

Zoonotic Importance and Prevalence of Parasites in Dogs: Pet Owner's Knowledge Assessment

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Abstract: Dogs are the most common pet animals worldwide. Dog feces harboring infective parasitic forms (larvae, eggs, cysts of helminths and oocysts of protozoan) are potential sources of environmental contamination, representing a high risk of infection for human beings. A random house-to-house fecal screening of dogs was conducted between January 2012 and June 2012. In addition, a pre-tested structured questionnaire to obtain information on the dogs' age, sex, housing status, vaccination status, purpose of keeping, way of feeding and to assess dog keeping zoonotic disease-related knowledge, attitude and practice of dog owners and knowledge on method of disease transmission was applied. For this purpose 200 dogs of Mekelle city, Tigray region of Northern Ethiopia were examined. Six intestinal helminth species (*Toxocara canis*, *Ancylostoma* species, *Diphyllobothrium latum*, *Echinococcus granulosus*, *Dipylidium caninum* and other Taenidae) were identified. Overall prevalence of intestinal helminths was 30.5% (n=61). In this study the occurrence of *T. canis* was most common (prevalence 14%). Parasitic diseases of dogs were not considered a major health problem in the society. Moreover, routine treatment of dogs with antiparasitic drugs (deworming) was not a common practice in the city. Parasites of importance for human health were highly prevalent in Mekelle city dogs and the public awareness regarding parasites of zoonotic importance was limited. Therefore; interventions that include health education to dog owners and the establishment of a program focusing on zoonotic diseases transmitted by dogs is must.

Key words: Dog • Health • Mekelle • Parasite • Zoonotic

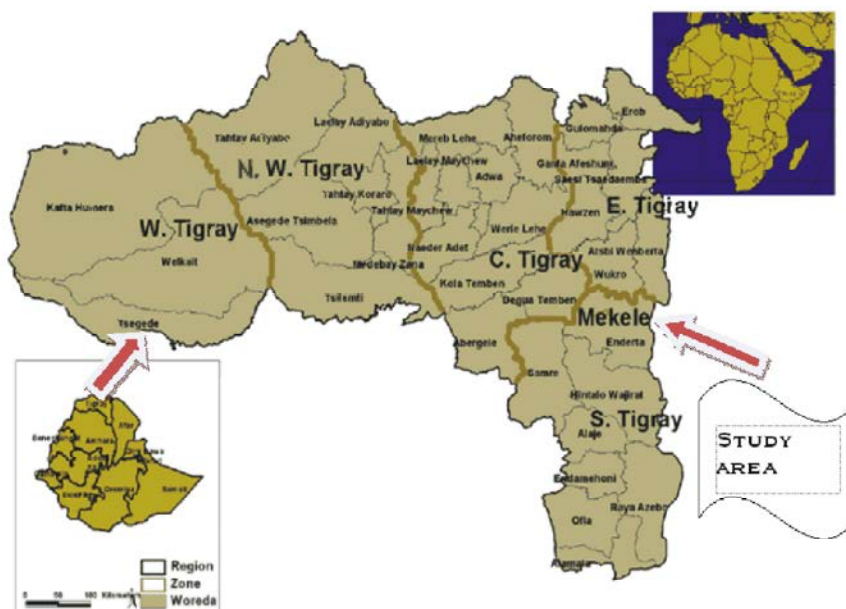
INTRODUCTION

Dogs are the most successful canids, adapted to human habitation worldwide contributing to physical, social and emotional well-being of their owners, particularly children [1]. The role of dogs as companion animals and the close relationship between humans and dogs, although offering significant benefits to many people, also represent a potential public health risk, since natural transmission of parasitic infections from dogs to humans may occur, either directly or indirectly via environmental factors [2, 3].

Dogs are definitive hosts for several endoparasites with zoonotic potential such as *Ancylostoma caninum*, *Toxocara canis*, *Dipylidium caninum*, *Echinococcus granulosus*, *Giardia* spp., or coccidians like *Cryptosporidium* spp and others. Dog faeces harboring

infective parasitic forms (larvae, eggs, cysts of helminths and oocysts of protozoan) are potential sources of environmental contamination representing a high risk of infection for the people and therefore have been recognized as a significant public health problem worldwide, especially in developing countries and communities that are socioeconomically disadvantaged [4, 5].

