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(RESEARCH ARTICLE)

Prevalence of intestinal helminths in dogs and owners: Awareness of zoonotic diseases in a rural community in southwest Nigeria

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Abstract

The overwhelming impact of zoonotic infections and its ease of transmission own to the cohabitation of man and some domestic pets is well recognizable, and though it is most often neglected its deleterious effect permeate every sphere of public health concern. Dog as the closest domestic pet to man presents a potential risk and acts as an agent of such interspecies transmission of infections to him. This study examined excrement of 97 dogs using the Formol- ether concentration technique. Four parasites species were identified with overall prevalence of 68%. Toxocaracanis was seen to be the most prevalent helminth (42.3%). Age (p= 0.002, $\chi 2$ = 12.774) and mode of life (p= 0.021, $\chi 2$ = 5.317) of the dogs were significant risk factors of helminthic infections, while gender and function of dogs were not. Dogs may play an active role in transmission of zoonotic diseases in the area, given the closeness of infected dogs with humans and the rampant excretion of helminth-infested dog excreta dispersed into the environment, hence, the need for the study.

Keywords: Zoonoses; Helminths; Infections; Cohabitation

1 Introduction

Human-dog bond is a deep connection between two species that exists like no other in the animal world. Human-dog relationship has existed for several centuries with several advantages and some known disadvantages [1]. In Nigeria, however, studies that were conducted on use of dogs have shown that people keep dogs for various reasons, including companionship as pet, house guard, assistance for hunting of wildlife, and as food animal that is eaten by some people. Their perceived economic and social worth thus depends on the community values attached to their use, which varies from one place to another [2].

The functions and value attributed to dogs as a result of the culture and ecological setting of the people contributes to the condition in which dogs are kept, and the degree of supervision they receive within human community [3].

However, being a reservoir host for a large number of parasites, dogs share these pathogens between pets and humans [4]. Human can be infected through the ingestion of eggs, cysts or oocysts via contaminated food-stuffs or water, hands, inhalation of dust, and/or by penetration of larvae through the skin [5]. Parasite eggs can also be carried into human houses if adhered to shoes or animals' paws. Additionally, arthropods and other environmental factors, such as rain and

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wind may also play a vital role in this context [6]. The presence of these parasites in dogs causes different clinical symptoms depending on the parasite species and density [7].

Parasitic helminths are among the most commonly encountered disease-causing agents in dogs all over the world especially regarding pathology of the intestinal tract [8]. The parasites affect dogs of all ages, including both kernel and free dogs. Sometimes, dogs could be infected without apparent evidence of the parasites' presence [9]. Infections by several species of these helminths impede the successful rearing of dogs resulting in losses manifested by lowered resistance to other infectious agents, poor growth, weight loss, reduced work and feed deficiency, general ill health and sometimes death if untreated [10].

The prevalence of helminth parasites has been shown to vary considerably from one geographic region to another depending on the general of helminth involved, the animal species, and local environmental conditions such as humidity, temperature, rainfall, vegetation, and management practices [11]. There are numerous reports on canine [dog] intestinal parasites worldwide. Some studies reported prevalence between 4 and 40% [12, 13]. Others reported higher prevalence of over 60% [14, 15, 16].

Dogs are definitive hosts for quite a large number of parasites for which other animals may become intermediate hosts and some of the parasites like *Giardia lamblia, Toxocaracanis, Cryptosporidium spp, Ancylostomaduodenale, Echinococcusgranulosus, Dipylidiumcaninum, and Toxoplasma gondii* can be transmitted to human from dogs [17, 18].

Some helminth parasites of dogs are zoonotic causing many diseases in man like hydatidosis caused by Echinococcus species, visceral larva migrans caused by *Toxocaracanis* and cutaneous larva migrans caused by Ancylostoma species. Since dogs live in close proximity to humans, contamination of man's food, water and hands with infective stages of these gastrointestinal [GI] helminths can lead to these infections with serious consequences. Some parasites like *Echinococcusgranulosus* also use food animals as intermediate hosts in which they cause great economic loss through organ condemnation during meat inspection [19].

