Prevalence of endoparasitic infections of non descript dogs in Mathura, Uttar Pradesh

Vikrant Sudan · Amit Kumar Jaiswal ·
Daya Shanker · Dharamendra Kanojiya ·
Amreesh Sachan

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Abstract The objective of this study was to investigate, through cross-sectional survey, the distribution, types and prevalence of gastro-intestinal parasites affecting stray dogs in and around Mathura, India. Freshly voided faecal samples of 108 identified, stray, non descript dogs of either sex and different age groups were collected and examined for coprological examination by direct faecal smear method; simple flotation and sedimentation techniques to detect parasitic oocysts and/or eggs. A total of 96 samples (88.9 %) were found positive for helminthic eggs (nematodes and cestodes) while 16 (14.2 %) were found to be positive for protozoan infections with a overall parasitic prevalence of 98 (90.7 %). Single parasite infections (72.2 %) were more common than two or more infections (27.8 %). The data on the distribution of the various worm species in the positive dogs indicate that *Ancylostoma caninum* eggs were by far the most common (55.6 %). The other detected worm egg species and their respective frequencies were: *Toxocara canis* (51.9 %), *Dypilidium caninum* (50.0 %), Taenids (33.3 %), *Toxocara leonina* (25.9 %), *Diphylobothrium latum* (5.6 %), *Spirocerca lupi* (3.7 %) and *Physaloptera canis* (3.7 %). *Eimeria canis* oocysts were detected in eight samples (7.4 %) besides, total coccidian oocysts in 16 samples (14.8 %). The prevalence of helminth eggs was higher in puppies compared to adults. The prevalence of different species of helminths also varied in different age groups. The high prevalence of

gastro-intestinal helminth parasites of zoonotic potential registered in the dogs indicates a potential risk to human health. The public health significance of the encountered parasitic infections is described and the prevalence is compared with the surrounding areas.

Keywords Canines · Endoparasitic infections · Mathura · Prevalence · Public health significance · Zoonoses

Introduction

In spite of playing diversified and beneficiary roles in human society, dogs are the potent source of some of the zoonotic parasites (Robertson et al. 2000; Podberscek 2006). Parasitic diseases, particularly gastro-intestinal helminths and protozoans, have been incriminated as the major impediment to dog health worldwide (Smith 1991). In order to access the prevalence of naturally occurring parasitism in dogs residing in areas in and around the Campus of Veterinary University, Mathura, Uttar Pradesh, India, a study was conducted regarding the copro examination of nondescript dogs, with no possible deworming history.

Materials and methods

Sampling procedure and data collection

A cross-sectional design in which data was collected at a single point and time (Thrusfield 2005) was used in the instant study. The population of study constituted stray dogs residing around human localities in and around the

V. Sudan (✉) · A. K. Jaiswal · D. Shanker · D. Kanojiya ·
A. Sachan

Department of Parasitology, College of Veterinary Sciences &
Animal Husbandry, U P Pandit Deen Dayal Upadhyaya Pashu
Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan
Sansthan (DUVASU), Mathura 281001, India
e-mail: viks.sudan@gmail.com

Veterinary Campus, Mathura. Data was collected on the dogs' demographic characteristics (age, gender, etc.). The age of the presented dogs was determined based on body condition scores. Dogs were subjectively evaluated on two-scale level as 'unhealthy' or 'healthy'. Dogs were grouped into three age categories. Dogs under 6 months of age were classed as puppies, those in range of 7–1 year were classed as juvenile and those beyond 1 year were classed as adult.

Sampling and parasitological techniques

Freshly voided faecal samples were collected after defaecation from the respective dog, put into faecal plastic bags, labelled and kept cool before transportation to the laboratory of Department of Parasitology, DUVASU, Mathura for coprological examination, where they were immediately examined or stored at refrigerated temperature (4 °C) for a maximum of 1 day before processing. The sedimentation and floatation technique as described by Soulsby (1982) were used to detect the presence of helminth eggs (cestodes and nematodes) and coccidia oocysts in the samples. A total of 108 identified, free living, stray, non descript dogs of either sex and different age groups were used in the present study.

Statistical analysis

Descriptive statistics were generated and presented as tables. For the epidemiological studies, the prevalence (p) of dogs harbouring each parasite was calculated as $p = d/n$, where d is the number of dogs diagnosed as having a given parasite at that point in time and n is the number of dogs at risk (examined) at that point in time (Thrusfield 2005).