Several studies of canine intestinal parasites of public health importance have been reported in many other parts of the world [6-8]. However, such a report is scanty in Ethiopia, which is essential for development of control measures in animal and public health. Therefore, the objectives of this study were to determine the prevalence internal parasites of dogs of public health importance and to assess the pet owner's knowledge regarding zoonotic parasitic diseases of dogs.



MATERIALS AND METHODS

Study Area: The study was conducted in Mekelle city, Tigray region (Northern Ethiopia) and the neighbouring rural communities (longitude 13°29' N and 39°28' E). Mekelle is an urban centre and the capital of Tigray region. The city covers an area of about 53 square kilometres, with an estimated population of 215,546 people. It is located 783 kilometers north of Addis Ababa between altitudes of 2000-2200 m.a.s.l and the average rain fall and average temperature ranges are from 150-250mm and 17-21°C, respectively. Its rainy seasons occur mainly between June and September, although a short rainy season do occur on March and April [9].

Study Design: A random house-to-house screening of dogs was conducted between January 2012 and June 2012. A total of 200 questionnaires were administered to household members of the community in Mekelle city. A pre-tested structured questionnaire was prepared in local language to obtain information on dogs' age, sex, housing status, vaccination status, purpose of keeping, way of feeding and to assess dog keeping parasitic zoonotic disease-related knowledge, attitude and practice of dog owners and knowledge on method of disease transmission. Thereafter, pre-labeled specimen containers were distributed for the collection of stool samples. In households with more than one dog, only one dog (chosen by the dog owner) was considered for faecal examination.

Sample Collections: Faecal samples from dogs were collected and a sub-sample of faeces was taken into a pre-labelled clean sterile universal plastic bottle containing 10% formaldehyde solution. All samples were carried to the parasitology laboratory at Mekelle University and processed for microscopic helminths eggs examination.

Laboratory Procedures: A small portion (1-3 g) of the sample was sieved through double-ply gauze to remove rough materials. The filtrate was centrifuged at 3000 rpm for 3 min, the supernatant decanted and the tube allowed to stand for 10 min. Fifty mg of the sediment was taken onto a degreased glass slide and covered with a cellophane strip soaked overnight in 50% solution of glycerol-malachite green [10]. Slides were examined for helminthes eggs under a light microscope immediately after preparation. Parasite eggs were identified based on the morphological characteristics [11].

Data Entry and Statistical Analysis: Data were entered using an excel spreadsheet and checked for entry errors, by comparing data entries with the original data forms. Then, data were transferred to Stata® software package (version 9.0; Stata Corporation, College Station, USA) for analysis. Descriptive statistical analysis was applied to determine the frequencies.

RESULTS

A total of 200 dogs, consisting of 145 (72.5%) males and 55 (27.5%) females were examined. All dog owners

Table 1: Characteristics of dogs and knowledge, attitudes and practice of dog owners regarding potential zoonotic disease in Mekelle city

Variables	N	%
Sex of dogs		
Male	145	72.5
Female	55	27.5
Age of dogs (months/years)		
0-12 months	59	29.5
1-3 years	45	22.5
3-6 years	38	19.0
6-9 years	24	12.0
9-12 years	21	10.5
≥ 12years	13	6.5
Reason for keeping dogs		
Hunting	167	83.5
Companion	23	11.5
Both reason	10	5.0
Where do dogs usually roam		
Confined to dog house on compound	65	32.5
Inside the house	19	9.5
Within the compound	88	44.0
Anywhere within or outside the compound	21	10.5
Dog owner's knowledge of possible disease transmitted or caused by dogs		
Rabies	105	52.5
Wound form dog bite	65	32.5
Worms	19	9.2
Dysentery	7	3.5
Other bacterial/ viral diseases	4	2
Do children play with dogs		
Yes	194	97
No	6	3
Dog owner's perception of diseases transmitted by dogs		
Serious	54	27.0
Not serious	98	49.0
Do not cause any disease	48	24.0

