



SHORT COMMUNICATION

## Copro-Prevalence of Hookworm Infection and Associated Risk Factors in Pet Dogs in Ludhiana

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### ABSTRACT

The study was conducted to know the copro-prevalence of hookworm infection in relation to various risk factors in the pet dogs from in and around Ludhiana. Total 250 dog faecal samples were examined by flotation and Mc Master egg counting technique for qualitative and quantitative evaluation, respectively. The prevalence of hookworms was correlated with meteorological data, age, sex and breed. Coprological examination revealed an overall prevalence of ancylostomosis as 13.20% and eggs per gram (epg) of faeces ranged from 600-28,300. Micrometry revealed the mean size of eggs as 65.75  $\mu\text{m}$  (Length)  $\times$  43.22  $\mu\text{m}$  (Breadth). The monthly prevalence varied from 5.55 to 26.66% with the highest prevalence in the month of October and the lowest in March. The highest prevalence of hookworms was at a mean temperature of 25.1°C and relative humidity 68%, recorded in the month of October. The season-wise highest prevalence was in the autumn (24.14%) and the lowest in winter (9.46%). The prevalence was higher in male (14.37%) dogs as compared to their female counterparts (10.84%). The breed wise highest prevalence was seen in Mongrel (19.23%). The prevalence was relatively higher in younger (0-6 month-old pups) (28%) than aged dogs. The studies indicated that hookworm had higher prevalence in males, in young dogs, mongrel breed and in autumn months.

**Keywords:** Ancylostomosis, dog, fecal, flotation technique, prevalence

In developing countries, including India, uncontrolled population of stray and semi-domestic dogs in close proximity to urban and rural human habitat contaminate public parks, playfields and school grounds with helminthic eggs and act as a source of parasitic transmission to domestic dogs and humans, particularly children.

Ancylostomosis occurs in warm and temperate climates with adequate moisture. *Ancylostoma caninum* and *Uncinaria stenocephala* infections are relatively common in pups, although the former is much more frequent (Krishnabhanu and Vardhani, 2013). *A. caninum* is the most pathogenic species of all hookworms in pet animals. The primary sign of hookworm infection and disease is anaemia in dogs, especially in pups. *A. caninum* causes

hemorrhagic diarrhoea (Lamb *et al.*, 2012). Creeping eruptions due to initial hookworm infection commonly occur in children playing in places contaminated with excreta of dogs generally referred as cutaneous larvae migrans (Prociv and Croese, 1996; Ashraf *et al.*, 2008).

Higher prevalence of *Ancylostoma* spp in stray dogs as compared to pet dogs may be due to ill management and lack of deworming (Ashraf *et al.*, 1994). Due to paucity of information in this region except for isolated reports, the present study was conducted to ascertain the copro-prevalence of hookworm infection in relation to various risk factors from the pet dogs from in and around Ludhiana, Punjab.

**MATERIALS AND METHODS**

Total of 250 fecal samples were collected from the suspected cases of dogs from Ludhiana presented to Small Animal Clinics of Teaching Veterinary Clinical Complex, GADVASU, Ludhiana from March-2015 to February-2016. The month-wise, season-wise, age-wise, breed-wise, sex-wise, and overall prevalence were studied during the period.

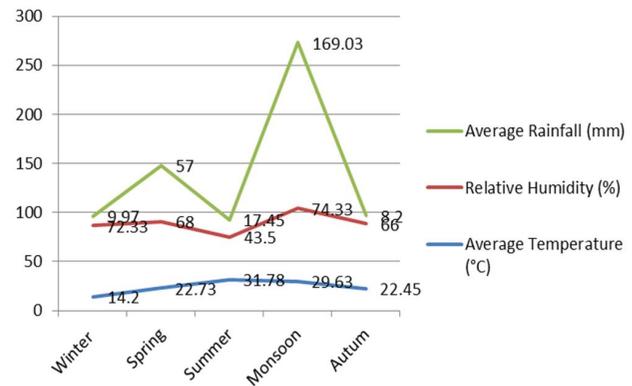
Faecal samples were processed by faecal flotation technique for the presence of hookworm eggs. Identification of the hookworm species was made by morpho-metric observations of the eggs and the quantification of the eggs was done by Mc Master Technique (Soulsby, 1982). Data were procured from Department of Agricultural Meteorology, PAU, Ludhiana during the period of March-2015 to February-2016 to correlate the prevalence of hookworms with various meteorological factors Viz. season, ambient temperature, relative humidity and rainfall (Table 1, Fig. 1).