The clinical symptoms of helminth infected dogs depend on the age of animal, the number, location and developmental stage of the worms. Majority of dogs infected with worms are asymptomatic, however young puppies show clinical signs which include poor growth, enlarged abdomen, vomiting, diarrhoea, coughing or nasal discharge. Death is rare but has been reported in severe cases as a result of obstruction of the intestine or ulceration and perforation on the intestinal wall [20].

In Nigeria, dogs are left to roam freely in public places, children's playgrounds, scavenging waste dumps, decaying food materials and faecal matter. They contaminate the environment with helminth eggs which are passed out with their faeces. In most rural and urban resource limited communities, children play outdoors and adults walk the streets bare-foot picking up infections from contaminated soils [21].

This study is aimed at determine the prevalence and intensity of intestinal helminths in dogs in a rural community in southwest Nigeria with special attention to potential zoonotic infections.

2 Material and methods

2.1 Materials

The materials used include disposable examination gloves, applicator sticks, glass slides, cotton wool, universal bottles, Pasture pipette, saline solution, coverslips, Glass and rubber test tubes, sieve, marker.

2.1.1 Equipment and Apparatus

Microscope, centrifuge machine.

2.1.2 Chemicals, kits and reagents

Distilled water, Di-ethyl ether, 10% formol water.

2.2 Study area

The study was conducted in Oyan town, a rural community in Odo-Otin Local Government of Osun State, Nigeria. Oyan is situated between latitudes 8.031089 and 8.060466 N and longitude 4.742298 and 4.781107 E of the Greenwich meridian.

2.3 Data collection

The sample size was calculated using

$$n = \frac{1.92^2 \times p_{exp}(1 - p_{\text{exp})}}{d^2} \ldots\ldots \text{(Thrusfield, 2015)}$$

Where n = required sample size
Pexp = expected prevalence
d = desired absolute precision

$$P_{\text{exp}} = 0.06$$

$$d = 0.05$$

$$= \frac{1.92^2 \times 0.006(1-0.006}{0.05^2} \ldots\ldots\ldots\ldots \text{(Sherry, 2015)}$$

$$n = 87$$

The total sample size calculated from the formula above is 87

2.4 Data collection

This is a cross-sectional study that was conducted from February 2021 to June 2021.

The sample bottles were distributed to the dog owners and some important details about the dogs were written on the labelling space on the universal bottles. The samples taken were strictly examined for freshness and the presence of adult worms. While those that were examined were fresh and without adult worms, those that were not fresh and had worms were disregarded.

3 Laboratory investigations

3.1 Sample Collection

Fresh dog stools were collected into clean universal bottles within 24 hours of excretion.

3.2 Procedure for Direct Microscopy

A drop of freshly prepared normal saline was placed at the middle of a clean glass slide.A pin-sized portion of the stool sample was emulsified with the saline using an applicator stick. A clean cover slip was placed over the smear and was viewed under the microscope using X10 and X40 objective lens.

3.3 Procedure for Formol-ether Sedimentation Technique

One gram of stool was emulsified in 7ml of 10% formal saline.It was strained through wire gauze.Three (18) ml of ether was added to the filtrate and it was centrifuged at 3000 rpm for 1 minute.The supernatant was removed and a wet mount was made of the deposit.The deposit was examined under the microscope at magnification of X10 and X40.

Formal-ether sedimentation after filtration. Adapted from Cheesbrough 2009, WHO, 1994

3.4 Data analysis

Data analysis was carried out using the statistical software, SPSS statistical software version 21. A Chi-square test was used to determine the level of significance of the differences. Values were considered to be significant when $P < 0.05$.

