Nigerian Veterinary Journal
Vol 34 (3) 851-858

Prevalence of Zoonotic Gastrointestinal Helminth in Dogs And Knowledge of Risk of Infection by Dog Owners in Ibadan, Nigeria.

ODENIRAN, P.O. and ADEMOLA, I.O*.

Department of Veterinary Microbiology and Parasitology, University of Ibadan, Ibadan, Nigeria.

*Correspondence: E-mail: io.ademola@mail.ui.edu.ng, Phone No: +234 802 317 802

SUMMARY

Zoonotic infections are among the most common on earth and are responsible for over 60% of human infectious diseases, some of which are caused by helminth parasites. A study of intestinal zoonotic helminth of dogs and the risk perception by dog owners in veterinary clinics and some settlements around Ibadan, Nigeria was conducted between December 2011 and September 2012. Faecal samples collected from 104 dogs were processed by floatation (centrifugation) and direct smear methods and then examined for the presence of ova and oocyst. Coprological examination revealed that 26 (25%) of dogs examined were infected with both single and mixed zoonotic helminth. The prevalence for the various intestinal zoonotic helminth observed were *Ancylostoma caninum* (16.35%), *Toxocara canis* (3.85%) and Mixed (*Ancylostoma, Toxocara* and *Echinococcus*) (4.81%). The total prevalence indicated 73.1% of infected animals in the rural areas and 26.9% in the urban. Statistically, the prevalence was comparable ($p<0.05$) for both communities. However, the risk perception of helminthoses among dog owners in Ibadan showed significant difference among communities ($p<0.0001$). Helminth of importance for human health was moderately prevalent in dogs in Ibadan and most of the respondents were ignorant of dog helminth and its zoonotic risk.

Keywords: Prevalence; dog; zoonoses; helminthes; risk perception

INTRODUCTION

Zoonotic infections can be defined as infections of animals that are naturally transmissible to humans. As such they are worldwide and often spread to humans through their companion and domestic animals (Goldsmid, 2005).These diseases are receiving increasing attention from international community, as they account for 75% of newly emerging infectious diseases (Tenguria *et al.*, 2011).

Where studies have been conducted, parasitic diseases, in particular gastro-intestinal helminthes 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 helminth affects the dog sub clinically and dogs may harbour a wide range of these 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 (Khante *et al.*, 2009). The major risk factors affecting epidemiology of helminthoses and other gastro-intestinal track parasites can be classified broadly as parasite factors, host factors and environmental factors (Thrusfield, 2005).

One major cause of zoonosis is the close contact between dogs and humans which predisposes

humans to zoonotic disease, and this constitutes a high potential risk, especially to children and immunocompromised individuals (Robertson *et al.*, 2000). The prevalence of zoonotic helminth infections in man in any region is directly associated with the prevalence of infections in the animal population in that region. A study conducted in Anse-la-Raye, St. Lucia to estimate the prevalence and symptomatology of paediatric toxocariasis recorded 86% seroprevalence of *Toxocara canis* among the children, though the prevalence of infection in dogs was not abnormally high in the community (Thompson *et al.*, 1986). A survey of the dog and cat population conducted at New Bussa revealed a significant high frequency of hookworm *Ancylostoma* spp.; *Echinococcus granulosa*, *Dipylidium caninum* in dog; and *Opisthorchis felineus*, *Toxocara cati* and *Capillaria hepatica* in cat (Okaeme, 1985). Uncontrolled population of stray and semi domesticated dogs in close proximity to human population in urban environments is a common fact in developing countries, which in conjunction with the lack of veterinary attention and zoonotic awareness, increases the risks of disease transmission (Traub *et al.*, 2005). Recent data on the prevalence of canine helminthoses in dogs in Ibadan is scare, with the most recent being studies by Sowemimo and Asaolu who recorded 24.7% in Ibadan in 2008. Therefore, the present study was aimed at determining the spectrum and prevalence of gastro-intestinal helminth, which could be of zoonotic importance in dogs in and around Ibadan and to assess owners' awareness about zoonotic parasites.

MATERIALS and METHODS

Area of study and study population

The study was conducted between December 2011 and September 2012 in Ibadan, Nigeria.

Ibadan with an estimated population of about 2,550,593 million lies on the longitude 3°5' East of Greenwich meridian and latitude 7°23' North of the Equator. It is a city in southwestern Nigeria, located about 110km northeast of Lagos. (Filani *et al.*, 1994).

