

Full Length Research Paper

Zoonotic helminth parasites in faecal samples of household dogs in Jimma Town, Ethiopia

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Accepted 3 April, 2011

A cross sectional study was conducted in Jimma town from October 2009 to April 2010 to determine the occurrence and prevalence of zoonotic gastrointestinal helminth parasites in household dogs. For the purpose, faecal samples from 334 dogs were collected and examined using faecal floatation and McMaster egg counting parasitological tools. Among the animals examined, helminth parasite infection was detected in 215 (64.4%) dogs, and the species of helminth parasites found with their relative frequencies were: *Ancylostoma caninum* (58.8%), *Toxocara canis* (25.8%), *Dipylidium caninum* (25.8%), *Taenia* spp. (18.3%), *Toxocara leonina* (16.8%) and *Trichuris vulpis* (0.6%). There was a significant difference in the overall prevalence between adult and young animals ($P < 0.05$). The species specific prevalences similarly showed a significant variation between the two age groups, being high in young dogs. Both the overall and parasite specific prevalences were statistically insignificant between genders. The overall and parasites specific prevalence showed a decreasing trend as the host age increases. The overall mean faecal egg counts for *T. canis*, *T. leonina*, *A. caninum* and *D. caninum* were: 657.5 ± 76.4 , 674.5 ± 96.2 , 3368.2 ± 258.3 and 622.1 ± 51.8 , respectively. In conclusion, the prevalence and intensity of gastrointestinal parasites were high; all of the parasites identified were potential public health risks. It implies the necessity of providing education to the public about the potential health risks associated with owning pet animals and how to prevent and minimizing the risk of acquiring helminth zoonotic parasites from dogs.

Key words: Zoonotic, helminth parasites, dog, faeces, Ethiopia.

INTRODUCTION

In Ethiopia dogs are important animals in many urban and rural households, contributing as house guards in the majority of the cases and pet animals. In spite of pet benefits to their owners, there are well documented health hazards associated with humans association with dogs. A number of infections, in particular parasitic diseases, capable of being transmitted from pets to human, had been reported and summarized by many authors (Schantz, 1994; Geffray, 1999; Plant et al., 1996; Robertson et al., 2000; Paul et al., 2009). Among the zoonotic parasites that have been widely studied and recognized as a significant public health problem world wide are the following helminth zoonotic parasites: *Taenia* spp./*Echinococcus* spp., *Toxocara canis*,

Dipylidium caninum and *Ancylostoma* spp. These and others are important in developing countries; due to the presence of uncontrolled population of dogs exist in close proximity to increasing density of human population in both rural and urban environment (Dutta, 2002). Furthermore the level of hygienic conditions and the lack of veterinary attention and zoonotic disease awareness in those countries, exacerbate the transmission of these diseases (Schantz, 1991; Traub et al., 2002). To minimize the transmission of zoonotic parasite diseases, data must be collected on the prevalence of parasites and habits of dog owners. But in this regard there are only few published data available in central part of Ethiopia (Yacob et al., 2007; Endrias et al., 2010). Currently there are no data available on the zoonotic helminth parasites of household owned dogs in Jimma town, Southwest Ethiopia. Therefore this study was undertaken to determine the occurrence, prevalences and intensity of helminth zoonotic parasites in the

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faeces of household dogs in the Jimma town.

MATERIALS AND METHODS

Study area

The study was carried out from November, 2009 up to April 2010 in Jimma town, 346 km Southwest of Addis Ababa at latitude of about 7° 13' 8" 56' N and longitude of about 35°52' to 37°37' E, and at an elevation 1750 m above sea level. The area receives a mean annual rainfall ranging from about 1420 to 1800 mm which comes from February to October. The annual mean temperature is ranging from 12.1 to 28°C. According to the 2007 national statistic authority data, the total human population is estimated at 174,446.

Collection of sample and parasitological procedures

The study animals were dogs owned by residents of Jimma town. The number of animals we planned to take samples was 382 by using sample size determination formula of Thursfield (1995), indicated below:

$$N = 1.96^2 \times PQ / D^2$$

where N is the required sample size, P (52.9%) is expected prevalence based on previous study of Endrias et al. (2010) here in Ethiopia, Q is 1-P, D is the level of precision (5%) and 1.96 is to indicate 95% confidence level.