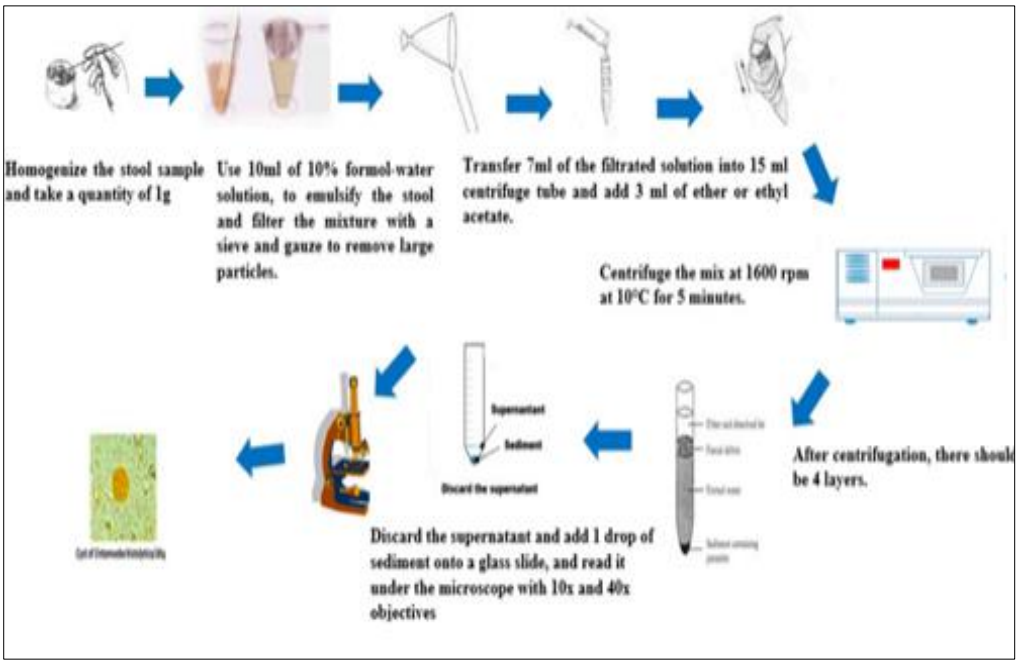

Figure 1 Diagrammatic expression of the Methodology used

4 Results

This chapter gives the analysis of the results obtained from the study. A total number of Ninety-seven (97) dogs were recruited for the study and their stool samples analysed. The descriptive analysis of the data was done, and the association of the variables were computed with Chi-square (χ^2). A *p*-value of <0.05 was considered significant.

The table 4.1 showed the demographic characteristics of the studied population. The highest 00percentages (49.5%) of the participants were above the age bracket of 12 month, followed by those within 7-12 years (25.8%) age bracket, and those between 0-6 had the lowest percentage (24.7%). The sex distribution was slightly skewed to the male, taking up 52.6% compared to 47.4% of female. The distribution based on the function of the dogs examined showed that about 62% were used for companionship and about 38% were used for hunting.

Table 1 Demographic Characteristics of the studied population

Variables		Frequency	Percentage
Age	0-6	24	24.7
	7-12	25	25.8
	>12	48	49.5
Sex	Male	51	52.6
	Female	46	47.4
Function	Companionship	60	61.9
	Hunting	37	38.1
	Total	97	100.0

The table shows that there is a significant association between the infection rate and the age of the dogs examined having the Pearson Chi-square value of 12.774 and the p-value of 0.002. The highest rate (95.8%) of infection is seen within the age range of 0-6, followed by those within the age range 7-12 months with 68% infection rate, while those that are older than 12 months had the lowest rate (54.2%) of infection.

Table 2 Prevalence of helminths in dogs in relation to age and sex (*N* = 97)

Variables	Number Examined	Number Infected	Infection rate (%)	Pearson Chi-Square	*p*-value
Age (Month)					
0-6	24	23	95.8	12.774	.002**
7-12	25	17	68		
>12	48	26	54.2		
Sex					
Male	51	37	72.5	1.005	.316
Female	46	29	63		
Total	97	66	68		

** Significance at 0.01 level

Table3 Prevalence of helminths in relation to dog function (N=97)

Function of dog	Number Examined	Number Infected	Infection rate (%)	Pearson Chi-Square	p-value
Companionship	60	39	65	0.669	.413
Hunting	37	27	73	-	-
Total	97	66	68	-	-

The table reveals a significant association between the infection rate and the mode of life of the dogs examined having the Pearson Chi-square value of 5.317 and the *p*-value of 0.021. The highest rate (74.6%) of infection is seen in the free ranging dogs, followed by those that are kennelled with 50% infection rate.

