

Prevalence of Gastrointestinal Helminthes among Dogs in Bahir Dar Town, Ethiopia

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Abstract: A cross sectional study was conducted in Bahir Dar town, from October 2011 to March 2012 to determine the prevalence of gastrointestinal helminthes of dogs and identify host related risk factors such as sex, age, breed and type of feed with the occurrence of gastrointestinal helminthes. Out of 384 dogs sampled and subjected to faecal examination using floatation and sedimentation methods, 302 (78.1%) of the dogs were proved to be infected. A breakdown of the number of parasitized dogs showed that 172 (44.8%) were positive for *Ancylostoma caninum*, 126 (32.8%) for *Toxocara canis*, 102 (26.6%) for taeniidae egg, 86 (22.4%) for *Dipylidium caninum*, 83 (21.6%) for *Strongyloides stercoralis*, 33 (8.6%) for *Trichuris vulpis* and 23 (6%) positive for coccidia oocysts. Out of the total of 207 male and 177 female dogs examined for gastrointestinal helminthes, 164 males (79.2%) and 136 females (76.8%) were known to be positive for one or more gastrointestinal helminthes. Statistical analysis of the data showed that there was no significant difference ($p>0.05$) in overall prevalence of helminthes infection between sexes. There was a statistically significant difference ($P<0.05$) in the overall prevalence between adult (73.8%) and young (85.4%) dogs. The species specific prevalence similarly showed a significant variation between the two age groups, being high in young (85.4%) than adult (73.8%) dogs. The overall prevalence of helminthes in exotic-breed were higher (81.3%) than local-breed dogs (76.6%). Statistical analysis showed no significant difference ($P>0.05$) in the overall prevalence between breed of dogs. The prevalence of helminthes infection was high in dogs that were feed raw (93.7%) followed by dogs that feed mixed (90.7%) and cooked (37.5%). Statistical analysis showed significant difference ($P<0.05$) in the prevalence of gastrointestinal helminthes among feed types. The high prevalence of gastrointestinal helminthes of dogs in Bahir Dar town may be due to lack of access to Veterinary services and poor awareness of the owners. This suggests the need to implement awareness creation among the dog owners on the prevalence, route of transmission and preventive measures of helminthes of dogs in Bahir Dar in order to decrease the risk of the diseases in dogs and human population.

Key words: Prevalence • Gastrointestinal helminthes • Dogs • Bahir Dar town • Ethiopia

INTRODUCTION

Intestinal parasites are among the most common pathogenic agents encountered by Veterinarians dedicated to companion animals and they constitute one of the main causes of mortality in dogs [1]. Dogs are the definitive hosts to a number of helminthes, which can result in significant health problems as well as financial losses globally [2]. More importantly, some dog helminthes can also infect humans and cause significant clinical diseases in humans such as coenurosis,

hydatidosis, trichinellosis, ocular and visceral larva migrans. These zoonotic parasites are significant to public health especially in developing countries and communities that may be socioeconomically challenged [3].

In dogs, gastrointestinal helminthes exert serious problems resulting in lowered resistance to infectious disease, retarded growth, reduced work efficiency and general ill-health. Intestinal parasites in dogs may result in clinical signs such as vomiting, diarrhea, anemia, anorexia, dermatitis and loss of condition [4].

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Since dogs live in close proximity with human being there are zoonotic diseases that can be transmitted to humans and cause serious consequences. The most common zoonotic helminthiasis of dogs are *Strongyloides stercoralis*, *Ancylostoma caninum*, *Dipylidium caninum*, *Toxocara canis*, *Taenia spp* and *Trichuris vulpis*. The transmission of zoonotic parasites could be through indirect contact with dogs, secretions and excretions, infected water and food and through direct contact with the dogs [5].

The prevalence of parasites considerably varies from one region to another among the different diagnostic techniques employed [6]. Considering aspects related to public and animal health, study of the prevalence of parasitic infections in dogs should, therefore, be a continuous task, with the most relevant aim being establishment of control measures [7].