Results

Prevalence of gastrointestinal parasitic eggs and oocysts

Out of the total of 108 faecal samples examined, 48 (44.4 %) were found positive for helminthic eggs (nematodes and cestodes) while 16 (14.2 %) were found to be positive for protozoan infections. The proportion of the dogs harbouring hookworm eggs (*Ancylostoma caninum*) was the highest (55.6 %) followed by *Toxocara canis* (51.9 %), *Dypilidium caninum* (50.0 %), Taenids (33.3 %), *Toxocara leonina* (25.9 %), *Diphylobothrium latum* (5.6 %), *Spirocerca lupi* (3.7 %) and *Physaloptera canis* (3.7 %). Protozoan oocysts (*Eimeria canis* and other sporozoans) were detected in total of 16 samples (14.2 %). Single parasite infections ($n = 78$; 72.2 %) were more

common than two or more infections ($n = 30$; 27.8 %). Detailed prevalence of GIT parasites is shown in Table 1.

Factors associated with prevalence of GIT parasite eggs infection

Host age was found to be a significant factor with respect to the prevalence of *T. canis* and *A. caninum* is concerned, as the infections being detected more frequently in puppies (<6 months of age) than juvenile and adult dogs (Table 1). There was no significant difference in the prevalence of gastro intestinal parasites between male (53 %) and female (47 %) dogs. Health status was not significantly associated with prevalence of parasite infection as apparently healthy (51 %) and unhealthy (49 %) dogs were almost equally infected indicating sub clinical infections in most of the cases.

Discussion

The present study showed that canine gastrointestinal parasitism was an important health disease. Helminthosis is often described as one of the main problems in dogs across the globe (Traub et al. 2005). However, the present study was different from the other mentioned works, as it dealt with natural parasitism in dogs and only those dogs were selected that had no possible history of deworming. Moreover, stray dogs were selected as they took their food from outside on their own and were not pets. This was done so as to assess the true nature of parasitic infections in nature and to give a valid and accurate data regarding prevalence of parasitism in canines in the study area. The relatively high level of parasitism recorded in this study is definitely related to the lack of earlier deworming history of dogs as they were free range eating habit of dogs in the study area. Mixed parasitism involving two or more helminth genera was also common in the present study.

The main significant finding of this survey is the persistent infections of dogs by helminths like *A. caninum* and *T. canis*, as in addition to its deleterious effects on dog's health they are responsible for a wide variety of public health hazards. The higher prevalence of *A. caninum* (55.6 %) and *T. canis* (51.9 %) could be due to the nature of the environment, poor levels of hygiene and overcrowding especially in communities that are socio-economically disadvantaged together with the lack of veterinary attention in residing areas (Traub et al. 2005). Puppies are usually born with or acquire ascarid infection early in life through trans-mammary and trans-placental transmission (Soulsby 1982). Humans, when come in contact with the infective stages of canine hookworms, develops cutaneous larva migrans (CLMs). Reports on the

Table 1 Overall prevalence of various parasitic infections along with age group affected and severity of infection

S. no.	Parasite species	Number of infected cases ^a	Age wise prevalence ^b			Severity of infection		
			Puppies (below 6 months)	Juveniles (between 7 months and 1 year)	Adults (above 1 year)	Mild (+)	Moderate (++)	Heavy (+++)
1	<i>Ancylostoma caninum</i>	60 (55.6 %)	36 (60.0 %)	16 (26.7 %)	8 (13.3 %)	16 (26.7 %)	24 (40.0 %)	20 (33.3 %)
2	<i>Toxocara canis</i>	56 (51.9 %)	38 (50.0 %)	10 (17.9 %)	8 (14.1 %)	12 (21.4 %)	28 (50.0 %)	16 (28.6 %)
3	<i>Dipylidium caninum</i>	54 (50.0 %)	14 (26.0 %)	20 (37.0 %)	20 (37.0 %)	18 (33.3 %)	20 (37.1 %)	16 (29.6 %)
4	Taenids	36 (33.3 %)	4 (11.1 %)	8 (22.2 %)	24 (66.7 %)	8 (22.2 %)	28 (77.8 %)	–
5	<i>Toxocara leonina</i>	28 (25.9 %)	20 (71.6 %)	4 (14.2 %)	4 (14.2 %)	8 (28.6 %)	12 (42.8 %)	8 (28.6 %)
6	Other coccidians	16 (14.8 %)	2 (12.5 %)	6 (37.5 %)	8 (50.0 %)	2 (12.5 %)	12 (75.0 %)	2 (12.5 %)
7	<i>Eimeria canis</i>	8 (7.4 %)	–	4 (50.0 %)	4 (50.0 %)	2 (25.0 %)	6 (75.0 %)	–
8	<i>Diphylobothrium latum</i>	6 (5.6 %)	–	–	6 (100.0 %)	4 (77.7 %)	2 (33.3 %)	–
9	<i>Spirocerca lupi</i>	4 (3.7 %)	–	–	4 (100.0 %)	4 (100.0 %)	–	–
10	<i>Physaloptera canis</i>	4 (3.7 %)	–	2 (50.0 %)	2 (50.0 %)	4 (100.0 %)	–	–