Table 4 Prevalence of helminths in relation to dog's mode of life (N=97)

Mode of Life	Number Examined	Number Infected	Infection rate (%)	Pearson Chi-Square	*p*-value
Free Range	71	53	74.6	5.317	.021
Kennel	26	13	50	-	-
Total	97	66	68	-	-

Table 5 Prevalence of the GI Helminth species

Helminth species	No. of Positive	Prevalence (%)
Toxocaracanis	41	42.3
Ancylostomacaninum	13	13.4
Echinococcus	0	0
Strongyloides	0	0
Toxocara + Ancylostoma	8	8.2
Toxocara + Ancylostoma + Strongyloides	1	1
Toxocara + Echinococcus	1	1

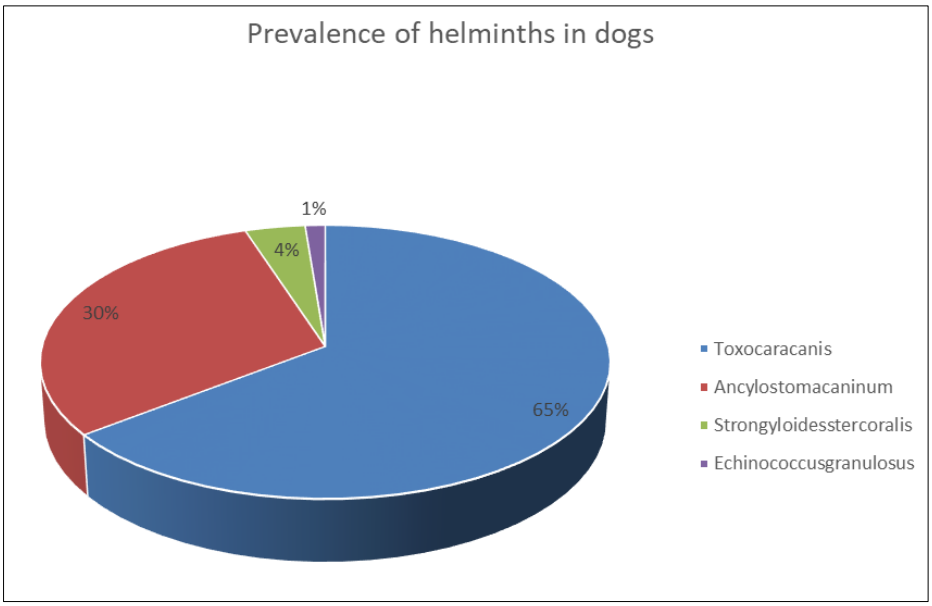

Figure 2 Prevalence of the helminths found in the dogs examined

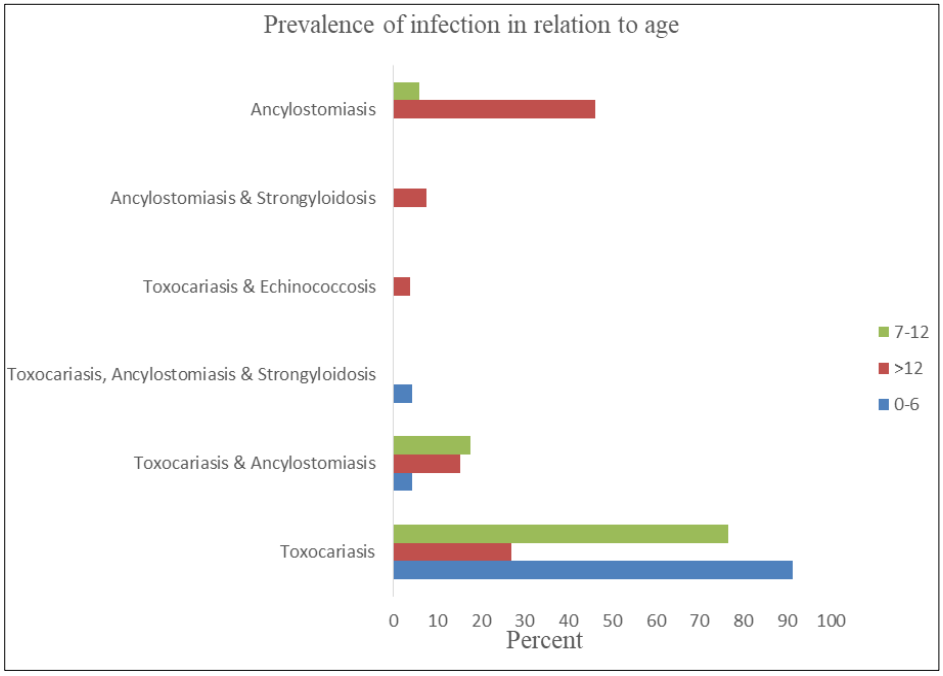

Figure 3 Prevalence of infection in dogs in relation to age

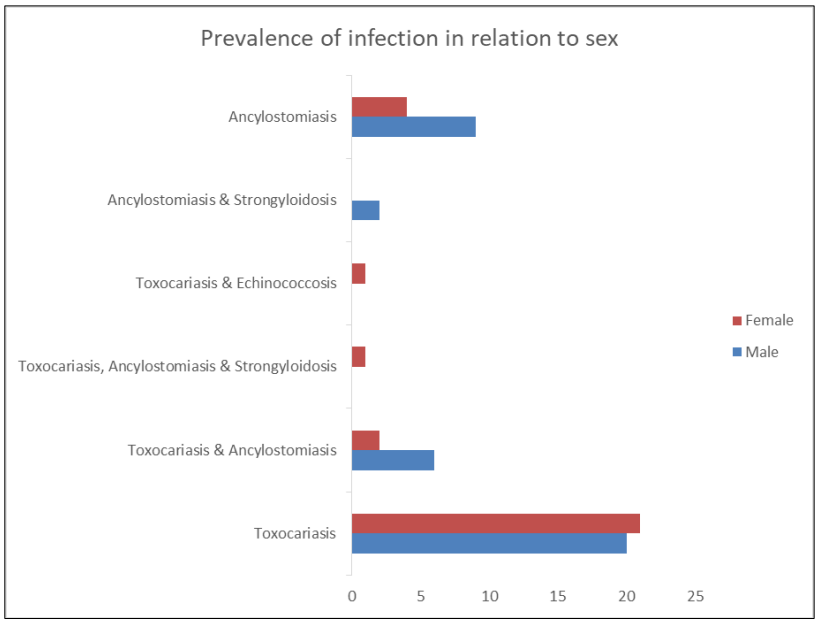

Figure 4 Prevalence of infection in relation to sex

5 Discussion

The results obtained from this study has demonstrated that there is high prevalence (68%) of zoonotic intestinal helminths, namely *Toxocaracanis*and hookworm (*Ancylostomacaninum*) among the studied population; and while these two occurred in single infection, others seen such as *Strongyloidesstercoralis* and *Echinococcusgranulosus* only existed in multiple infections. These parasites have also been reported in dogs and other canids in different studies and locations within Nigeria and other parts of the country with significant difference in prevalence and intensity between regions. The overall prevalence in this study (68%) was in congruence with that reported by Ugbomoiko*et al.,* (2008) from different ecological zone in Nigeria. However, it was higher than that reported from southeast Nigeria (52.2%), Ilesa, Osun State (47.1%), Western Europe (34%) and United State (36%). Also, the reported prevalence in this study was lesser than 86.97% reported by Ugochukwu and Ejimadu (1985) in Calabar and 81.9% by Anosike*et al.,* (2004) in Owerri. This could have been due to the ecological conditions in African countries which are contributory to the development, survival and transmission of the morbific stages of the parasites.