However, in Ethiopia, very little attention was given for diseases of dogs and the works done so far on the prevalence of the different gastrointestinal parasites of dogs are scanty. In line with the above fact, there is paucity of information on the gastro intestinal parasites of dogs in Bahir Dar town, Ethiopia. Therefore, the objectives of this study were to determine the prevalence of gastrointestinal helminthes and identify the potential risk factors associated with gastrointestinal helminthes occurrence among dogs in Bahir Dar town, Ethiopia

MATERIALS AND METHODS

Study Area: The study was conducted from October 2011 to March 2012 in Bahir Dar town, North West Ethiopia. Bahir Dar is located at 11°36' latitude N and 37°23' longitude E in north western part of the country and it is 570 km away from Addis Ababa. The annual mean temperature is ranging from 15°C to 22.5°C with the average humidity which range from 1200-1800 mm and elevation of 1800 meter above sea level. The land escape marked by the presence of LakeTana, which drains water, shed of about 3,000km² and areas adjacent to Lake Tana and Abay River have poor drainage and annual over flooding during the dry months [8].

Study Animals: Dogs of all age group and both sexes randomly selected from 384 house hold dogs were considered. The history, sex and age of the dogs were recorded. The ages of dogs were determined using criteria for estimation of dog's age described by Tizard [9].

Those dogs less than 1 year were classified as young (n=144) and those over 1 year as were categorized as adults (n=240). The numbers of male and female dogs sampled in the study were 207 and 177, respectively.

Study Type: A cross-sectional study was conducted from October 2011 to March 2012 in Bahir Dar town. Sampling was carried out repeatedly at households in Bahir Dar, Ethiopia who owns dogs.

Sampling Method and Determination of Sampling Size: Simple random sampling technique was employed to determine the prevalence of gastrointestinal helminthes of dogs and assess the potential risk factors for infection by employing simple flotation and sedimentation techniques. To calculate the total sample size, the following parameters were used: 95% level of confidence interval (CL), 5% desired level of precision and with the assumption of 50% expected prevalence of gastro intestinal helminthiasis in dogs in the study area the sample sizes were determined using the formula given in Thrusfield [10].

$$n = \frac{1.96^2 \cdot P_{exp} (1-P_{exp})}{d^2}$$

Where, n=required sample size, P_{exp}=expected prevalence, d²=desired absolute precision

By using this formula, the sample size was 384. Dogs were selected using random sampling method and sample was taken from these animals.

Sample Collection and Study Methodology: To collect faecal sample households were selected randomly by lottery system. The faecal samples were collected directly from the rectum of the dogs and from top layers of fresh voided faeces and examined macroscopically for proglottids. Thereafter, a sub-sample of faeces was taken into labelled universal bottle containing 10% formaldehyde solution and transported to Bahir Dar regional Veterinary laboratory where they were analyzed for helminthes ova and oocysts. Where immediate examination of faecal samples was not possible, the collected samples were preserved in 10% formalin.

During collection each sample was labelled with the dog's number corresponding to owner's name, date, age of dog, breed, sex, feed type and place of collection. The presence of helminthes infections were confirmed by sedimentation and flotation techniques. For this purpose,

the sample collected from each dogs will be examined and the result will be considered as positive when at least one parasite egg or cyst is observed in one of the employed technique. The flotation fluid used in the study was common salt (NaCl) solution, which was prepared in the laboratory. Identification of the characteristic helminthes ova and oocysts of coccidae were made using a light microscope with x10 and x40 objectives [11].

Age Estimation: Ages of the dogs sampled in the study were classified in to two category young (0-1 year) and adult (>1 year).

Data Management and Analysis: Microsoft Excel was used for data management and computation of descriptive statistics. Computation of descriptive statistics was conducted using SPSS version 16.0. Descriptive statistics such as percentages, proportions and frequency distributions were applied to compute some of the data. The prevalence of the parasites was calculated by dividing the number of dogs harboring a given parasites by the number of dogs examined. Pearson's chi-square (χ^2) to measure association between prevalence of the parasite with the age, sex, breed and feed type of dogs were used as the statistical tools. The difference among risk factors was statistically significant if the p-value was less than 0.05 ($P<0.05$).

RESULTS

Overall Prevalence of Gastrointestinal Helminthes of Dogs: During coproscopy, 78.1% of the dogs were positive for different types of parasite eggs and parasite

species namely *Ancylostoma caninum* 177(44.8%), *Toxocara canis* 126(32.8%) Taeniidae species 102(26.6%), *Dipylidium caninum* 86(22.4%), *Strongyloides stercoralis* 83(21.6%), *Trichuris vulpis* 33(8.6%) and Coccidae oocyst 23(6%) (Figure 1).