However we only manage to take faecal samples from 334 household dogs. To collect faecal sample households were selected randomly by lottery system. The faecal samples were collected directly from rectum of the dogs and fresh faecal material also collected were from the floors of cages or from ground (puppies), and then transferred in a labeled disposable container. Then the sample was transported to parasitology laboratory of Jimma University, College of agriculture and veterinary medicine, for further examination. In the laboratory faecal samples were assessed visually to check the presence of proglitids to categorize the sampled animal as *Taenia* species positive or negative then after samples were stored in a refrigerator at 4°C until processing. Each faecal sample was examined for helminth parasites eggs by the standard McMaster technique, using saturated sodium chloride as flotation solution. Each faecal sample was examined microscopically for parasite egg identification by using 100× magnification of light microscope. All helminth eggs were identified based on their morphological characteristic described by Thienpoint et al. (1998) and Taylor et al. (2007). Helminth egg count per gram (EPG) was determined for the following helminth species: *Ancylostoma caninum*, *T. canis*, *Toxocara leonina* and *D. caninum*. The age and sex of sampled dogs were recorded.

Statistical analysis

The data collected from each animal were coded and recorded in Microsoft excel spreadsheet and then analyzed by using intercooled STATA version 8. A dog was classified as positive if at least one egg of zoonotic helminth parasite was present in its faecal sample. Overall prevalence was defined as the percentage of faecal samples positive for any parasites species, and the specific prevalence as the percentage of faecal samples positive for a given parasite species. Chi-square (χ^2) was used to measure association between prevalence of the helminths in different age and sex groups, t-test was also used to assess the association of different

variables such as sex and age with mean egg per gram (EPG) count of the following helminth parasites; *A. caninum*, *T. canis*, *T. leonina* and *D. caninum*. The confidence interval (CI) for prevalence was calculated using binomial CI analysis in STATA software at 95%. All analyses were held at $P < 0.05$ for significant.

RESULTS

Out of the 334 dogs' faecal sample examined, the prevalence of intestinal helminth parasites eggs was 64.37% (215). During the study period the most frequently observed helminth parasite species in household dogs of Jimma was *A. caninum* (58.6%), followed by *T. canis* (25.7%), *D. caninum* (25.7%), *Taenia* spp eggs (18.3%), *T. leonina* (16.4%) and *Trichuris vulpis* (0.6%).

Among the infected dogs (215), 104 (48.4%) of them were harboring more than one helminth parasite, furthermore 59 (27.4%), 66 (30.7%), 64 (29.8%), 22 (10.2%), and 4 (1.8%) of the dogs were infected with 1, 2, 3, 4, 5, and 6 species of helminth parasite, respectively.

Statistically significant difference was observed in the overall prevalences between young and adult age groups ($P < 0.05$, $\chi^2 = 54.9$). In regard to gender there was no significant difference in the overall prevalence between male and female (Table 1)

The overall prevalence of helminth parasites in 11 different age groups showed a trend of general decrement as the age of the dog increases. The highest prevalence (100%) belongs to seven month old dogs and the lowest prevalence (20%) was recorded for six years old dogs (Figure 1).

The specific prevalences for each species of helminth parasites in different age and sex group are summarized in Table 2. The general prevalences of these parasites showed significant differences between young and adult dogs for each species of helminth, except for *T. vulpis* and *Taenia* spp, the prevalences of infection tend to be higher in young dogs (< 1 year). In contrast, no significant variation was documented in prevalence of each parasite species with regard to sex (Table 2).