Based on this study, there was a disparity between the prevalence rates reported from two different locations in Osun state; that is 68% reported in this present study from Oyan, a rural community around Osogbo, and Ilesa (47.1%). This disparity may be due to the resource-limitation of the dog owners in the rural community of Oyan compared to that of the urban setting in Ilesa in which case the dog owners are likely to afford a better livelihood.

The presence of hookworm (*A. caninum*) and *Toxocara*in this studyis significant due to their zoonotic entailment considering the highprevalence of intestinal helminth infections recorded in dogs and the closeness of the human-to-dog bond. The risk oftransmission of these parasites to humans seems to be obvious. *Toxocaracanis* has a prevalence rate of 42.7% in this study.Several syndromes have been ascribed to Toxocaraspecieswhichinclude visceral larva migrans, ocular larva migrans and someneurologic and atopic symptoms (20]. The high prevalence of *T. canis*presents a potentially serious condition that might increase thepossibility of many children in the study area harbouring*T. canis.*Studies on the prevalence and other intestinal parasites of dogs invarious areas of the United States of America [USA] have shown that aprevalence of 7% for *T. canis*infection among a population of dogsshould be considered hazardous to children [23]. This is because of thedaily shedding of many thousands of eggs into the environment whichmay lead to environmental contamination and thereby exposing children to accidental ingestion of the eggs as a result of their playhabit [24].The prevalence pattern of *T. canis* in this study was age dependent;*T. canis* decreased with age of dog. This pattern has been observedpreviously [25, 26]. This study observed the highest prevalence oftoxocariasis in puppies under six months of age. This is consistent withprevious studies which reported similar findings [27, 28]. The highprevalence of ascarid infections in puppies is in accordance with thetransmission pattern of the parasite which is mainly by transplacentalandtransmammary routes in the first few days of puppy's life whichincrease the occurrence of the parasite at an early age. The acquired age-dependent immunity by adult dogs decreases the establishment aswell as the fecundity of the parasite [29], probably as consequence of repeated exposure.

In this study no significant effect of sex on the prevalence of the intestinalhelminths were observed, although the infection in the male dogs was higher than that of the female dogs and this totally agrees with the reports of Sowemimo and Asaolu (2008) and Awoke *et al.* (2011). It however, disagrees with the study by Anosike*et al.* (2004) in Owerri, Imo state which reported that the male dogs were significantly more infected than the females. Anosike*et al.* (2004) attributed their result to the fact that the males are more free-ranging than the females.

This study presents a significant effect of age on the prevalence of the zoonotic helminth infection in the dogs observed. A significantly higher prevalence was observed in young dogs than in adult dogs. This finding disagrees with the report of Yacob*et al.* (2007) in Ethiopia, in which prevalence was higher in adult dogs than the young ones. However, a study conducted in Addis Ababa by Awoke *et al.* (2011) observed no statistical difference between the prevalence rate of GI helminth infection in young and adult dogs.

In this study, most of the dogs sampled in the study area are freerange and receive only limited care from their resource limited owners.This might have accounted for the significantly higher prevalence of *T.canis* (42.7%) recorded in these dogs compared to their kennelledcounterparts (34.6%). The high prevalence of *T. canis* infection in freerange dogs could also be due to their scavenging habits which exposedthem to natural infections. They can also contaminate the environmentwithfaecal matter, many of which contains viable and infective ova andunder suitable environmental conditions such as that in tropical areabecomeembryonated in the soil and thereby poses risk to humans. Our present results agree with Ugbomoiko*et al.* (2008) and Kimura *et al.* (2013), who reported *Toxocaracanis*as the most common helminth in dogs. *Toxocaracanis*is a soil transmitted helminth; thus, habits like feeding off floors and sleeping on bare grounds in the study dogs could account for this observation.