Prevalence of Gastrointestinal Helminthes of Dogs Between Sexes: Out of the total 207 male and 177 female dogs examined for gastrointestinal helminthes, 164 males (79.2%) and 136 females (76.8%) were confirmed to be infected by one or more of the identified gastrointestinal helminthe parasites (Table 1).

Prevalence of Gastrointestinal Helminthes Between Ages: From the total of 144 young and 240 adult dogs examined, the overall prevalence of gastrointestinal helminthes was found to be higher in young (85.4%) than adult (73.8%) dogs Statistical analysis of the data showed the presence of significant variation ($P<0.05$) on the overall prevalence of gastrointestinal helminthes between age groups (Table 2).

Prevalence of Gastrointestinal Helminthes of Between Breeds: Out of 261 local and 123 exotic breed dogs examined for gastrointestinal helminthes, exotic breeds had overall prevalence of 81.3% and the prevalence of gastrointestinal helminthes in local breeds dogs were known to be 76.6% (Table 3). However there was no statistical significant difference ($P>0.05$) on the overall prevalence of gastrointestinal parasites between breeds.

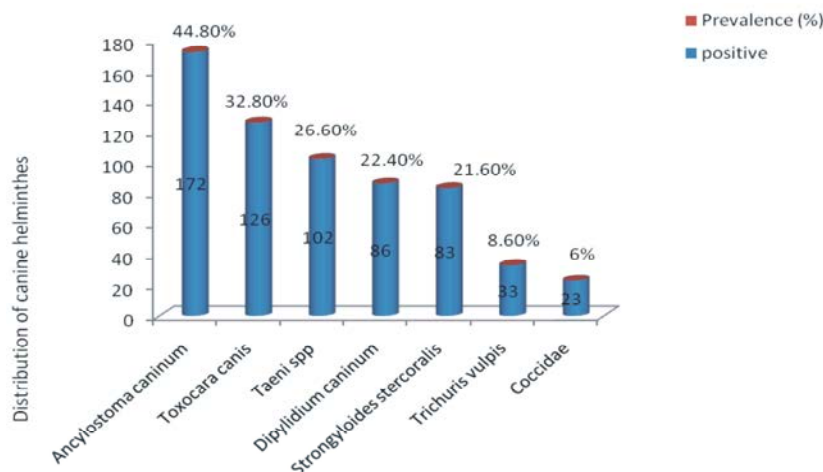


Fig. 1: The distribution of gastrointestinal helminthes diagnosed in the faeces of 384 dogs and their respective prevalence, in Bahir Dar town

Table 1: Prevalence of gastrointestinal helminthes between sexes of dogs

Helminthes	Sex	No. of positive (prevalence)	χ^2	P-value
Overall	Male	164(79.2)	0.319	0.572
	Female	136(76.8)		
<i>A. caninum</i>	Male	90(43.5)	0.313	0.576
	Female	82(46.3)		
<i>T. canis</i>	Male	63(30.4)	1.152	0.283
	Female	63(35.6)		
Taeniidae	Male	62(30.0)	2.644	0.104
	Female	40(22.6)		
<i>D. caninum</i>	Male	57(27.5)	6.828	0.009
	Female	29(16.4)		
<i>S. stercoralis</i>	Male	41(19.8)	0.866	0.352
	Female	42(23.7)		
<i>T. vulpis</i>	Male	19(9.2)	0.196	0.658
	Female	14(7.9)		
Coccidae	Male	9(4.3)	2.150	0.143
	Female	14(7.9)		

Table 2: Prevalence of gastrointestinal helminthes between ages of dogs

Helminthes	Age	No. of positive (Prevalence)	χ^2	P-value
Overall	Young	123(85.4)	7.168	0.007
	Adult	177(73.8)		
<i>A. caninum</i>	Young	75(52.1)	4.954	0.026
	Adult	97(40.4)		
<i>T. canis</i>	Young	69(47.9)	23.84	0.000
	Adult	57(23.8)		
Taeniidae	Young	32(22.1)	2.225	0.136
	Adult	70(29.2)		
<i>D. caninum</i>	Young	33(22.9)	0.036	0.850
	Adult	57(22.1)		
<i>S. stercoralis</i>	Young	29(20.1)	0.296	0.586
	Adult	54(22.5)		
<i>T. vulpis</i>	Young	7(4.9)	4.087	0.043
	Adult	26(10.8)		
Coccidae	Young	7(4.9)	0.521	0.470
	Adult	16(6.7)		

