Gastrointestinal Helminthes of Dogs in Yirgalem Town, Southern Ethiopia

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Abstract

The study was conducted from November 2011 to March 2012 to estimate the prevalence and major gastrointestinal parasites burden of dogs (n=427) in Yirgalem town. The overall prevalence of parasites was 72.8% and the prevalence of *Ancylostoma caninum, Dipylidium caninum* and *Toxocara canis* were 53.4%, 43.1% and 54.3%, respectively. Significant difference was observed between the prevalence of the *A. caninum* and *D. caninum* (x^2 =9.1, p = 0.003), and between *T. canis* and *D.* caninum (x^2 =10.7, p= 0.001). The highest relative proportion of solitary infection was recorded for *A. caninum* (12%) followed by *D. caninum* (8%) and *T. canis* (7%). On the other hand, mean egg count of *T. canis* were the highest followed by *A. caninum* and *D. caninum* with the significant mean difference between *A. caninum* and *D. caninum* (x^2 =67, p = 0.0481), and between *T. canis* and *D. caninum* (x^2 =79, p = 0.0149). There were significant differences in the mean egg count between sexes (F = 4.14, p = 0.0429) and purpose of keeping the dog (F = 9.22, p=0.001). Male dogs harbor higher number of eggs than female. A significantly greater mean egg count (p = 0.000) was observed in dogs kept as guard and for both joy and guard compared to dogs used only for joy. In conclusion, this study revealed the importance of some gastro-intestinal tract parasites of dog in the study area that need attention for subsequent control measures.

Key words: *Ancylostoma caninu*, *Dipylidium caninum*, dog parasites, prevalence, *Toxocara canis*
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INTRODUCTION

The most common gastrointestinal parasites of dogs are roundworm, especially the *Toxocara* species, and hook worm, primarily *Ancylostomas* species (Lee et al., 2010). *Ancylostoma caninum* occurs in the small intestines of dogs and more commonly in puppies before they are born and transmitted via the dam's milk. As dogs live in close proximity with humans there is transmission of zoonotic parasites of dogs to human resulting in serious consequences. Children are the most vulnerable to these parasites as they are usually in close contact with these animals especially in the developing countries where there is no practice of regular deworming of dogs. It is recommended that all dogs should get regular fecal examination, treatments and prevention of internal parasites (Lee et al., 2010). Intestinal parasites are among the most common pathogenic agents causing serious intestinal pathology in dogs. Among canine intestinal parasites, *T. canis*, *Ancylostoma* spp. and *D. caninum* have received great attention due to their zoonotic potential (Blagburn et al., 1996). One of the most common cosmopolitan parasites of dogs is the canine roundworm, *T. canis.* Apart from its veterinary importance, this species is responsible for the most widely recognized form of visceral larva migrans (VLM) in human (Taylor et al., 2007).

The significance of dog parasites with regard to both animal health and zoonotic importance has been recorded in Ethiopia. Hence, several works were carried out so far to identify dog parasites in a broader sense by different researchers including Zewdu et al. (2010) in Ambo town, Degefu et al. (2011) in Jimma Town and Abere et al. (2013) in Bahir Dar which are located at Central, South-western and North-western Ethiopia, respectively. However, information regarding the status of dog helminths in the Southern part of Ethiopia is scant. Hence, this work estimated the prevalence and intensity of dog parasite and identified the associated risk factors.

MATERIALS AND METHODS

Study area

The study was conducted at Yirgalem town, which is located in the Southern Nation Nationalities and People Region (SNNPR) and 320km far from Addis Ababa. Geographically the town lies between 6^0 44 and 6^0 84 N latitude and 37^0 92 and 38^0 06 E longitudes.

Study population

The study animals were dogs of all age groups, breeds (local and exotic) and both sexes. Dogs aged up to one year were classified as puppies, from one to three years as young and those more than three years as adult. They were randomly selected from confined (indoor), semi-confined (mixed) and loses (outdoor) housing system.