6 Conclusion

In conclusion, the present study has revealed four of the zoonotic intestinal helminths in the dogs, with *Toxocaracanis* having the highest prevalence followed by *Ancylostomacaninum.* The presence of the two can pose public health problems in the study area. Hence, intervention measures which are basically offshoot of personal hygiene and consistent deworming of infected individuals, are necessary to reduce the risk of transmissionof parasites from dogs to humans. And though there was no significant association between the function of the dogs and the infection rate, it is however noteworthy that the significant association that exist between the mode of life of the dogs, where most of them are free rangers, can assist the easy spread and transmission of zoonotic infections within the study area.

Recommendations

The diagnostic technique of parasites done in this study, based on the morphological characteristics of ova under light microscope, has low sensitivity for demonstrating these parasites, and based on this some parasites may have been missed in our study. Therefore, we recommend more sensitive diagnostic techniques such as serological tests like ELISA, western blot and molecular techniques to better identify and quantify them.

Zoonotic infections are often part of the neglected infections in developing countries such as Nigeria, and this underlines their ability to cause indelible public health issues. Zeroing this down to a rural community such as Oyan, this fact still holds true as it is a resource limited settlement where little or no attention is payed to proper pet management practises (such as deworming of pet and proper disposal of dungs). We hereby recommend that educational programs to make people aware of zoonoses, hygiene, and proper pet management practices be implemented, and most importantly should be extended to the rural communities.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest among the authors.

References

[1] Cutt H, Giles-Corti B, Knuiman M, Burke V. Dog ownership, health and physical activity: A critical review of the literature. *Journal of Health and Place*. 2007; 13:261-272

[2] Oliveira-SequeiraTC.Amarante AF, Ferrari TB, Nunes LC. Prevalence of intestinal parasites in dogs from Sao Paulo State, Brazil. *Journal Veterinary Parasitology*.2002; 103: 19–27

[3] Ugbomoiko US, Ariza L, Heukelbach J. Parasites of importance for human health in Nigerian dogs: high prevalence and limited knowledge of pet owners. *BMC Veterinary Research.*2008;4: 49.

[4] Cascio A, Bosilkovski M, Rodriguez-Morales AJ, Pappas G. The socio-ecology of zoonotic infections.*Clinical Microbiology Infection.*2011;*17*: 336–342.

[5] Endrias Z, Yohannes S, Berhanu M. Prevalence of helminth parasites of dogs and owner's awareness about zoonotic parasites in Ambo town, central Ethiopia. *Ethiopia Veterinary Journal.* Ed.2010; 14(2):17–30.

[6] Kimura A, Morishima Y, Nagahama S. *et al.* A coprological survey of intestinal helminths in stray dogs captured in Osaka prefecture Japan. *Journal of Veterinary Medical Science.*2013;75(10):1409–1411.

[7] Zewdu E, Semahegn Y, Mekibib B. Prevalence of helminth parasites of dogs and owner's awareness about zoonotic parasites in Ambo town, central Ethiopia. *Ethiopian Veterinary Journal.*2010;14(2):17–30.

[8] Anosike JC, Nwoke BE, Ukaga CN, Madu NG, Dozie IN. Aspects of intestinal helminth parasites of dogs in World bank-assisted Housing Estate, New Owerri, Nigeria. Afr. J. Appl. Zoo. Environ. Biol. 2004; 6: 25–29.

[9] Crompton DW, Nesheim MC. Nutritional impact of intestinal helminthiasis during the human lifecycle. *Annual Review Nutrition*. 2002; 22:35-59.

[10] . Oluyomi A, Sowemimo A. Gastrointestinal Helminth Parasites of Domestic Dogs in Ilesa, Osun State, Nigeria: A Faecal Examination Survey Study. *Journal of Bacteriology and Parasitology.* 2017; 8:3.

[11] Awoke E, Bogale B, Chanie M. Intestinal nematode parasites of dogs: prevalence and associated risk factors. Int. J. Anim. Vet. Adv.2011; 3(5): 374–378.