Dogs of all age groups and both sexes were randomly selected from Veterinary clinics and rural settlements. With the informed consent of dog owners, interviews were conducted using pre-tested structured questionnaires to obtain information on the dogs' age, sex, regimen, defaecation sites, previous anthelminthic treatment and disease- related knowledge of owners.

Collection and examination of faecal samples

With the aid of spatula, faecal samples were collected per rectum, using simple random sampling method. The samples were transported in ice-pack to the Veterinary Parasitology research laboratory, University of Ibadan. Faecal sample was mixed with saturated salt solution and poured into a centrifuge tube, filling to within ½ to 1inch of the top. Then samples were placed in centrifuge tube holder, thereafter spinned at 1,200 rpm for 5 minutes. The samples were placed upright in a tube holder and saturated salt solution was added to form a meniscus. A coverslip was then placed on a tube and allowed to stand for 10minutes. The coverslip was removed and placed on a slide that already contains a drop of tinctured iodine and then examined under a light microscope (Maff, 1986). The eggs of parasites were identified on the basis of morphological characteristics (Taylor *et al.*, 2007).

Statistical analysis

Data were entered and summarized using excels spreadsheet and checked for entry errors, by comparing data entries with original forms. Then, data were analyzed using Graph pad (Prism 5). The Fisher's exact test was applied to compare urban and rural data for relative significant differences and unpaired t-test to determine significant difference of mean and

variance of general perception in stratified communities.

RESULTS

A total of 104 consisting of 61 (58.7%) males and 43 (41.3%) females was examined; 77 (74%) dogs lived in urban, and 27 (26%) in rural areas.

All dog owners agreed to participate and completed the questionnaires. Table 1 summarizes the differences in dog regimen and the perception of dog owners to diseases transmissible by their animals, stratified by urban and rural areas (Figure 1). In the rural area, significantly more individuals kept dogs for hunting and observed their dogs catching prey than in the city ($p < 0.0001$), whereas 58.4% and 25.9% of dog owners in the urban and rural areas kept dogs as watch dogs, respectively (Table 1). Treatment with anthelmintic drugs was a more frequent practice for dogs from urban than rural areas.

Figure 1 demonstrated the risk perception by dog owners, stratified by communities. Interestingly, all dog owners in the rural communities, and about half in the urban area did not perceive diseases transmitted by dogs as a serious 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 mentioned helminths ("worms") as a health problem, but more than half were aware of the risk of rabies transmission in urban area while rural dog owners did not mention rabies (Table 1).

In total, 26 (25%) of the examined dogs were infected with at least one intestinal helminth species. Ova of three species, namely *Ancylostoma* sp., *Toxocara canis* and *Echinococcus granulosus* were identified in dogs of both urban and rural areas (Table 2)..

Table 1. Characteristics of dogs, knowledge and attitude of dog owners regarding potential zoonotic diseases in Ibadan and environ

Variables	Urban		Rural	
	N	%	N	%
Sex of dogs				
Male	47	61	14	51.9
Female	30	39	13	48.1
Age of dogs				
0-6 months	33	42.9	6	22.2
6-12 months	12	15.6	2	7.4
1-3 years	25	32.5	18	66.7
3-6 years	1	1.3	1	3.7
>6 years	6	7.8	-	-
Breeds of dogs				
Exotic	60	77.9	1	3.7
Local	6	7.8	26	96.3
Crossbreed	11	14.3	-	-
Type of household				
Single	28	36.4	10	37
Multiple	49	63.6	17	63
Reasons for keeping dogs				
Hunting	2	2.6	16	59.3
Watch dog	45	58.4	7	25.9
Companion	19	24.7	2	7.4
Research	11	14.3	-	-
No specific reason	-	-	2	7.4
Where do dogs usually roam?				
Confined to dog house on compound	25	32.5	-	-
Inside the house	10	13	-	-
Within the compound	39	50.6	-	-
Anywhere within and outside compound	3	3.9	27	100
How do dogs leave house premises?				
Always accompanied	11	14.3	17	63
Occasionally accompanied	4	5.2	1	3.7
Never accompanied	62	80.5	9	33.3
Usual place of defeacation.				
Within the house premises	71	92.2	-	-
Without the house premises	4	5.2	13	48.1
Within/Without the house premises	2	2.6	14	51.9
Preferred type of floor where dogs defeacate				
Only impervious	65	84.4	-	-
Only pervious	5	6.5	27	100
Both pervious/impervious	7	9.1	-	-

