

Intestinal Nematode Parasites of Dogs: Prevalence and Associated Risk Factors

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Abstract: A cross-sectional study was conducted to determine the prevalence of intestinal nematode parasites of dogs from November 2009 to April 2010 in Gondar. The study discovered that Zoonotically important parasites are also serious problems of dogs in this area. Coprological examination of direct fecal smear and simple floatation techniques were deployed to screen parasite and determine their species. In this study the prevalence of intestinal nematodes was analyzed in relation to age, sex and types of breeds. Of the total 326 dogs' faecal samples examined, 14.7% (n = 48) were found to harbor one or more parasite species. The prevalence of intestinal nematode parasites was 4.6, 8.3 and 1.8% in less than 1 year, 1-3 years and greater than 3 years of age groups, respectively. The prevalence recorded on sex basis are 7.1% (female) and 7.7% (male), and those of local and cross breeds were 10.7 and 4.0%, respectively. But the difference in prevalence among age, sex and age groups was not found statistically significant (p>0.05). Parasites from the four genera were identified and these include *Ancylostoma caninum*, *Toxascaris leonina*, *Toxocara canis* and *Strongyloides stercoralis*. *Ancylostoma caninum* (4.6%) was the most prevalent parasites encountered as compared to other three types of nematode parasites.

Key words: Dogs, gondar, nematode, risk factors

INTRODUCTION

The domestic dog (*canis familiaris*) is generally considered as the first domesticated mammal and has co-existed with man as a working partner and house pet in all areas and culture since the days of the cave dwellers and are the most successful canids adapted to human habitation worldwide (Birchard and Sherding, 2006). They have contributed to physical, social and emotional well being of their owners, particularly children. However; dogs like many canines have been reported to harbor a variety of intestinal parasites, some of which can also infect livestock, wildlife and humans. In spite of the beneficial effects, close bonds of dogs and humans (in combination with inappropriate human practices and behavior) remain a major threat to public health, with dog harboring a bewildering number of infective stages of parasites transmissible to man and other domestic animals (Hendrix, 2006; Foryet, 2001). Dogs are affected at some stage in their life and many will be re-infected unless they are given regular, routine deworming treatment (Foryet, 2001). Heavy infection in malnourished dogs cause anemia and protein loss (Coati *et al.*, 2003; Taylor, 2007). Ascarids (*Toxocara canis*) and hook worms (*Ancylostoma* species) are common intestinal parasites of dogs. These two were mostly diagnosed in puppies because of the occurrences of both transplacental and transmammary transmission of *T.canis*. Puppies are usually born with or

acquire ascarid infection early in their life (Taylor, 2007). The clinical signs of parasitic infection in dogs are varied and occasionally some infected animal may present no symptoms. These factors, coupled with inadequate information by dog keepers on the risks of disease transmission and poor level of hygiene have resulted in an increase risk of exposure to zoonoses (Hendrix, 2006; Martínez-Moreno *et al.*, 2007). Dogs are associated with more than sixty zoonotic diseases among which parasite in particular, helminthosis, can pose serious public health concerns worldwide. Many canine gastrointestinal parasites eliminate their dispersion elements (eggs, larvae, oocysts) by the fecal route (Hendrix, 2006). Zoonotic disease such as visceral and ocular larval migrans caused by *Toxocara canis* and cutaneous larval migrans caused by *Ancylostoma braziliense* are some intestinal helminth infections in dogs (Urquhart *et al.*, 1996). Even though nematodes are the major parasites that affect dogs and also human, a study has not been conducted on nematode parasites in Gondar. Therefore, the main objectives of this study were estimation of the prevalence of intestinal nematodes, identifying them and assessing associated risk factors.

MATERIALS AND METHODS

Study area: The study was conducted in Gondar from November 2009 to March 2010. Gondar is located 727 km

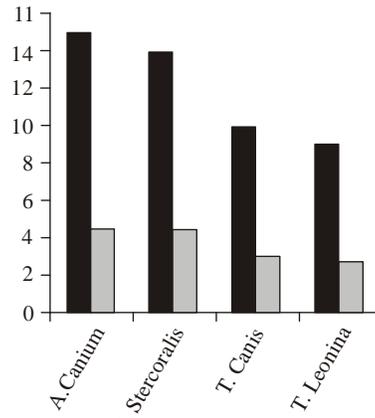
north western Addis Ababa in Amhara regional state and is 2,220 m above sea level with 1172 mm mean annual rainfall and 19.7°C average annual temperature. The area is also characterized by two seasons, the wet season from June to September and the dry season from October to May. It is 257 km² area wide (North Gondar Zone Agricultural Bureau, 2011).

Study animals: The study animals were dogs found in Gondar. 326 dog fresh feces samples were collected and examined in parasitological laboratory of veterinary faculty for the presence of gastrointestinal nematode parasite eggs.