Table 3: Prevalence of gastrointestinal helminthes between breeds of dogs

Helminthes	Breed	No. of positive (Prevalence)	χ^2	P-value
Overall	Local	200(76.6)	1.068	0.301
	Exotic	100(81.3)		
<i>A. caninum</i>	Local	118(45.2)	0.058	0.810
	Exotic	54(43.9)		
<i>T. canis</i>	Local	97(37.2)	7.001	0.008
	Exotic	26(23.6)		
Taeniidae	Local	48(18.4)	27.894	0.000
	Exotic	54(43.9)		
<i>D. caninum</i>	Local	55(21.1)	0.821	0.365
	Exotic	31(25.2)		
<i>S. stercoralis</i>	Local	60(23.0)	0.908	0.341
	Exotic	23(18.7)		
<i>T. vulpis</i>	Local	11(4.2)	19.893	0.000
	Exotic	22(17.9)		
Coccidae	Local	17(6.5)	0.397	0.529
	Exotic	6(4.9)		

Table 4: Prevalence of GIT helminthes in dogs between feed types

Helminthes	Feed types	No. of positive (Prevalence)	χ^2	P-value
Overall	Raw	89(93.7)	1.239	0.000
	Cooked	36(37.5)		
	Mixed	175(90.7)		
<i>A. caninum</i>	Raw	56(58.9)	31.893	0.000
	Cooked	20(20.8)		
	Mixed	96(49.7)		
<i>T. canis</i>	Raw	36(37.9)	15.141	0.001
	Cooked	16(16.7)		
	Mixed	74(38.3)		
Taeniidae	Raw	29(30.5)	15.053	0.001
	Cooked	11(11.5)		
	Mixed	62(32.1)		
<i>D. caninum</i>	Raw	23(24.4)	5.879	0.053
	Cooked	13(13.5)		
	Mixed	50(25.9)		
<i>S. stercoralis</i>	Raw	31(32.6)	15.344	0.000
	Cooked	9(9.4)		
	Mixed	43(23.3)		
<i>T. vulpis</i>	Raw	14(14.4)	8.242	0.016
	Cooked	3(3.1)		
	Mixed	16(8.3)		
Coccidae	Raw	8(8.4)	2.414	0.299
	Cooked	3(3.1)		
	Mixed	12(6.2)		

Prevalence of Gastrointestinal Helminthes of Dogs among Feed Types: The highest overall prevalence of gastrointestinal helminthes were recorded in those dogs which were fed raw animal products (93.7%) followed by those dogs which were fed on mixed (90.7%) and cooked (37.5%) feeds, respectively. There was statistically significant variation ($p < 0.05$) on the overall prevalence of gastrointestinal parasites in dogs among the feed types given to them (Table 4).

DISCUSSION

The overall prevalence of gastrointestinal helminthes among dogs in the current work was known to be 78.1%. This value was higher than studies carried out by Yacob *et al.* [12] and Endrias *et al.* [13], who reported prevalence of 51 and 52.9% in Debre Zeit and Ambo towns, respectively. The higher prevalence of gastrointestinal helminthes among dogs in Bahir Dar town and the differences in the prevalence of the present study among other researchers finding could be attributed to limited Veterinary services in the town, lack awareness of the owners about prevention and control of dog parasites.

The prevalence of gastrointestinal helminthes among dogs in this study (78.1%) was lower than that reported by Tarish *et al.* [14] in Iraq and Pandey *et al.* [15]

in Morocco, who reported the prevalence of gastrointestinal helminthes to be 100%. The difference in the prevalence of gastrointestinal helminthes infections could be explained by the differences in climatic factors required for the biology of the parasites, Veterinary facilities and public awareness to take care of their dogs.

The predominant species of helminthe parasite identified in the current research was *Ancylostoma caninum* (44.8%). This result was higher than the result of Shihun [16] who reported 32% prevalence of *A. caninum* in his study conducted Debre Zeit, Ethiopia.