Variables	Urban		Rural	
	N	%	N	%
Observation on dogs catching prey				
Yes	8	10.4	19	70.4
No	69	89.6	8	29.6
Last Anthelminthic treatment of dogs				
< 6mths ago	61	79.2	1	3.7
>6mths ago	11	14.3	-	-
Never	5	6.5	26	96.3
Dog owners knowledge of possible disease/conditions transmitted or caused by dogs				
Rabies	41	53.2	-	-
Scabies	2	2.6	-	-
Worms	2	2.6	2	7.4
Dysentery	4	5.2	-	-
Wound from dog bite	1	1.3	-	-
Other bacterial/viral diseases	2	2.6		
None	-	-	25	92.6
All	25	32.5	-	-
Do children play with dogs?				
Yes	36	46.8	23	85.2
No	41	53.2	4	14.8
Dog owners perception of diseases transmitted by dogs				
Serious	38	49.4	-	-
Not Serious	35	45.5	5	18.5
Do not cause any disease	4	5.2	22	81.5

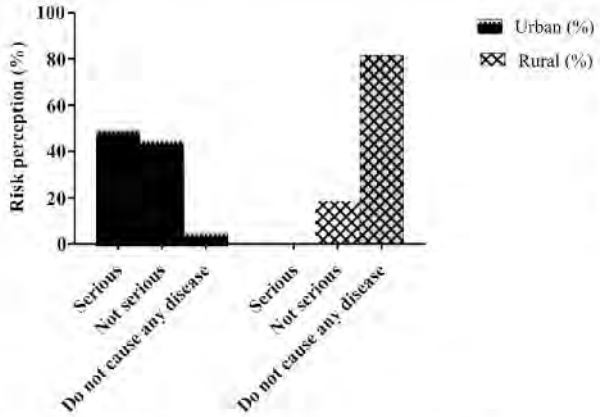

Fig. 1: Risk perception by dog owners of zoonotic helminth in dog

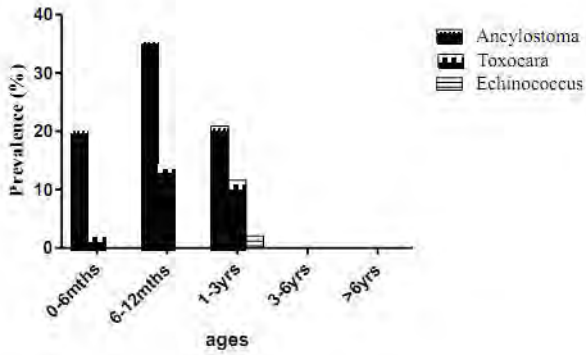

Fig.2: Prevalence of intestinal helminthes species diagnosed in dogs, stratified by age of dogs.

Table 2: The prevalence of some intestinal helminth parasites in dogs from Ibadan and environ

Prevalence	Urban		Rural		Total
	N	%	N	%	%
Ancylostoma caninum	4	15.4	13	50	65.4
Toxocara canis	2	7.7	2	7.7	15.4
Ancylostoma spp & echinococcus spp	0	0	1	3.8	3.8
Ancylostoma spp & Toxocara spp	1	3.8	3	11.5	15.3
Total	7	26.9	19	73.1	100
Summary					
	N	%	N	%	%
One host infection	6	23.1	15	57.7	80.8
Multiple host infection	1	3.8	4	15.4	19.2
Total	7	26.9	19	73.1	100
Total prevalence	(N) 104	(%)			
Ancylostoma caninum	17	16.35			
Toxocara canis	4	3.85			
Mixed infection	5	4.81			
Total	26	25			

N= number of animal

The pattern of prevalence and distribution of helminth parasites, by age of dogs, is depicted in Figure 2. In general, prevalence of parasite infection increased with age of the dog. However no helminth parasite was recovered from dogs above six years.