The overall mean EPG counts (EPG \pm Std. Err) for *A. caninum*, *T. canis*, *D. caninum* and *T. leonina* were 3374.2 \pm 292.5, 657.5 \pm 76.4, 622.1 \pm 51.8 and 674.5 \pm 96.2, respectively

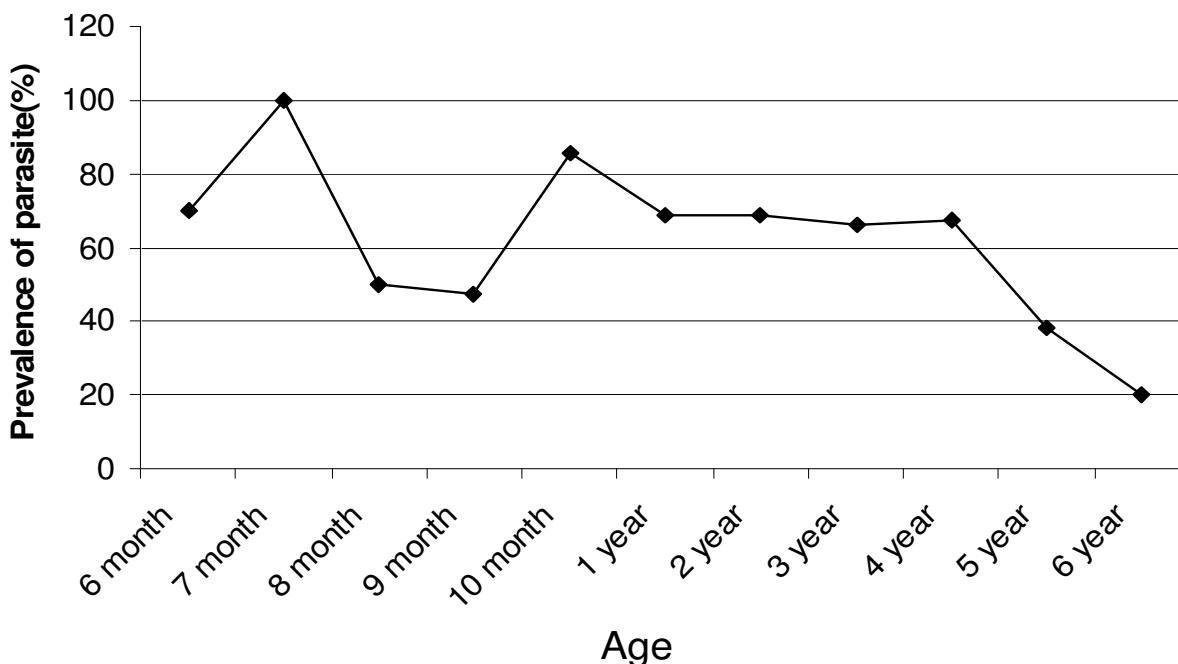
Table 3 shows the mean EPG count recorded among *A. caninum*, *Toxocara canis*, *D. caninum* and *T. leonina* positive dog population in relation to age and sex. There was no significant difference in the mean EPG count among different age (young and adult) and sex groups for all of helminth parasite eggs recovered.

DISCUSSION

This cross sectional study demonstrated that gastrointestinal helminth parasites were common among

Table 1. Overall prevalence in dogs by age and sex.

Category	No. animals examined	No. of positive animals (%)	95% CI for prevalences	χ^2 (P-value)
Age				
Young	131	116 (88.5)	82.01 - 93.06	54.99 (0.000)
Adult	203	99 (48.74)	38.47 - 53.15	
Sex				
Male	205	132 (64.39)	57.22 - 71.25	0.00 (0.99)
Female	129	83(64.34)	55.43 - 72.57	

**Figure 1.** The overall age-specific helminth prevalence among examined dogs.

household dogs in Jimma town, Southwest Ethiopia. The present work also confirmed the occurrence of eggs of different species of nematode (*T. canis*, *T. leonina*, *T. vulpis* and *A. caninum*) and cestode (*D. caninum* and eggs of other *Taeniids* spp) in the faecal samples examined. All helminth parasites detected in the faecal samples are recognized as having a public health hazard. A similar observation was documented by previous studies in Ethiopia (Yacob et al., 2007; Endrias et al., 2010) and a few other literature from some tropical countries were in agreement with the present findings (Schandevyl et al., 1987 in Zaire; Fabiyi, 1983) in Nigeria.