[12] Daryani A, Sharif M, Amouei A, Gholami S. Prevalence of Toxocaracanis in stray dogs, northern Iran. See comment in PubMed Commons below Pak J Biol Sci. 2009; 12: 1031-1035.

[13] Joffe D, Niekerk D, Gagne F, Gilleard J, Kutz S, Lobingier R. The prevalence of intestinal parasites in dogs and cats in Calgary, Alberta. *Canadian Veterinary Journal.* 2011; 52(12):1323–1328.

[14] Overgaauw PA, Van Zutphen L, Hoek D, Yaya FO, Roelfsema J, Pinelli E, Van Knapen F,Kortbeek LM. Zoonotic parasites in fecal samples and fur from dogs and cats in The Netherlands. *Veterinary Parasitology*. 2009; 163: 1-2: 115-122.

[15] Morey DF. Burying key evidence: the social bond between dogs and people. Journal of Archaeological Science.2006; 33(2): 158-175

[16] Duscher GG, Leschnik M, Fuehrer HP, Joachim A. Wildlife reservoirs for vector-borne canine, feline and zoonotic infections in Austria. *International Journal for Parasitology.*2015; 4(1): 88-96.

[17] Eguia-Aguilar P, Cruz-Reyes A, Martinez-Maya J. Ecological analysis anddescription of the intestinal helminths present in dogs in Mexico City. Vet Parasitol. 2005; 127: 139–46.

[18] Kutdang ET, Bukbuk DN, Ajayi JAA. The prevalence of intestinal helminths of dogs (Canisfamilaris) in Jos, Plateau State, Nigeria. *Researcher.*2010; 2(8):51–56.

[19] Lee AC, Montgomery SP, Theis JH, Blagburn BL, Eberhard ML. Public health issues concerning the widespread distribution of canine heartworm disease. *Trends in Parasitology.*2010; 26(4): 168-173.

[20] Mirazaei M, Fooladi M. The prevalence of intestinal helminths in owned dogs in Kerman city, Iran. *ScientiaParasitologica*. 2012;13(1): 51–54.

[21] Othman RA. Prevalence of Toxocaracanis in dogs, North West Bank of Palestine. Korean J Parasitol. 2011; 49: 181-182

[22] Partz JA, Gractzyk TK, Gella N, Vittor AY. Effects of environmental changes on emerging parasitic diseases. *International Journal of Parasitology*. 2002; 30:1395-1405.

[23] Pereckiene A, KaziÅ«naite V, Vysniauskas A, Petkevicius S, Malakauskas A, et al. A comparison of modifications of the McMaster method for the enumeration of Ascarissuum eggs in pig faecal samples. Vet Parasitol. 2007; 149: 111-116.

[24] Ramírez-Barrios RA., Barboza-Mena G, MunozJ, Angulo-Cubillan F, Hernandez E, Gonzalez F, Escalona F. Prevalence of intestinal parasites in dogs under veterinary care in Maracaibo, Venezuela. *Veterinary Parasitology*. 2004; 121:11–20.

[25] Sowemimo OA, Asaolu SO. Epidemiology of intestinal helminths parasites of dogs in Ibadan, Nigeria. J. Helminthol.2008; 82: 89–93.

[26] Williams RW, Menning E. Intestinal helminths in dogs and cats of the Bermuda Islands and their potential public health significance, with a report of a probable case of visceral larva migrans. J Parasitol. 1961; 47: 947-951.

[27] WHO. Guidelines for dog rabies control. World Health Organization. Geneva.2002.

[28] Xhaxhiu D, Kusi I, Rapti D, Kondi E, Postoli R, Rinaldi L, Dimitrova ZM, Visser M, Knaus M, Rehbein S. Principal intestinal parasites of dogs in Tirana, Albania. *Parasitology Research*. 2011; 108(2): 341-353.

[29] Yacob HT, Ayele T, Fikru R, Basu AK. Gastrointestinal nematodes in dogs from Debre Zeit, Ethiopia. Vet. Parasitol. 2007; 148: 144–148.