DISCUSSION

The overall prevalence of canine intestinal helminth found in this study (25%), especially in dogs from rural settlements (73.1%), revealed a very high level of infection that requires an effective anthelmintic control programme. According to the studies conducted in different countries worldwide, the estimated prevalence of dog intestinal helminth vary from 5 to 70% (Blagburn *et al.*, 1996; Bugg *et al.*, 1999), and some factors such as geographical location, status of animal ownership, sampling protocols, demographic factors, anti-helmintic usage, and diagnostic techniques are responsible for the wide range of helminth prevalence. The knowledge and perception of dog owners regarding zoonotic diseases transmitted by dogs was not adequate, especially in the rural settlement possibly because of the low level of education. The three helminth reported in this study have been previously documented in dogs throughout the world, with differences in prevalence and density between regions (Chiejina and Ekwe, 1986; Anene *et al.*, 1996, Ugochukwu and Ejimadu, 1985, Minnaar *et al.*, 2002, Fontanarrosa *et al.*, 2006). In our study, the overall prevalence of intestinal helminths (25%) was below that reported from other parts of Nigeria (Anene *et al.*, 1996; Omudu and

Amutu, 2007). This could due to the differences in the use of anthelmintics and level of hygiene maintained by the pet owners. However, the prevalence of helminthoses in our study is similar to that of Sowemimo and Asaolu who recorded 24.7% in Ibadan in 2008. The potential for human zoonotic disease has rarely been addressed in control programs in Nigeria and other low income countries (WHO, 2005). The prevalence of intestinal helminth infections found in dogs and the close contacts with people predispose humans to infection. For example, *Toxocara canis* infection in humans can cause visceral larva migrans, in severe cases leading to blindness (Taylor, 2001), and dog hookworm infections put humans at risk for cutaneous larva migrans which is endemic in many resource-poor communities (Heukelbach *et al.*, 2005), while *Echinococcus* infections account for hepatic and pulmonary pathology, cysticercosis is a major cause of seizures and epilepsy (Garcia, 2007)

Our results shows that the prevalence pattern was age dependent; *T. canis* increased with age of dog, whereas *Echinococcus granulossus* was detected in dogs between age 1 and 3 years. This could be as a result of long period of exposure and the contamination of the environment. The high prevalence of ascarid infections in puppies is in accordance with the mode of transmission of the parasite, which is mainly by transplancental and transmammary routes and acquired age-dependent immunity may be caused by repeated exposure (Susan et al., 2009). Decrease in older dogs is due to specific immune response to the parasite exposed to the dogs at early age.

This study showed that the helminth species per host revealed that single infection was more common; polyparasitism with more than two parasites species was less frequently observed. Infection with single helminth species was common possibly because the specie has developed resistance to the anthelmintics due to frequent use (van Wyk, 2001).

In general, the trend in prevalence, density and species composition of helminth observed in this study may reflect the degree of environmental contamination and inequalities in the health care service between urban and rural areas. Our study also showed that helminthes of human health importance were prevalent in Nigerian dogs and that intervention measures are necessary to reduce the risk of transmission of these helminthes from dogs to humans. We therefore conclude that a consistent programme of sanitary education must be included in public health government actions as a first step for the control of intestinal helminth in dogs. Finally, veterinary schools should emphasize the client education in training veterinarians as a means to prevent or minimize zoonotic disease transmissions.

REFERENCES

ANENE, B.M., NNAJI, T.O. and CHIME, A.B. (1996): Intestinal Parasitic infections of dogs in the Nsukka area of Enugu, Nigeria. Prev. Vet. Med. **27**: 89-94.

BLAGBURN, B.L., LINDSAY, D.S., VAUGHAN, J.L., RIPPEY, N.S., WRIGHT, J.C., LYNN, R.C., KELCH, W.J., RITCHIE, G.C. and HELPER, D.I. (1996): Prevalence of canine parasites based on fecal flotation. Compend. Contin. Educ. Pract. Vet. **18:** 483–509.

BUGG, R.J., ROBERTSON, I.D., ELLIOT, A.D. and THOMPSON, R.C. (1999): Gastrointestinal parasites of urban dogs in Perth, Western Australia. Vet. J. **157**: 295–301.

CHIEJINA, S.N. and EKWE, T.O. (1986): Canine toxocariasis and the associated environmental contamination of urban areas in Eastern Nigeria. Vet Parasitol, **22**: 157-161.

CRAIG, P.S. and MACPHERSON, C.N. (2000): Dogs and cestode zoonoses. In: Dogs, zoonoses and public health (Macpherson CN, Mesli FX, Wandeler AI Eds.), CAB International, Oxon, United Kingdom: 149-221.

FILANI, M.O., AKINTOLA, F.O. and IKPORUKPO, C.O. (1994): Ibadan Region.