Table 2: Prevalence of intestinal helminth parasites in dogs

Parasite species	N	%
<i>Toxocara canis</i>	29	47.54
<i>Ancylostoma</i> species	14	22.95
<i>Echinococcus granulosus</i>	7	11.48
<i>Dipyllobothrium latum</i>	4	6.56
<i>Dipylidium caninum</i>	4	6.56
Taenidae	3	1.50
Number of intestinal helminth species per host		
One helminth species	52	85.25
Two helminth species	8	13.12
Three helminth species	1	1.64

agreed to participate and completed the questionnaires. In the study area, significantly more individuals kept dogs for hunting and security reasons (83.5%), whereas 11.5% of dog owners kept dogs as watch dogs and 5% for both reasons (Table 1). In the study area, more than 30% of dog owners in the city did not perceive diseases transmitted by dogs as a human health problem

($p < 0.0001$). The bonds of humans with their animals were close and children played with virtually all dogs included in the study (Table 1). When asked about possible diseases transmitted by their dogs, less than 10% of owners knew risk of helminths ("worms") zoonosis, but more than 50% were aware of the risk of rabies transmission through bite and salivation (Table 1).

In total, 61 (30.5%) of the examined dogs were infested with at least one intestinal helminth species. Six species, namely *T. canis*, *Ancylostoma* species, *E. granulosus*, *D. caninum*, Taenidae and *D. latum* were identified in dogs of the study areas (Table 2).

The most common parasites were *T. Canis*, followed by *Ancylostoma* sp. and *Echinococcus granulosus* (Table 2). Multiple infections with 2 and 3 parasites species per host were also recorded in the study area (Table 2). The pattern of prevalence and distribution of parasites, stratified by age of dogs, is depicted in table 1. In general, prevalence of parasite infestation increased with age of the dog. An exception was observed in *T. canis* infection, which was by far the most common infestation in puppies and showed decreasing prevalence with age.

DISCUSSION

The present study provides a base line data of parasites in dogs in Mekelle city Tigray region, Ethiopia. The results showed a prevalence high intestinal helminth species. The knowledge and perception of dog owner's regarding zoonotic diseases transmitted by pets was sufficient but not definitive however, dog owner's knowledge regarding zoonotic parasitic diseases transmitted by pets was insufficient.

The parasites reported in this study have been previously documented in dogs throughout the world, with a pronounced difference in prevalence between regions [6,12]. In this study, the overall prevalence of intestinal helminths (33.86%) was similar to that reported from different ecological and epidemiological settings in Nigeria (24%) [13]. However, a higher prevalence of 71% was reported from Spain [14]. In South Africa (76%), Mexico (85%) and Morocco (100%), prevalence was even higher [15,16].

Considering the high prevalence of intestinal helminth infestations found in dogs and the close bonds in which dogs live together with people, the risk of transmission of these parasites to humans seems to be obvious. For example, *Toxocara* infection in humans may cause visceral larva migrans, in severe cases leading to blindness, *T. canis* decreased with age of dog, whereas *A.*

caninum, *E. granulosus*, Taenidae, *D. caninum* and *D. latum* increased with age, even though to a less extent. These patterns have been observed previously [13,16].

The number of intestinal parasite species per host revealed that single infection was more common; polyparasitism with more than two parasites species was less frequently observed. These results are in agreement with [17] who explained that interactions among parasite species depend on parasite burden rather than the mere presence of other species.

Echinococcus granulosus causing hydatid disease. The diagnostic technique of parasites done in this study, based on the morphological characteristics of ova under light microscope, has the disadvantage that it fails to distinguish *E. granulosus* from other Taenidae. Thus, *E. granulosus*, a major zoonotic parasite of livestock and dogs in Nigeria [18] has possibly been present but not reported in our survey. The fact that dogs enjoy unrestrained association with humans, scavenge for food in an environment contaminated with faecal material of potential intermediate hosts and feed on offal of slaughtered livestock in abattoirs makes transmission of hydatid disease predictable in the setting studied [19].

In general, the trend in prevalence and species composition of parasites observed in this study may reflect the degree of environmental contamination. In particular, *T. canis*, *A. caninum*, *E. granulosus*, *D. latum* and *D. caninum* are zoonotic parasites constituting serious public health problems in the study areas.

CONCLUSION AND RECOMMENDATION

The present study result reveals that parasites of importance for human health were highly prevalent in Mekelle city dogs and the public awareness regarding parasites of zoonotic importance was limited. Therefore, intervention measures are necessary to reduce the risk of transmission of parasites from dogs to humans. Interventions should focus on health education provided to dog owners and the establishment of a program based on zoonotic diseases.

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