A Survey on Gastro-Intestinal Parasites of Non-Descript Dogs in and Around Arusha Municipality, Tanzania

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Abstract: Dogs are the most common pet animals worldwide and perform a range of cultural, social, and economic functions in society. The objective of this study is to investigate, through cross-sectional survey, the distribution, types and prevalence of gastro-intestinal parasites affecting dogs in and around Arusha municipality, Tanzania. Faecal samples collected from 241 non-descript, apparent healthy dogs were processed by sedimentation and floatations technique and then examined for protozoan oocyst and helminth eggs. Coprological examination revealed that 59.3% of the dogs excreted helminth eggs in their faeces. Dogs harbouring one-parasite eggs were more common (73.8%) than those harbouring two (12.4%) or three (0.4%). The data on the distribution of the various worm species in the positive dogs indicate that *Ancylostoma caninum* eggs were by far the most common (57.2%). The other detected worm egg species and their respective frequencies were: *Toxocara canis* (13.7%), *Mesostephanus* spp. (1.66%) and *Taenia* spp. (0.4%). Protozoan eggs (*E. canis*) were detected in two samples. The prevalence of helminth eggs was higher in young dogs (puppies) compared to adults (p<0.05). The prevalence of different species of helminths also varied in different age groups, with *Toxocara canis* being higher in puppies than in adults (p = 0.005). Sex-wise prevalence of helminths was not significant (p>0.05). The high prevalence of gastro-intestinal helminth parasites of zoonotic potential registered in the dog population from a highly urban area in Arusha indicates a potential risk to human health. Increased awareness of their potential threat to human health coupled with additional research into the zoonotic capacity of *Toxocara* spp. and *Ancylostoma* spp. is desirable.

Key words: Arusha, dog, endo-parasites, prevalence, Tanzania, zoonoses

INTRODUCTION

Dogs were domesticated from wolves as recently as 15000 years ago (Morey, 2006), or perhaps as early as 100000 years ago based on recent genetic fossil and DNA evidence (Savolainen et al., 2002, Lindbald-Toh, 2005). Evidence suggests that dogs were first domesticated in East Asia, possibly China, and the first people to enter North America took dogs with them (Savolainen et al., 2002). Dogs perform a range of cultural, social, and economic functions in society. Dogs are kept as pets and companions, for hunting, as guards, draught animals, for food, or for commercial purposes. Some studies also suggest that keeping pets is associated with a higher level of self-esteem in children (Paul and Serpell, 1996; Knobel et al., 2008).

Where studies have been conducted, parasitic diseases, in particular gastro-intestinal helminths and protozoan have been identified as the major impediment to dog health worldwide owing to the direct and indirect losses they cause (Smith, 1991). Most of the parasites affect the dog sub clinically and dogs may harbour a wide range of parasites with zoonotic potential, thus causing a health risk to humans (Craig and MacPherson, 2000). In areas of high population density such as urban and peri-urban, dog keeping practices may also be a risk to the transmission of zoonoses, some of which could be of parasitic origin (Khante et al., 2009). The major risk factors affecting epidemiology of helminthosis and other Gastro-Intestinal Track (GIT) parasites can be classified broadly as parasite factors, host factors and environmental factors (Wakelin, 1984; Harper and Penzhorn, 1999; Thrusfield, 2005). Although dogs closely have cohabited with humans since early civilisation, studies of dog endoparasites in Tanzania are very limited and very little information is available on the distribution, prevalence and risk factors associated with parasite occurrence and the role of parasites causing mortality in dogs in Tanzania (Muhairwa et al., 2008). This information is important in evaluating and recommending parasite control measures in canine health and welfare programmes.

The current study aimed at determining the spectrum of species and prevalence of gastro intestinal parasites, which could be of productivity and zoonotic importance in dogs in and around Arusha Municipality, Tanzania. The hope was that the baseline epidemiological data collected would facilitate the development of effective interventions for controlling such infections.

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MATERIALS AND METHODS

Study area: This study was conducted in and around Arusha municipality, the second largest municipality in Tanzania. Geographically, the municipality is situated at the foot of Mount Meru (Lat 03°16S and 03°20S and Longt 36°37 and 36°50 E) and intersect the Great North Road from Cape Town to Cairo and is the hub of the northern tourist circuit of Tanzania. Currently the human population is estimated at 516,000 with a growth rate of 4% as opposed to the national of 2.8% per annum (URT, 2002). The study sites were purposively selected in collaboration with the government livestock extension and administration officers. The sites, commonly referred to as administrative wards, were selected on the basis of having a higher concentration of dogs and animal health service facility such as dog dipping tank and dog vaccination centre. These sites included: Suye (5 villages), Elarai (7 villages), Themhi (10 villages), Moshono (2 villages), Moivo (1 village) and Singisi (2 villages). Elarai and Themhi sites were within the urban areas while Suye and Moshono were in the peri-urban and Moivo and Singisi sites were in the rural area of the municipality.