Sample size determination
The sample size required for the study was calculated according to the formula given by Thrusfield (2005). The sample size calculated was 384 dogs by using the expected prevalence of 50% but with the intention of maximizing the precision, it was raised to 427.

Study methodology
Coprological examinations were performed on 427 randomly selected dogs. The freshly collected feces were put in tightly closed universal bottles and processed to examine for internal parasitic eggs. The presence of eggs was determined by the floatation techniques as described by Kassai (1999). Eggs were counted using McMaster counting technique conducted according to Chauhan and Agarwal (2006) and Foreyt (2001) and the result was considered as positive when at least one parasite egg was present (Lorenzinl et al., 2007). Maximum effort was made to count, characterize and classify the different eggs observed under 10 x magnifications (Hendrix, 2003; Soulsby, 1982). Furthermore, gravid parasites were collected and transported to Yirgalem Veterinary Clinic laboratory for examination.

Data management and analysis
Preliminary analysis was done in Microsoft Excel and descriptive statistics was used to summarize the prevalence and relative percentage of each parasite. The association between the risk factors and the occurrence of the helminth parasites was analyzed with Logistic regression and confidence interval and *p*-value were employed to investigate the presence of association. Additionally, Odds Ratio was used to assess the strength and direction of this association using STATA statistical soft ware version 9. Moreover, the average mean egg counts were subjected to Analysis of Variance (ANOVA). The variation within each category was further evaluatedusing multiple comparisons of Bonferroni test.

RESULTS

Prevalence
Out of the 427 dogs examined, 311 (72.8%) were positive for one or more types of parasitic eggs. The prevalence of *A. caninum*, *D. caninum* and *T. canis* were 53.4%, 43.1% and 54.3%, respectively (Table 1). There was significant difference between the prevalence of A. **c**aninum and *D. caninium* (x^2 =9.1, p = 0.003), and between *T. canis* and *D. caninium* (x^2 =10.7, p= 0.001), while no significant diffrence was observed between the occurence of *A. **c**aninium* and *T. canis*. The highest relative proportion of solitary infection was for *A. caninum* (12%) followed by *D. caninum* (8%) and T. canis (7%). The record on mixed infection of these parasites was highest for all the three parasites mixture (34%) followed by double infection with *A. caninum* and *T. canis* (21%), and *D. caninum* and *T. canis* (12%). The least mixed infection recorded was in case of *A. caninum* and *D. caninum* (6.4%) (Table 1).

There was a significant difference between the mean egg count of *A. caninum* and *D. caninum* (*p* = 0.0481) and between *T. canis* and *D. caninum* (*p* = 0.0149) (Table 2). The mean the highest mean egg count was for *T. canis* followed by *A. caninum* and *D. caninum*.

Table 1. Prevalence and relative proportion of GIT parasites in dog in the study area

Species	Prevalence (%) (95%CI)	Relative proportion (%)
A. caninum	53.4 (228/427)	11.9 (37/ 311)
T. canis	54.3 (232/427)	8.0 (25/311)
D. caninum	43.1 (184/427)	7.1 (22/311)
A.C+ T. canis	15.2 (65/427)	20.9 (65/311)
A. C +D. C	4.7 (20/427)	6.4 (20/311)
T. C + D. C	7.7 (33/427)	11.6 (36/311)
A. C + T. C + D. C	24.4 (104/427)	34.1 (106/311)

Table 2. Comparison of the mean egg count of each parasites (n= 427)

Species of parasites	Mean (95%CI)	Range	SE	SD	Mean difference
A. caninium	274 (224, 323)	50-6000	25.08	518.26	1 and 2 (*p* = 0.725)
T. canis	286 (241, 332)	50-4500	23.21	479.70	1 and 3 (*p* = 0.0481)
D. caninum	207 (163, 252)	10-7500	22.52	465.34	2 and 3 (*p* = 0.0149)

Analysis of mean egg count of the parasites with different risk factors

The analysis of variance revealed the existence of significant association between the mean Egg Per Gram of feces (EPG) with sex (F = 4.14, p=0.0429) and purpose of keeping the dog (F = 9.22, p = 0.001) (Table 3). Male dogs harbor higher number of eggs than female. Within purpose comparisons indicated that the mean egg count was significantly greater (p = <0.001) in the dogs kept for guard and for both joy and guard than the dogs used only for joy. On the other hand, there were no difference between age groups, breeds, and kept indoor outdoor or mixed (Table 3).