The overall prevalence (64.4%) recorded in the present study is higher than previous, similar coprological studies of Yacob et al. (2007) and Endrias et al. (2010), whom reported prevalences of 51 and 52.9% in this country. The achieved prevalence is also higher than the 52.4% found by Maria et al. (2006) in Argentina, and 53%

in Hungary (Fok et al., 2001). Our numbers agrees with the 68.4% recorded by Anene et al. (1996) in Nigeria. In contrast, a study done in some developed countries household dogs revealed a very low prevalences of gastrointestinal parasites when compared to our finding in Netherlands (Overgaauw, 1997), Belgium (Claerebout et al., 2009), UK and Iceland (Wolf and Wright, 2003; Roddie et al., 2008), and France (Regosz, 2007; Pullola et al., 2006). This difference can be associated with a high level awareness about dog parasites and socioeconomic status of pet owners in developed countries for hygiene and make use of the available veterinary cares for their animals (Schanntz, 1999). In addition to this some factors such as geographic location and diagnostic technique, demographic factor and anthelmintic usage are also responsible for the wide variety of endoparasite prevalence (Katagiri and Oliveria-sequeira, 2008).

Table 2. Prevalence of species of parasite in relation to age and sex (n= 131, 203, 205 and 129 for young adult male and female respectively).

Parasite	Age	Prevalence (No. of positive animals)	X ² (p-value)	Sex	Prevalence (No. of positive animals)	χ ² (p-value)
<i>T. canis</i>	Young	38.7 (50)	17.4,0.000	Male	24 (50)	0.51 (0.47)
	Adult	17.9 (36)		Female	27.9 (36)	
<i>T. leonina</i>	Young	24.3 (32)	9.9, 0.002	Male	14.1 (29)	2.1 (0.15)
	Adult	11.3 (23)		Female	20.2 (26)	
<i>A. caninum</i>	Young	85.4 (111)	61.9, 0.00	Male	60 (123)	0.28 (0.59)
	Adult	41.8 (85)		Female	37.2 (73)	
<i>D. caninum</i>	Young	35.8 (47)	11.5,0.00	Male	27.3 (56)	0.68 (0.41)
	Adult	19.2 (39)		Female	23.3 (30)	
<i>T. vulpis</i>	Young	1.5 (2)	3.11, 0.07	Male	- (0)	3.19 (0.07)
	Adult	- (0)		Female	2 (0.9)	
<i>Taenia</i> spp	Young	22.9 (30)	3.10,0.07	Male	29.7 (61)	0.55 (0.45)
	Adult	15.3 (31)		Female	16.3 (21)	

Table 3. Mean EPG count for some parasites in relation to age and sex of dogs.

Parasite	Age			Sex		
	Adult mean EPG ± Std. Err	Young mean EPG ± Std. Err	t (p-value)	Male mean EPG ± Std. Err	Female MEAN EPG ± Std. Err	T (p-value)
<i>T. canis</i>	811.5±83.4	722±117.1	-0.7/ 0.76	3540.3±406.3	3089±376.8	0.02/ 0.77
<i>T. leonina</i>	621.7± 100.4	712.5± 149.5	-0.46/0.67	641.4± 87.7	711.5± 181.3	0.32/0.373
<i>A. caninum</i>	3422.3± 358.5.	3333.8± 457.3	0.15/ 0.44	3540.3.1±406.4	3089.1±376.4	0.85/ 0.19
<i>D. caninum</i>	566.6±46.2	668±86.6	-0.97/ 0.83	637.5±65.04	593±86.8	-0.40/0.65

The overall and specific parasite prevalences between male and female showed no statistical significant variation. This finding was almost alike with the reports of Visco et al. (1977), Anene et al. (1996), Ramifrez-Barrios et al. (2004,) Maria et al. (2006) and Yacob et al. (2007).

The overall and specific parasites prevalence recorded in our study are strongly associated with

age. The overall prevalence of helminth parasites was significantly higher ($P < 0.05$, $\chi^2 = 54.9$) in young dogs (< 1 year-old) than in adult. This is partially due to parasite specific immunity usually acquired with age or probably as consequence of single or repeated exposures (Ramirez-Barrios et al., 2004).

