% in July and 36% in December and the soil was silty and loamy. The differences in temperature and humidity year round and soil type could have contributed to the variation in the prevalence of arthropods.

Table 4. Seasonal prevalence of *Ct. felis felis*, *D. cati* and *L. serrata* in the cats of Bangladesh

Arthropod species	Season of the year	No. of examined cats	Infection of cats	
			Number	Percentage (%)
Ct. felis felis	Summer (March to June)	11	9	81.82 %
	Rainy (July to October)	9	7	77.77 %
	Winter (Nov. to Feb.)	16	15	93.75 %
	Overall	36	31	86 %
D. cati	Summer (March to June)	11	1	9.09 %
	Rainy (July to October)	9	1	11.11 %
	Winter (Nov. to Feb.)	16	2	12.5 %
	Overall	36	4	11 %
L. serrata	Summer (March to June)	11	3	27.27 %
	Rainy (July to October)	9	1	11.11 %
	Winter (Nov. to Feb.)	16	1	6.25 %
	Overall	36	5	14 %

In fecal examinations, egg of *L. serrata* was not found. According to Hobmaeir and Hobmaier (1940), the eggs do not appear in the feces of the dog but instead are found in the nasal secretions. The possibility that the eggs of small number of *Linguatula* organisms were not shed in the feces of the cats. This aspect requires additional verification.

The present study suggests that arthropod infestation especially *Ct. felis felis* is highly prevalent in domestic and stray cats in Bangladesh. Besides, it has been found that age, sex and season had little effect on arthropod parasitism. In this research work, arthropod prevalence and pathologic changes in domestic and stray cats are studied. So, further study is essential to investigate regional arthropod prevalence, pathogen carriage and public health significance of cat arthropods in Bangladesh.

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