The study showed that ticks infestation was prevalent in 66.5% of the animals with a higher prevalence observed during minor wet season (82.3%) compared to dry season (58.4%) (Table 2). Contrary to the observed mange mite prevalence (Table 1), higher tick prevalence was observed in Borana camel herds, and female animals. Tick prevalence also increased with age of the animals and was more prevalent in camels with poor body conditions.

Analysis of the prevalence of dog parasites with risk factors

With the logistic regression analysis, no significant association (p>0.05) was observed between parasitism and the potential risk factors in this study (Table 4).

Table 3. Analysis of the mean egg count with various risk factors

Risk factors		Mean	SD	F (p-value)	Bonferroni result	
					Category	*p* value
Sex	Female	860	431			
	Male	1106	957	4.14 (0.0429)		
Age	<1	979	1115			
	[1,3]	1001	883			
	>3	1159	743	1.24 (0.2903)		
Breed	Local	1033	822			
	exotic	1232	1290	1.37 (0.2430)		
Purpose	Guard	3600	818		Guard and Joy	1.000
	Joy	775	317	9.22 (0.001)	Guard and both	0.000
	*Both	1042	4738		Joy and Both	0.000
keeping	Indoor	1043	918			
	Outdoor	1044	743	0.24 (0.7830)		
	mixed	1165	545			

*Both means dogs kept for both guard and Joy purposes

Table 4: Univariate and multivariate logistic regression analysis of potential risk factors in association with occurrence of gastrointestinal helminthes in the study area

Risk factors		No. Tested	No. (%) positive	Univariate analysis		Multivariate analysis	
				Crude Odd Ratio (95% Cl)	P-value	Adjusted Odd Ratio (95% Cl)	*P*-value
Sex	Female	83	66 (80. 0)	1		1	
	Male	344	245 (71.0)	1.6 (0.9, 2.8)	0.13	2.0 (1.2, 4.3)	0.06
Age	≤ 1	68	47 (69.0)	1		1	
	(1,3)	218	154 (70.6)	1.1(0.6,1.9)	0.81	1.4 (0.65,3.0)	0.401
	>3	141	110 (78.0)	1.6 (0.82,3.0)	0.17	1.3(0.6,3.03)	0.503
Breed	Local	383	281 (73.3)	1		1	
	Exotic	44	30 (68.1)	1.3(0.7,2.5)	0.5	1.2(0.5,3.03)	0.709
Purpose	Guard Joy	413	303 (73.3)	1		1	
	Mixed	11	6 (54.5)	2.3(0.7,7.7)	0.18	1.4 (0.22, 8.0)	0.829
		3	2 (66.7)	1.4(0.12,15.3)	0.8	3.0(0.13,53.3)	0.517
How kept	Indoor	355	259 (72.9)	1		1	
	Outdoor	32	24 (75.0)	1.1(0.48,2.6)	0.8	1.7 (0.6, 5.0)	0.340
	Mixed	40	28 (70.0)	1.2 (0.6, 2.4)	0.7	1.3 (0.5, 3.6)	0.606