Sampling methodology and survey design: A cross sectional study was conducted with a random sampling methodology. The sample size for this study purpose was determined according to Thrusfield (2005). Since there is no study conducted about canines in Gondar, the sample size was determined by using 50% expected prevalence and 5% desired absolute precision at 95% confidence interval.

Sample collection and examination: 326 fecal samples were collected directly from the rectum with the help of fingers or immediately after voiding of feces of each dog using sterilized plastic gloves. The collected samples were placed in sterilized sample bottle until it has been processed for diagnosis. Sampling containers were labeled with the necessary information (breed, sex and age). Then the samples were immediately taken to the parasitological laboratory for processing. Coprological examination for the detection of parasite eggs was performed using simple floatation and direct fecal smear techniques (Johannes, 1996).

The floatation fluid was prepared by taking 400 g of sodium chloride (NaCl) in to 1000 mL of tap water and was stirred to dissolve the salt crystals (Hendrix and Sirois, 2007; Foryet, 2001). A specimen of 2-5 g of feces is placed in a suitable container, such as a paper cup. Flotation solution is added directly to the feces, mixed thoroughly with a tongue depressor, and strained through a metal tea strainer in to a second paper cup are poured in to a test tube, and the floatation medium is added until a meniscus is formed. A glass cover slip is placed over the meniscus and allowed to remain for 10 to 15 min, after which the coverslip is removed and placed on a glass microscope slide and examined with a microscope (Hendrix and Sirois, 2007). For direct fecal smear, a small quantity of feces is placed on a slide, mixed with droplets of water and a coverslip is placed on the fluid. Then, the slide is thoroughly examined (Hendrix, 2006). After that, eggs were identified based on their morphological characteristics.



Identified nematode parasite species of dogs

Fig. 1: In our investigation it is found that *A. caninum* is the most (4.6%) and *T. leonina* is the least (2.67%) prevalent parasites in dogs in Gondar. This figure also showed that some of the dogs have been found harboring more than one parasite

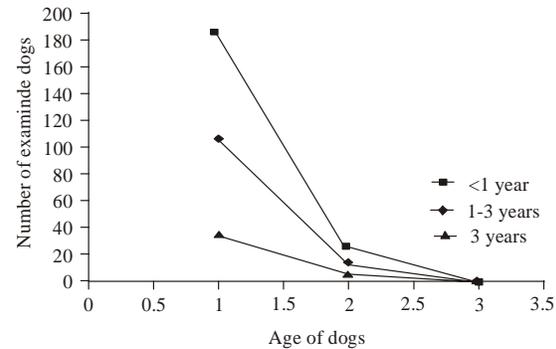


Fig. 2: The prevalence of intestinal nematode infection of dogs by age group. The prevalence of intestinal nematode parasites among different age groups of <1 year, 1-3 years and >3 years were 4.6, 8.3 and 1.8%, respectively

Data entry and statistical analysis: Data were entered using excel spread sheet and checked for entry errors by comparing data entries with the original data forms then it was transferred to SPSS (2004) for analysis. Chi-square test was applied to determine the significance of differences.

RESULTS

Of 326 fecal samples collected, 14.7% (48/326) dogs were depicted positive for the intestinal nematode eggs. The main intestinal nematode parasites identified were *A. caninum*, *T. leonina*, *T. canis* and *S. stercoralis* as shown in Fig. 1.

In this study a comparison was made between breed, sex and age of dogs to assess the existence of any link

between these risk factors and the prevalence of parasites. Therefore, the prevalence of intestinal nematodes in relation to sex, age and types of breeds were analyzed. However, the result showed that there exists no statistical significant difference among sex groups with prevalence of 7.1% (23/326) and 7.7% (25/326) in females and males respectively. And hence the minimum expected count was 5.15 ($p > 0.05$) among the two sex categories.

The difference between the prevalence was statistically non-significant and the minimum expected count was (20.17) ($p > 0.05$) as shown in Fig. 2.

The prevalence of intestinal nematode parasites in relation to breed was 10.7 and 4.0% in local and crosses respectively. The difference between the two breed was not significant and the minimum expected count was 8.98 ($p > 0.05$). But it was clear that much of the animals examined were local breeds.

In general, according to the results of this study; there was no statistical significant difference between age, sex and breed categories (in all the risk factors the study tried to address) as the p -value is greater than 0.05.

DISCUSSION

According to this study, the overall infection prevalence of dogs with intestinal nematode parasites is 14.7% (48/326). The four major nematode parasites identified were *A. caninum* (4.6%), *S. stercoralis* (4.29%), *T. canis* (3.06%) and *T. leonina* (2.76%).