^a Values in parenthesis indicate the overall prevalence of the particular parasites in the study

^b Values in parenthesis indicate the prevalence of the severity of the particular parasite in the study

occurrence of CLM in India are sporadic and are mainly restricted to case reports as presented by dermatology clinics and hospitals. Such individuals are known to have a history of prolonged exposure to wet surfaces in those public places where stray dogs are known to roam freely (Chetty et al. 1981; Pavithran 1990; Sugathan 2002; Thappa and Karthikeyan 2002). CLM is frequently encountered in socioeconomically disadvantaged communities that are unable to afford proper footwear and often sleep in environments heavily contaminated by faeces of stray dogs (Heukelbach et al. 2002). Infections with *A. caninum* can also result in eosinophilic enteritis (Prociv and Croese 1996; Landmann and Prociv 2003). Study to literature revealed *A. caninum* to be highly prevalent with prevalence rate of 89 and 72 % in Madhya Pradesh and tea-growing communities in Assam (Traub et al. 2004), respectively. Similarly, unidentified hookworm infections were found to be 50.5 % in Miraj (Joshi and Sabne 1977), 73 % in Bangalore (Malaki 1966), 71 % in Uttar Pradesh (Sahai 1969) and 91–99 % in Calcutta (Mapplestone and Bhaduri 1940). Pawlowski (2001) reported three clinical signs to be associated with Toxocariasis in humans viz., visceral larva migrans, ocular larva migrans and covert toxocariasis. The literature on the seroprevalence or the incidence of toxocariasis in humans in India is very much scanty. As per one study, seroprevalence of 6.4 % was found in a rural area in Haryana and in similar two separate studies conducted in Chandigarh and New Delhi, 7 out of 30 and 14 out of 68 suspected ocular cases of toxocariasis were seropositive for *T. canis* (Mirdha and Khokar 2002). Of late, the prevalence of *T. canis* in tea-growing communities in Assam was found to be 11 % (Traub et al.

2002). Parasite surveys on canines revealed *T. canis* to be the most common parasite of stray dogs in Miraj and Calcutta with prevalence rates of 55.8 and 82 %, respectively (Mapplestone and Bhaduri 1940; Joshi and Sabne 1977). By contrast, the prevalence of *T. canis* in adult stray dogs in Madhya Pradesh was 2.7 %. In a yet another study, 46 % of public parks and 32 % of school grounds in Andhra Pradesh were found to be contaminated with *Toxocara* ova (Kumar and Hafeez 1998).

There are numerous reports of human cystic hydatid disease throughout India with wide prevalence rates of between 3.5 % in villages in Amritsar to 33 % in the town of Kurnool areas (Reddy et al. 1968; Singh and Dhar 1988). Varying percentages of hydatid cysts have been recovered from sheep, goats, cattle, buffaloes and camels throughout the country (Reddy and Suvarnakumari 1971; Singh and Dhar 1988). Despite the parasite's significant economic and public health impact on the subcontinent, production losses in livestock and human morbidity and mortality as a result of cystic echinococcosis has yet to be assessed on a national scale (Chowdhury 2001).

Besides these, the other infections reported here in are not of zoonotic significance but never the less they are significant in terms of dogs health is concerned. *E. canis* reported herein is a sporadic parasite described worldwide. The authors did not get enough literature on the prevalence of other parasites of stray dogs from neighbouring geographical locations in the Indian context for the sake of criticism and/or discussion.

Most of the dogs examined appeared to be in fairly good health condition, but yielded different types of helminth eggs during examinations. This could be attributed to the

subclinical nature of the parasitic conditions. Although sex did not emerge as a significant factor in this study, females dogs were more infected with helminth parasites than their male counterparts. This may be due to the physiological peculiarities of the female dogs, which usually constitute stress factors thus reducing their immunity to infections. Age emerged out to be a main factor in epidemiology of parasitic diseases in canines in the present study. A very high prevalence rate of *A. caninum*, *T. canis* and *T. leonina* was found in puppies.