Out of the infected animals, 73.6% of them were

found to be harbouring more than one helminth parasites. Similar observations have been documented in different places (Trabur et al., 2002; Endrias et al., 2010). On the other hand single helminth parasite infections were reported in studies conducted else where (Anene et al., 1996, Bugg et al., 1999, Papazahariadou et al., 2007). This difference may be attributed to the

level of awareness about dog parasite, regular deworming, housing and other management activities practiced in these areas.

The predominant species of zoonotic helminth parasite observed in this study was *A. caninum* (58.8%), which is in agreement with earlier reports here in Ethiopia (Yacob et al., 2007) and other countries such as Brazil (Oliveira-Sequeira et al., 2002; Katagiri and Oliveria-Sequeira, 2008), Argentina (Maria et al., 2006), South Africa (Minnaar et al., 2002), Tanzania (Swai et al., 2010) and in China (Wang et al., 2006). Moreover, the results of the study showed statistically significant variation ($P < 0.05$, $\chi^2 = 25.6$) in the prevalence of *A. caninum* in young and adult household dogs, being high in young dogs (85.4%). The overall prevalence of *T. canis* (25.8 %) based on faecal examination, recorded in the current study is higher than the previous reports of, Yacob et al. (2007) and Endrias et al. (2010) whom reported 21 and 17.1% for Deberzeit and Ambo areas, central Ethiopia. In addition the prevalence of *Toxocara* infection reported here was higher than the earlier reports from Netherland (Paul et al., 2009) and Belgium (Claerebout et al., 2009). The study revealed that the prevalence of *T. canis* was higher in young (23.3%) dogs than in adults (11.1%).

In this study we found eggs of *T. leonine* in 55 household dogs (16.5%), which were not reported in any of the previous study so far conducted in Ethiopia. A comparable prevalence of 14.2% was reported in Zaire and a very low prevalence (3.3%) was reported from Nigeria (Oluyomi, 2009).

The prevalence of *D. caninum* in faecal samples was 25.8%, which is comparable with the report of Endrias et al. 2010 (25.6%), but higher than the reports of Collins (1981), Anene et al. (1996), Minnaar et al. (2002), Papazaharidu et al. (2007). The published works in European countries demonstrated very low prevalence of *D. caninum*: Spain (Martinez Moreno et al., 2007), Finland and other Nordic countries (Pullola et al., 2006) as well as Australia (Bugg et al., 1999).

There was statistically significant difference ($P < 0.05$, $\chi^2 = 11.4$) in the prevalence of *D. caninum* between the two age categories, with 51% in young and 35% in adult household dogs. The frequency of *T. vulpis* (0.6%) recorded in this study was lower than the recent findings of Yacob et al. (2007). This lower prevalence of *T. vulpis* may be due to unfavorable climate condition: even though its distribution is world wide, it is more common in temperate area (Bugg et al., 1999).

The prevalences of specific helminth parasite recorded in this study were statistically higher in young dogs ($P < 0.05$) than adult ones except in case of *Taenia* species and *T. lupis* (Table 2). There is a general consensus that the prevalence of intestinal parasites is higher in pups than adults, furthermore for *A. caninum* most young puppies, may get transmammmary infection from the infected mother. Urquhart et al. (1996) and Visco et al. (1977) reported that infection with these parasites is

higher in puppies, furthermore they can also get infected through contaminated feeds.

The faecal egg count (EPG) recorded for different species of parasite were elevated as compared to the previous reports of Yacob et al. (2007) and Oluyomi (2009). However there is no statistical variation on mean EPG count in infected animals in different age and sex groups.

Conclusion

This study revealed the presence of high prevalence and intensity of gastrointestinal helminth parasites in household dogs. In addition, all the species of helminth parasites recorded in the present work have potential zoonotic importance. Therefore attention must be given to public education that make people aware of the presence of zoonotic parasitic diseases from dogs and provide means of prevention to minimize the risk of acquiring the diseases.

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