**Table 1:** Monthly Temperature, Relative Humidity and Rainfall (March 2015 to February 2016)

Month	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	
March	25.5	13.3	93	59	84.6
April	32.6	19.5	75	45	29.4
May	39.6	23.9	52	23	17
Jun.	37.6	26	61	38	17.9
July	33.5	27.2	81	67	256.1
Aug.	33.3	26.5	86	67	165.6
Sept.	33.2	24.2	87	57	85.4
Oct.	31.3	19	90	45	16.4
Nov.	26.9	12.6	91	37	00
Dec.	21.3	7.3	94	42	1.7
Jan.	17.2	7.4	95	64	19.4
Feb.	23	9	91	46	8.8

**Statistical analysis**

The data was analysed by using  $\chi^2$  test, in IBM SPSS 22.0 software.



**Fig. 1:** Season-wise representation of average temperature (°C), relative humidity (%) and rainfall (mm)

**RESULTS AND DISCUSSION**

Out of 250 suspected faecal samples analysed, 33 (13.20%) faecal samples were found positive for the *Ancylostoma* spp. infection (Table 2), which was lesser than the prevalence reported by Panigrahi et al. (2014) from Bhubaneswar (23.4%), Odissa. Whereas, Tarub et al. (2014) observed that hook worm was the most common parasite in the dogs in Sikkim (71.3%), Mumbai (48.8%) and Delhi (39.1%). Qadir et al. (2011) found *A. caninum* infection was predominant (17.84%) in Jabalpur; Gugsu et al. (2015) reported the prevalence rate of 24.00% *Ancylostoma* spp. in dogs in Euthopia. Apart from all these studies Ali et al. (2013) encountered very low 3.22% prevalence of *A. caninum* in contaminated soil samples collected from slums of Lahore. The micrometry was performed using the stage and ocular micrometer. The length was ranging from 52.5 – 71.66  $\mu$ m and the Breadth was ranging from 39.1 – 47.66  $\mu$ m. The mean size of eggs were, length- 65.75  $\mu$ m and the breadth- 43.22  $\mu$ m. Based on morphometric analyses of eggs were confirmed to be *Ancylostoma* spp as per Soulsby (1982). Quantitative analysis by Mc Master counting technique revealed that the eggs per gram (epg) of faeces ranged from 600-28,300. The highest prevalence (26.67%) was seen in the month of October and the lowest (5.55%) in the month of March 2015 (Fig. 2). Since the ambient conditions of temperature, relative humidity and rainfall were favourable in the month of October for the development of larval stages (Table 1), therefore the highest prevalence of hookworms in the present study of October may be justified. Pangui

and Belot (1986) also augmented that monthly infection rate corresponded to climatic conditions. The seasonal prevalence was found to be 9.46, 12.28, 12.50, 14.28 and 24.14 percent in winter, spring, summer, monsoon, and autumn, respectively (Table 2).

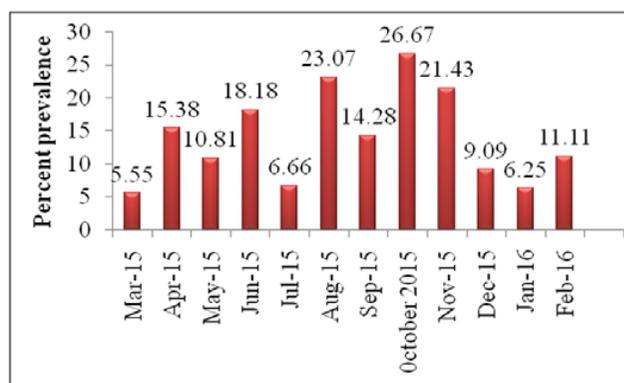
**Table 2:** Prevalence of *Ancylostoma* spp in dogs in Ludhiana by faecal examination from March 2015 to February 2016

Season	Dogs examined	Positive cases	Percent prevalence
Winter (Dec., Jan., Feb.)	74	7	9.46
Spring (March and April)	57	7	12.28
Summer (May, June)	48	6	12.5
Monsoon (July, Aug. and Sept.)	42	6	14.28
Autumn (Oct. and Nov.)	29	7	24.14
Total	250	33	13.20
Chi square value = 4.07, df = 4, P > 0.05 (Non-significant)			
<b>Age</b>			
0 - 6m	50	14	28.00
6-12m	64	6	9.37
1year – 3years	60	9	15.00
3 years onwards	76	4	5.26
Total	250	33	13.20
Chi square value = 14.72, df = 3, P < 0.05 (significant)			
<b>Sex</b>			
Male	167	24	14.37
Female	83	9	10.84
Total	250	33	13.20
Chi square value = 0.60, df = 1, P > 0.05 (Non-significant)			
<b>Breed</b>			
Labrador retriever	72	11	15.28
Mongrel	52	10	19.23
German shepherd	29	4	13.79
Pug	24	2	8.33
Pomeranian	15	2	13.33
Others*	58	4	6.89
Total	250	33	13.20
Chi square value = 4.54, df = 5, P > 0.05 (Non-significant)			

\* Among others 1 Boxer, 1 Grey hound, 1 Gaddi and 1 Daschshund was positive for hookworm.