***Ancylostoma caninum*:** *Ancylostoma caninum* is the most prevalent nematode parasite in the study with the 4.6% prevalence. Other study in Ethiopia by Yakob *et al.* (2007) indicates that the prevalence of *Ancylostoma caninum* parasite accounts 32% in Debre Zeit. However, the infection prevalence (4.6%) in this study agrees with Miró *et al.* (2007) studied on stray dogs in Madrid, Spain which is 4%. But higher prevalence rates were reported in Northern Greece (9.8%) by Lefkaditis *et al.* (2009), Galapagos Islands (57.7%) by Gingrich *et al.* (2010), Heilongjiang Province of Republic of China (66.3%) by Wang *et al.* (2006) and in Fortaleza of Brazil (95.7%) by Klimpel *et al.* (2010).

***Strongyloides stercoralis*:** Prevalence of *Strongyloides stercoralis* was 4.29% and is found to be the second principal nematode endoparasites and the occurrences has been found varied among different age groups. But it was more important in unweaned puppies. This probably be due to unweaned puppies have a chance to be infected orally from larvae adhering to the teats, ingestion of larvae with colostrum and lack of immunity and so susceptibility to parasites.

***Toxocara canis*:** The prevalence of *Toxocara canis* was found 3.06%. So the report of this study agrees with

researches conducted in Finland (3.1%) by Pullola *et al.* (2006) and Northern Belgium (4.4%) by Calerebout *et al.* (2009).

This finding is found to be less as compared to reports from Czech Republic (6.5%) by Dubna *et al.* (2007), Fortaleza Brazil (8.7%) by Klimpel *et al.* (2010), Japan (12.5%) by Yamamoto *et al.* (2009), Northern Greece (12.8 and 10.4%) by Papazahariadou *et al.* (2007) and by Lefkaditis *et al.* (2009), respectively, Spain (17.7%) by Martí nez-Moreno *et al.* (2007), Madrid Spain (7.8%) by Miró *et al.* (2007), Germany (22.4%) by Barutzki and Schaper (2003), People's republic of China (36.5%) by Wang *et al.* (2006), Argentina (11.6%) by Fantanarrosa *et al.* (2006), Italy (33.6%) by Habluetzel *et al.* (2003), Ethiopia (21%) by Yakob *et al.* (2007) and Galapagos Islands (16.5%) by Gingrich *et al.* (2010). But higher than reports from Poland (0.3%) by Borecka (2005) and Korea (0.9%) Kim and Huh (2005). This variation may be, due to differences in management systems, health care and degree of environmental contamination with infective stages and exposition to natural infection more than owned dogs. Studies reveal that dog's well cared for by their owners and given veterinary attention has lower incidence of intestinal helminthes than dogs lacking such privileges (Hendrix, 2006). Thus, the intestinal nematodes were less prevalent due to the fact that animals examined were kept in house with hygienic compound.

***Toxascaris leonine*:** The least prevalent of the four nematode parasites in this study was the *Toxascaris leonina* in which its prevalence 2.76%. Less prevalence was reported in United Arab Emirates (0.8%) by Schuster *et al.* (2009), Northern Greece (1.3%) by Lefkaditis *et al.* (2009) and Germany (1.8%) by Barutzki and Schaper (2003). And higher prevalence was found in Madrid, Spain (6.3%) by Miró *et al.* (2007).

The coproscopical examination conducted by Yakob *et al.* (2007) in Ethiopia revealed that there is statistically significant difference ($p < 0.05$) in overall frequency of gastrointestinal nematode infections among different age groups.

The infection prevalence of intestinal nematodes in this study in male and female dogs is 7.1 and 7.7%, respectively. There is no statistically significant difference ($p < 0.05$) between the two sex categories to which our result agrees with Daryani *et al.* (2009) and Yakob *et al.* (2007) reports conducted in Mazanderan (Iran) and Ethiopia (Debre Zeit), respectively. In contrast, a study in Nigeria indicated that female dogs were more likely of contracting intestinal nematodes than male dogs (Umar, 2009).

With regard age our study shows that the prevalence of intestinal nematodes was 4.6% in ages of less than one year, 8.3% between one to three year and 1.8% over three

years. However, there is no statistically significant difference ($p>0.05$); which agrees with the study by Kahante *et al.* (2009) in Nagpur. Unlike to this, a study conducted in Mazanderan, Iran by Daryani *et al.* (2009) reported that there exists statistical significant difference between different age groups in stray dogs. This may be due to the fact that stray dogs under examined were more prone to large number of intestinal nematodes at any age due to lack of anthelmintic treatments compared to pet dogs.

In the present study the prevalence in local breeds and cross breeds was 10.7 and 4.0%, respectively. However, the difference between breeds is not found statistically significant ($p>0.05$) in infection prevalence.

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