Sampling procedure and data collection: In conducting the study, a cross-sectional design in which data was collected at a single point and time (Thrusfield, 2005) was used. The population of study constituted dogs and their owners within Arusha Municipality and by time of conduction this study; the number of dogs (kennelled and feral/stay) was estimated to be 5000 (Dr. Rwegasira, Arusha, personal communication). Breeds of dog kept were not known to most of participating owners and therefore they were classified as non-descript. Participants presenting dogs (for dipping or vaccination) were required to complete a questionnaire about their dogs. Data was collected on the dogs’ demographic characteristics (age, gender, breed), purpose of keeping dog (pet or security), history of deworming and Rabies vaccination. The age of the presented dogs was determined by dentition (Butler, 2009) and body condition scores were subjectively estimated on two-scale level as ‘unhealthy’ or ‘health’ based on the guides published by (Marrians, 2006). Dogs were grouped into three age categories. Dogs under six months of age were classed as puppies, those in range of seven to one year were classed as juvenile and those beyond one year were classed as adult. These age classes were based on age of first deciduous teeth eruption, colour and the strength of the teeth (Butler, 2009). The study was conducted during the period of September to December 2009.

Sampling and parasitologic techniques: Faecal samples (fresh stool) were collected per-rectum using plastic gloves, put into faecal pots, labelled and kept cool before transportation to the local Veterinary investigation laboratory where they were immediately examined or stored at refrigerated temperature (4°C) for a maximum of one day before processing. The sedimentation and floatation technique as described by Soulsby (1982) and Urquhart et al. (1987) was used to detect the presence of stomach and intestinal eggs (cestodes and nematodes) in the samples. The presence of coccidia oocysts was also recorded.

Statistical analysis: Collected data were entered, stored and analyzed using Epi-Info version 6.04b (CDC, USA). Descriptive statistics were generated and presented as tables. For the epidemiological studies, the prevalence (p) of dogs harbouring each parasite was calculated as p = d/n, where d is the number of dogs diagnosed as having a given parasite at that point in time and n = number of dogs at risk (examined) at that point in time (Thrusfield, 2005). Associations between parasitism and categorical (host and management) factors were compared using chi-square tests for independence. The level of significance was set at p<0.05.

RESULTS

Prevalence of GIT parasite eggs and oocysts: A total of 241 dogs were examined, of which 143 (59.3%) were diagnosed as harbouring nematodes and cestodes eggs at varying levels. The proportion of the dogs harbouring hookworm eggs (Ancylostoma caninum) was the highest (57%). Other gastro-intestinal parasites encountered included Toxocara canis (13.7%), Mesostephanus spp (1.6%) and cestodes/tapeworms (Taenia spp: 0.4%). Protozoan eggs (E. canis) were detected in two samples. Single parasite infections (n = 178; 73.8%) were more common than two or more infections (n = 31; 12.8%). Prevalence of GIT parasites is shown in Table 1. Security reason (n = 236, 98%) was reported as the main purpose of keeping dogs.

Factors associated with prevalence of GIT parasite eggs infection: Significant factors influencing prevalence of GIT parasites infection are given in Table 2. Host age was found to be a significant factor with respect to the prevalence of T. canis and A. caninum (p<0.05), with eggs

| Table 1. Prevalence of different gastrointestinal parasites eggs |
|------------------|--------|--------|
| Parasite spp     | Number positive | Prevalence(%) |
| A. caninum       | 138    | 57.3   |
| T. canis         | 33     | 13.7   |
| Mesostephanus spp| 4      | 1.6    |
| Taenia spp       | 1      | 0.4    |
| E. canis         | 2      | 0.8    |
| A. caninum + Toxocara canis | 24 | 10.8 |
| A. caninum + E. canis    | 2      | 0.8    |
| A. caninum + Mesostephanus spp | 3 | 1.2 |
| A. caninum + Taenia spp   | 1      | 0.4    |
| A. caninum + T. canis + Mesostephanus spp | 1 | 0.4 |
been detected more frequently in puppies (<6 months of age) than juvenile and adult dogs. There was no significant difference in the prevalence of gastro intestinal parasites between male (8.3%) and female (13.7%) dogs (p>0.05). There were no significant differences in the prevalence of parasite infection between local and crossbred dogs (10.04% vs. 8.3%; p>0.05). Health status, source, history of last anthelmintic treatment (less or more than 3 months prior to sampling) were not significantly associated with prevalence of parasite infection (p = 0.431). Surprisingly, dogs vaccinated against rabies in the last one year prior to the study survey were significantly associated with lower prevalence of GIT parasite infection (p = 0.0206).