In conclusion, the results obtained in this investigation suggests gastrointestinal helminths infections are prevalent and locally widespread. Puppies were at a higher risk of helminth infection, which is likely to negate the efficient dog growth rate and performance. Dogs are associated with more than 60 zoonotic diseases among which parasite in particular, helminthosis can pose serious public health concerns worldwide. Thus, concerted efforts should therefore be made to embrace modern dog disease control programs and specifically the need for routine deworming of their dogs along with the stray dogs.

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References

- Chetty GN, Janaki VR, Thambiah AS (1981) Cutaneous larva migrans (report of five cases). *J Assoc Physicians* 29:403–406
- Chowdhury N (2001) Helminths of domesticated animals in the Indian Subcontinent. In: Perspectives on helminthology. Science Publishers, Enfield, pp 89–158
- Heukelbach J, Mencke N, Feldmeier H (2002) Editorial: cutaneous larva migrans and tungiasis: the challenge to control zoonotic ectoparasitosis associated with poverty. *Trop Med Int Health* 7:907–910
- Joshi BN, Sabne SS (1977) Incidence of *Toxocara canis* infection in stray dogs in Miraj area. *Indian J Pathol Microbiol* 20:239–242
- Kumar D, Hafeez M (1998) A study on the prevalence of *Toxocara* spp. eggs at public places in Andhra Pradesh. *J Commun Disord* 30:197–198
- Landmann JK, Prociv P (2003) Experimental human infection with the dog hookworm, *Ancylostoma caninum*. *Med J Aust* 178:69–71
- Malaki A (1966) A survey of gastro-intestinal parasites of dogs in Bangalore with notes on some interesting observations. *Indian Vet J* 43:409–412
- Mapplestone FA, Bhaduri NV (1940) The helminth parasites of dogs in Calcutta and their bearing on human parasitology. *Indian J Med Res* 28:595
- Mirdha BR, Khokar SK (2002) Ocular toxocariasis in a North Indian population. *J Trop Pediatr* 48:328–330
- Pavithran K (1990) Creeping eruption on the genitals. *Indian J Sex Transm Dis* 11:33–34
- Pawlowski Z (2001) Toxocariasis in humans: clinical expression and treatment dilemma. *J Helminthol* 75:299–305
- Podberscek A (2006) Positive and negative aspects of our relationship with companion animals. *Vet Res Commun* 30:21–27
- Prociv P, Croese J (1996) Human enteric infection with *Ancylostoma caninum*: hookworms reappraised in the light of a “new” zoonosis. *Acta Trop* 62:23–44
- Reddy CR, Suvarnakumari G (1971) Biology of *Echinococcus granulosus* as it occurs in South India. *Acta Trop* 28:311–321
- Reddy CR, Narasiah IL, Parvathi G, Rao MS (1968) Epidemiology of hydatid disease in Kurnool. *Indian J Med Res* 56:1205–1220
- Robertson ID, Irwin PJ, Lymbery AJ, Thompson RC (2000) The role of companion animals in the emergence of parasitic zoonoses. *Int J Parasitol* 30:1369–1377
- Sahai BN (1969) A survey of the helminth parasites of stray dogs in and around Bareilly, Uttar Pradesh. *Indian Vet J* 46:734
- Singh BP, Dhar DN (1988) *Echinococcus granulosus* in animals in northern India. *Vet Parasitol* 28:261–266
- Smith RD (1991) Veterinary clinical epidemiology. Butterworth-Heinemann, Boston, p 228
- Soulsby EJJ (1982) Helminths, arthropods and protozoa of domesticated animals, ELBS-7. Bailliere Tindal, London
- Sugathan P (2002) Massive infestation of cutaneous larva migrans. *Dermatol Online J* 8:21
- Thappa DM, Karthikeyan K (2002) Larva migrans eruption in an infant. *Indian Pediatr* 39:1164–1165
- Thrusfield MV (2005) Veterinary epidemiology, 3rd edn. Blackwell Science, Oxford, pp 234–238
- Traub RJ, Robertson ID, Irwin P, Mencke N, Thompson RC (2002) The role of dogs in transmission of gastrointestinal parasites in a remote tea-growing community in northeastern India. *Am J Trop Med Hyg* 67(5):539–545
- Traub RJ, Robertson ID, Irwin P, Mencke N, Thompson RC (2004) Application of a species-specific PCR-RFLP to identify *Ancylostoma* eggs directly from canine faeces. *Vet Parasitol* 123:245–255
- Traub RJ, Robertson ID, Irwin PJ, Mencke N, Thompson RCA (2005) Canine gastrointestinal parasitic zoonoses in India. *Trends Parasitol* 21(1):42–47