The lowest prevalence of hookworms in the present study was recorded in winter as cold temperature contributes to low egg viability and low survival of free living larvae

(Coggins, 1998). The highest prevalence in autumn may be because monsoon season precedes autumn. Due to favourable condition in monsoon for the survival of the worm the dogs picked up infection in the monsoon leads to highest copro-prevalence in autumn.



**Fig. 2:** Month-wise prevalence of *Ancylostomosis* in dog

Followed by autumn next highest prevalence (14.28%) was in monsoon or rainy season. Andresiuk *et al.* (2007) also reported that the prevalence of *Ancylostoma* spp was higher in autumn than in winter and suggested this could be for high temperatures (19°C), high humidity near to 80% and an intermediate rain pattern (333.5 l/m<sup>2</sup>) an ideal conditions for development and hatch in summer and autumn in Mar del Plata city prevailed. Lefkaditis and Koukeri (2006) observed that the optimum temperature for *A. caninum* development is between 23°C and 30°C. They do not develop to this stage at temperatures below 15°C. When the temperature is 15°C, infective larvae may appear 22 days after the eggs were shed in the faeces and at 37°C infective larvae may appear in 47 hours. Most larvae cannot survive temperatures above 37°C. Free living larvae of hookworms from dog faeces were observed to emerge for about a four week period in summer. Infective larvae crawl out of the faeces and into the soil or onto vegetation, and they then wait until an appropriate host comes along. They may enter the host directly through the skin or after being ingested and cause the infection. The occurrence of *Ancylostoma* spp. infection was more in 0-6 month followed by 1-3 years, 6 -12 month old dogs and lowest in older dogs (>3 years). The prevalence of *Ancylostoma* spp was found higher in younger animal than older animal. The finding was similar to that of Lefkaditis and Koukeri (2006). Dogs between 0-6 months showed

highest prevalence (28.00 %). Another reason for more prevalence in young dogs might be due to the lack of deworming, lack of awareness of the dog owners until and unless they visit the clinic for consultation.

So as a result of deworming by the end of 6 month of age there is less copro-prevalence at 6-12 month of age group. But at 1-3 year of age group the prevalence has increased may be because of the negligence of the owner to follow deworming schedule. After 3 years due to development of age resistance there is less copro-prevalence. A variable prevalence of *A. caninum* according to age was reported by various workers (Little *et al.*, 2009; Das *et al.*, 2009). The prevalence of ancylostomosis was higher (14.37%) in male than female (10.84%) dogs. As in the present study, Coggins (1998) also reported lower prevalence in females than that of males, which appeared to be independent of age. These findings might be due to the individual hormonal status of male and female dogs (Panigrahi *et al.*, 2014; Brahmhat *et al.*, 2015). The highest prevalence of *Ancylostoma* spp eggs was noticed in mongrel dogs (19.23%) and lowest in pug (8.33%) in the faecal samples analysed during the study (Table 2). Das *et al.* (2009) and Mahdy *et al.* (2012) found that *Ancylostoma* spp. infection was very common in mongrel dog. This may be due to the fact that pet dogs kept under good hygienic condition and good nutrition was showing less prevalence than kept under poor hygiene and nutrition. Moreover, the foreign breed dogs are reared by the moderate to high class people and the mongrel dogs are reared by the poor people and the high class people are aware about the deworming than the poor people. So, there is variation in the breed-wise prevalence.

## CONCLUSION

The present study showed that the prevalence of hookworm infection was higher in male dogs than female dogs. Though the prevalence of hookworm infection was there throughout the year, however, highest prevalence was observed in the month of October, in autumn season and in 0 – 6 months of age. Lowest prevalence was observed in the month of March, 2015, in the winter season and in the age group of 3 year onwards. Prevalence of hookworm infection varied in different breeds. The most important risk factor in the present study was seasons of the year due to various favourable factors as temperature, relative humidity and rainfall.

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