The overall prevalence of *T. canis* (32.8 %) in the current study was higher than the previous reports of Yacob *et al.* [12] and Endrias *et al.* [13] who reported 21% and 17.1% in the studies carried out at Deber Zeit and Ambo towns, respectively. The study proved that the prevalence of *T. canis* was higher in young (48.9%) dogs than in adults (22.8%). This fact has been justified by Martinez-Moreno *et al.* [1] who claimed most gastrointestinal helminthes have been found mainly in dogs younger than one year.

The prevalence of *D. caninum* in the present study (22.4%) was lower than the report from Debre Zeit [16] and Dire Dawa and Eastern Hararge [17] who reported prevalence of 47.54% and 83% *D. caninum*, respectively. The lower prevalence of gastrointestinal helminthes among dogs in Bahir Dar town and the differences in the prevalence of the present study among other researchers finding could be attributed the different techniques used in these studies and differences in the origin of the samples or by geographical differences.

The prevalence of *T. vulpis* (8.6%) confirmed in this study was higher than the findings of Yacob *et al.* [12] who reported 3% prevalence of *T. vulpis* among dogs in Debre Zeit, Ethiopia and Anene *et al.* [18] who reported 3.6% prevalence of *T. vulpis* in Nigeria. *T. vulpis* were more frequently found in older dogs (10.8%) than young (4.9%) dogs. This fact has been explained by Visco *et al.* [19] who noted that the prevalence of *T. vulpis* was lowest (6.1%) in dogs <1 years of age and increases significantly to >20% in old (>1 years of age) dogs.

The prevalence of coccidae was lower in young dogs (4.9%) than adult dogs (6.7%). Similar prevalence (3.7%) was observed in young dogs in the United States by Visco *et al.* [19].

The overall prevalence of gastrointestinal helminthes was higher in male dogs (79.2%) than female (76.8%) dogs. This finding agrees with the reports of Visco *et al.*

[19], who noted helminthes were significantly more likely to parasitize male dogs than females. The result was also in line with Anene *et al.* [18], Ramifrez-Barrios *et al.* [2] Maria *et al.* [20] and Yacob *et al.* [12]. The high prevalence of gastrointestinal helminthes in male dogs than female dogs could be attributed to hormonal factors and sex-associated behaviors such as roaming [21].

The overall prevalence of helminthes parasites was significantly higher ($P < 0.05$) in young (85.4%) than in adult (73.8%) dogs; which was in line with other studies [19, 21]. This could be justified by the fact that the immune systems of young dogs are not completely mature [7]. In addition, the larvae of these parasites remain in a state of latency in the muscular layer of bitches and during pregnancy larvae are reactivated and capable of infecting the fetus through transplacental route and puppies via transmammary route whereas, adult dogs may develop immunity which decrease the establishment as well as the fecundity of the of the parasites [22].

The prevalence of helminthes in exotic-breed dogs were higher (81.3%) than local-breed dogs (76.6%). Statistical analysis of the data showed that there was no significant difference ($P > 0.05$) in the overall prevalence between breed of the dogs examined. This fact could be justified by the fact that exotic breed are genetically prone to parasitic diseases due to low level of immunity.

The prevalence of gastro intestinal helminthes was highest in dogs that were fed raw (93.7%) followed by dogs that feed mixed (90.7%) and cooked (37.5%) feed items. Statistical analysis of the data showed significant difference ($P < 0.05$) in prevalence of helminthes between feed types. The highest prevalence of gastrointestinal helminthes in dogs that were fed raw is clarified by the fact that cooking can kill or inactivate infective eggs or cysts of gastrointestinal helminthes which could be transferred among dogs via feed.

CONCLUSION

Gastrointestinal helminthes was proved to be widely distributed among dogs in Bahir Dar town, Ethiopia. This high level gastrointestinal helminthes among dogs in the study area poses a huge health risk to the dog and human population that rise concerns about the protection of dogs and human population in the study areas. To the best of our knowledge, this is the first report on the

occurrence of gastrointestinal helminthes among dogs in the study areas. The results warrant further investigations to elucidate the animal and human health significance in the area. The study confirmed that among the different age groups young's were found to be the most susceptible to infection with gastrointestinal helminthes. This research also indicated that there was a significant difference ($P<0.05$) in the level of infection with helminthe parasites between ages and feed types among dogs. From this study it can be concluded that age, breed and feed can be considered as one of the important factors which influence the occurrence of these gastro intestinal parasites among dogs and the study also confirmed almost the same level of susceptibility between sexes of dogs to helminthes.

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