DISCUSSION

The current prevalence of dog helminthes (72.8%) is in agreement with some of the previous authors (Martinez-Moreno et al., 2006; Minnaar et al., 2002) who reported a prevalence of 71.3% in Spain and 76% in South Africa. On the other hand, Zewdu et al. (2010), Benito et al. (2003), Fontanarros et al. (2006) and Blagburn et al. (1996) reported relatively lower prevalence of 52.9% in Ethiopia, 53.6% in Spain, 52.4% in Argentina and 35.9% in USA, respectively. The reported prevalence of 53.4% for *A. caninum*, 43.1% for *D. caninum* and 54.3% for T. canis were higher than the previous reports of Zewdu et al. (2010) who recorded the prevalence of 35.7% for *A. caninum*, 25.6% for *D. caninum* and 17.1% for *T. canis*. Additionally, in the present study, infection with more than one helminth parasites (polyparasitism) was common. It was noted that, out of the 311 positive dogs, concurrent infection with three different species of helminthes was more common (34.0%) than infection with single or two types of parasites. Similarly, Zewdu et al. (2010) reported higher prevalence of mixed infections with three species of helminthes (35.6%) than single infection (24.4%). Higher incidences of concurrent infections with more than one species of helminthes (75.6%) were also reported by other studies in Ethiopia (Reshid, 1988; Shihun, 1994). In contrast, the dominance of single parasite infection was reported in studies conducted abroad (Anene et al., 1995; Bugg et al., 1999; Papazahariodous et al., 2007). This difference might be attributed to the level of awareness about dog parasites, regular deworming, housing and other management activities practiced in these areas.

The most prevalent adult helminthes observed in the present study was *T. canis* (54.3%). This prevalence was considerably higher than the result reported by Zewdu et al. (2010), Papazahariodous et al. (2007), Himonas (1968) and Haralabidis et al. (1988) who reported 17.14% in Ambo zone central Ethiopia, 12.8%, 25.4% and 22.4% in Greece.

This variation could be attributed to the difference in management system, health care and degree of environmental contamination with infective stage and exposure to naturally infection more than owned dogs.

The second prevalent parasite in this study was A. caninum (53.4%) and this is in agreement with those studies conducted in Wolaita (Reshid, 1988), Dire Dawa and Eastern Hararge (Temesgen, 1990), and Debre Zeit (Shihun, 1994). However, Zewdu et al. (2010) reported lower prevalence of 35.7%.

The prevalence of *D. caninum* in the present study (43.1%) was also found to be comparable to the reports from South Africa (Minnaar et al., 2002) and Debre Zeit (Shihun, 1994) with prevalence of 44% and 47.54%, respectively. However, higher prevalence was reported by Dada et al. (1979) in Zaria, Nigeria (97.8%) and Temesgen (1990) in Dire Dawa and eastern Hararge (83%). On the other hand, Reshid (1988) and Zewdu et al. (2010) reported lower prevalence of 32.4% and 25.6% from Wolaita and Ambo Zones, respectively. Very low prevalence of *D. caninum* occurred in European countries such as Greece (Papazahariodous et al., 2007), Spain (Martinez-Moreno et al., 2006), and Australia (Bugg et al., 1999). The routine use of antihelminthics, particularly in puppies is the most likely cause for the reduced prevalence of gastrointestinal helminthes in those countries (Robertson et al., 1991).

Concerning the average egg count of the three species of parasites, the mean egg count was the highest in case of *T. canis* followed by *A. caninum* and *D. caninum* and was higher than the mean count reported by Degefu et al. (2011). Likewise, this variation could be attributed to the differences in health care and degree of environmental contamination with infective stage, frequent mixing of pets with stray dogs which might have the infections, lack of awareness of dog parasites and their control strategies. On the other hand, the dogs that used for joy were found with relatively lower mean egg count (317) and this could be due to the better care (management) given to the joy type of dogs.

In conclusion, the coprological examination in the current study revealed the existence of three different types of dog helminthes namely, *T. canis*, *A. caninum* and *D. caninum*. The prevalence of mixed infections with three species of helminthes was more common than single or double infections. In general, the prevalence observed in the current study is high. As common principles of parasitic disease control scheme, the life cycle of these helminthes parasites should be broken by regular deworming and restriction from other sources that cause contamination with intermediate stages of dog parasites. Control of stray dog population should be carried out to reduce environmental contaminations.

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