**DISCUSSION**

The microscopic fecal examination showed that helminthosis was an important health disease in the study area. This finding is in agreement with the results of other researchers, that helminthosis is one of the main problems in dogs worldwide (Minnaar et al., 2002; Akao et al., 2003; Muhairwa et al., 2008; Davoust et al., 2008).

The overall prevalence of 59.3% of GIT parasite eggs/oocyst in the dogs in this study shows that there were frequent infections of our indigenous dogs with different species of helminthes and protozoans. The relatively high level of parasitism recorded in this study is probably related to the lack of improvement in our animal health management programmes or non-adoption of the modern animal health care programmes by dog owners.

Mixed parasitism involving two or more helminth genera was common in the present study and is in agreements with earlier reports (Akao et al., 2003; Sowemimo and Asaolu, 2008; Katagiri and Oliveira- Sequeira, 2008). *A. caninum* and *T. canis* were the most incriminated helminths in dogs. Other helminth/oocyst genera detected, though at a low frequencies included *Mesostesphanus* spp and *Eimeria canis*. This is the first time that the protozoan *E. canis* has been reported in northern Tanzania. The prevalence of 57.3% of *A. caninum* in this study is higher than the prevalence of 41% obtained in Nigeria and Kenya (Ugochukwu and Ejimadu, 1985; Kagira and Kanyari, 2000). The higher prevalence obtained in this result than those obtained in Kenya, and other relevant areas similar to those found in Tanzania could be due to the nature of the environment, poor levels of hygiene and overcrowding especially in communities that are socio-economically disadvantaged together with the lack of veterinary attention (Craig and MacPherson, 2000). Over crowding enhances high potential of environmental contamination with the parasite-laden faeces, leading to an increased rate of transmission of helminth parasites (Kirkpatrick, 1988; Rebecca et al., 2002; Ugboroiko et al., 2008).

Consistent to other studies, puppies were associated with high prevalence of helminth infection particularly for *A. caninum* (Kagira and Kanyari, 2000). Puppies are
usually born with or acquire ascarid infection early in life through trans-mammary and trans-placental transmission (Herd, 1979; Ugochukwu and Ejimadu, 1985; Hendrix et al., 1996).

Most of the dogs examined appeared to be in fairly good health condition, but yielded different types of helminth eggs during examinations. A good number of dog owners/keepers in the study area perceive helminth infection as a pre determined coincidental manifestation, which nobody could do anything to prevent.

Although sex did not emerge as a significant factor in this study, females dogs were more infected with helminth parasites than their male counterparts. This may be due to the physiological peculiarities of the female dogs, which usually constitute stress factors thus reducing their immunity to infections (Wakelin, 1984).

The significance of this survey is that persistent infections of dogs by helminth like *Toxocara canis* in addition to its deleterious effects on dog’s causes public health hazards. This helminth produces a condition known as visceral larval migrans in children and ocular migrans in adult human beings (Oladele et al., 2006; Gavignet et al., 2008). Although the seriousness of infection of *Toxocara canis* depends on the site of parasite migration, the aberrant larvae occasionally invade the central nervous system. Neurological problems, such as epilepsy, neuropsychologic deficits, and ataxia have been observed clinically in humans. In the case of ocular larval migrans, vision loss and permanent blindness may result (Akao et al., 2003; Nithiuthai et al., 2004).

CONCLUSION

Results obtained in this investigation and previous ones (Muhairwa et al., 2008) suggest gastrointestinal helminths infections are prevalent and locally wide spread. Puppies were at a higher risk of helminth infection, which is likely to negate the efficient dog growth rate and performance. Additionally, the present study has provided further evidence that household dog is a very important factor in parasitic zoonosis. Dogs are associated with more than 60 zoonotic diseases among which parasite in particular, helminthosis can pose serious public health concerns worldwide (Khante et al., 2009). Thus, concerted efforts should therefore be made to educate dog keepers/owners to embrace modern dog disease control programs and specifically the need for routine deworming of their dogs.

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REFERENCES