Rex Charles, Ibadan.
FONTANARROSA, M.F., VEZZANI, D., BASABE, J. and EIRAS, D. (2006): An epidemiological study of gastrointestinal parasites of dogs from Southern Greater Buenos Aires (Argentina): Age, gender, breed, mixed infections, and seasonal and spatial patterns. Vet. Parasitol. **136**: 283-295.
GARCIA, H.H., MORO, P.L. and SCHANTZ, P.M. (2007): Zoonotic helminth infections of humans: echinococcosis, cysticercosis and fascioliasis. Curr. Opin. Infect. Dis. **20**(5): 489-94.
GOLDSMID, J. (2005): Zoonotic infections - an overview. Chapter 14; 14.1-14.14. Available at http://www.tropmed.org/primer/chapter14.pdf
HEUKELBACH, J., WALTON, S.F. and FELDMEIER, H. (2005): Ectoparasitic infestations. Curr, Infect. Dis. Rep. **7:** 373-380.
KHANTE, G.S., KHAN, L.A., BODKHE, A.M., SURYAWANSHI, P.R., MAJED, M.A., SURADKAR, U.S. and GAIKWAD, S.S. (2009): Epidemiological survey of Gastro-intestinal parasites of non-descript dogs in Nagpur City. Vet. World **2**(1): 22-23.
MAFF (1986): Manual of Veterinary Parasitological Techniques, 3rd edn Her Majestỳs Stationery Office, London.
MINNAAR, W.N., KRECEK, R.C. and FOURIE, L.J. (2002): Helminths from a peri-urban resource limited community in Free State Province, South Africa. Vet. Parasitol. **107**: 343-349.
OKAEME, A.N. (1985): Zoonotic helminths of dogs and cats at New Bussa, Kainji Lake area, Nigeria. Int. J. Zoonoses. **12**(3): 238-40.
OMUDU, E.A. and AMUTU, E.U. (2007): Parasitology and urban livestock farming in Nigeria: Prevalence of ova in faecal and soil samples and animals ectoparasites in Makurdi. J. S. Afr. Vet. Assoc. **78**: 40-45.
ROBERTSON, I.D., IRWIN, P.J., LYMBERY, A.J. and THOMPSON, R.C.A. (2000): The role of companion animals in the emergence of parasitic zoonoses. Int. J. Parasitol. **30**: 1369-1377
SMITH, R.D. (1991) Veterinary Clinical Epidemiology. Butterworth-Heinmann, Boston, pp: 228
SOWEMIMO, O.A. and ASAOLU, S.O. (2008): Epidemiology of intestinal helminth parasites of dogs in Ibadan, Nigeria. J. Helminthol. **82**: 89-93.
SUSAN, E.L., EILEEN, M.J., DAVID, L., RENEE, P.J., MARK, E.P., BYRON, L., BLAGBURN, D.D., BOWMAN, S., MOROFF, T.D. and TAMS, L. (2009): Prevalence of intestinal parasites in pet dogs in the United States. Vet. Parasitol. **166** (1-2):144-52.
TAYLOR, M.R. (2001): The epidemiology of ocular toxocariasis. J. Helminthol. **75**: 109-118.
TAYLOR, M.H., COOP, R.L. and WALL, K.L. (2007): Veterinary parasitology. 3rd ed. Black well publishing, UK.
TENGURIA, R.K., KHAN, F.N., QUERESHI, S. and PANDEY, A. (2011): Epidemiological study of zoonotic tuberculosis complex, World J. Sci. Tech. 2011, **1**(3): 31-56.
THOMPSON, D.E., BUNDY, D.A.P., COOPER, E.S. and SCHANTZ, P.M. (1986): Epidemiological characteristics of Toxocara canis zoonotic infection of children in a Caribbean community. Bull. W. H. O. **64**(2): 283-290
THRUSFIELD, M.V. (2005). Veterinary Epidemiology. 3rd Edn., Blackwell Science, Oxford, London. pp: 234-238.
TRAUB, R.J., MORRIS, P.T. and ROBERTSON, I.D. (2005): Molecular epidemiology: a multidisciplinary approach to understanding parasitic zoonoses. Int. J. Parasitol. **35**: 1295-1307.
UGOCHUKWU, E.I. and EJIMADU, K.N. (1985): Studies on the prevalence of gastrointestinal helminths of dogs in Calabar Nigeria. Int. J. Zoonoses **12**: 214-218.
VAN WYK, JA. (2001): Refugia – overlooked as perhaps the most potent factor concerning the development of anthelmintic resistance. Onderstepoort J. Vet. Res. **68**, 55-67.
WHO (2005): Report of a Joint WHO/DFID-AHP Meeting with the participation of FAO and OIE Geneva, 20 and 21 September 200.