

Full Length Research Paper

# Comparison of gastrointestinal helminthes in dogs and awareness of zoonotic infection among dog owners in Calabar, South Eastern Nigeria

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A comprehensive study was carried out from October 2012 to November 2013 in dogs attending veterinary clinic and household dogs, to determine the prevalence status of gastrointestinal helminthes in both groups in order to intensify control measures of zoonotic helminthes in Calabar, South Eastern Nigeria. Prevalence of gastrointestinal helminthes eggs detected in dogs attending veterinary clinic and household dogs were *Ancylostoma caninum* 49.51% and 35.71%, *Dipylidium caninum* 36.0% and 28.57%, *Toxocara canis* 7.83% and 18.75%, *Ascaris* species 3.33%, and 10.71% *Taenia canis* 0.98% and 0.00%, *Coccidia* oocyst 1.57% and 0.00% and *Trichuris vulpis* 0.78% and 6.25% respectively. There was no statistical significant difference ( $P < 0.05$ ) in helminth infections between age groups, sex and breed of dogs in 2013. The age group, breed, restricted and unrestricted movement of dogs in 2011-2012 significantly affected the prevalence of zoonotic parasites ( $P < 0.001$ ), Dogs in 2011-2012 study group were found more likely to be parasitized and presented higher infection rates than household dogs in 2013. In view of the persistent *A. caninum*, *T. canis* and *D. caninum* infection of dogs in 2013, there is an urgent need to intensify control intervention in this community to reduce transmission of zoonotic helminths.

**Key words:** Comparison, gastrointestinal helminths, dogs, Southeastern Nigeria.

## INTRODUCTION

Dogs were the first domesticated mammals from wolves as early as 150,000 years ago (Morey, 2006). Some researchers through recent genetic fossil and DNA evidence puts this domestication period at 100,000 years ago (Salvolainen et al., 2002; Lindbald-Toh, 2005). Dogs perform a range of cultural, social and economic functions in the society. Dogs are kept as pets and companions, for hunting, as guards, draught animals, for food, or for commercial purposes (Swai et al., 2010).

The dog population in urban and suburban regions is composed of dogs that roam only with their owners and stray dogs which are ownerless (Beck, 2000). In both areas dogs come in close contact with humans and their dwellings and act as reservoirs and transmitters of zoonotic diseases (Traub, et al, 2005; Gracenea, et al, 2009). Intestinal parasites are among the most common

pathogenic agents encountered by veterinarians dedicated to companion animals and they constituted one of the main causes of clinical signs and mortality in dogs (Brownman, 2009; Martinez-Moreno, et al, 2007). Dogs act as transport host of many roundworms of man when they ingest infected human faeces (Hayward, 2004). More importantly, some dog helminthes infect humans and cause significant public health problem especially in developing countries that may be socioeconomically challenged (Wang, et al., 2006).

The role of dogs as companion animals and the close relationship between humans and dogs although offering significant benefits to many people (Swai, et al, 2010; Abere, et al, 2013), represent a potential public health risk since natural transmission of parasitic infections from dogs to human may occur, directly or indirectly via commercial factors (Lappin, 2002, Equia-Aquilar, et al 2005). The most common zoonotic helminth parasites of dogs are *Strongyloides stercoralis*, *Ancylostoma caninum*, *Dipylidium caninum*, *Toxocara canis*, *Echinococcus granulosus* and *Trichuris vulpis* (Paulos et al., 2012).

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Although dogs closely have cohabited with humans since early civilization, studies of dog endoparasites in Nigeria are limited to Ibadan, Nsuka and Zaria (Sowemimo and Asaolu, 2008., Onyenwe and Ikpegbu, 2004, Dada and Belina, 1979). There is little information on the parasites of dogs in south Eastern Nigeria especially in Calabar (Okon, et al, 2011). This study is therefore aimed at determining the prevalence of helminth infection between two groups of dogs and the awareness of zoonotic helminth infection among dog owners, in order to intensify development and modification of control measures of such diseases.

## MATERIALS AND METHODS

### Study Area

This study was conducted in Calabar, south Eastern Nigeria. Calabar is the capital of Cross River State in Nigeria, located between longitude 4° 57'0" and latitude 8° 19' 0" (www.collinsmap.com). Calabar was chosen for this study on the basis of having very high concentration of dogs and the propensity of indigenes and visitors to enjoy dog meat delicacy.

### Study animals and sample size determination.

The study animals were the available dogs attending veterinary clinic and household dogs in Calabar. About 614 and 649 dogs attended Cross River State Ministry of Agriculture veterinary clinic in 2011 and 2012 respectively. Fifty percent of the mean annual attendance (315.75 dogs but reduced to 310 dogs) was used to determine the working population size of dogs selected randomly from different households in Calabar for 2013.

### Sample Collection

A record of 1263 faecal samples of dogs investigated for parasitic infection between 2011-2012, in Cross River State Ministry of Agriculture Veterinary Clinic, Calabar was compiled and compared with 310 faecal sample collected in 2013 for this study. The record showed age, sex, breed and management method of dogs. This information was extracted from the veterinary office Calabar, and compared with recent findings to determine the prevalence status of infection in 2013.

A total of 310 faecal samples were collected directly from the rectum of each household dog, using plastic gloves. Collected faeces were immediately transferred into labelled disposable plastic containers before transportation to Cross River University of Technology Parasitological laboratory for processing. During sample collection, data was collected from dog owners on the demographic characteristics (sex, age, breed), history of

deworming, management methods, purpose of keeping the dog (pet, security, hunting) and rabies vaccination of each dog.

### Parasitological Procedure

The samples were processed using formol-ether concentration techniques as described by Sowemimo and Asaolu (2008). The faeces collected from each dog was weighed and then preserved in 10% aqueous formaldehyde solution in clean universal bottles labelled with the dog identification number. This involved passing a subsample of each faecal specimen through double-ply gauze of mesh size 0.25mm<sup>2</sup> to remove rough materials and washing with distilled water, as necessary. The filtrate was collected in pre-weighed centrifuge tubes and was then centrifuged at 2500 rpm for 2 minutes. The supernatant was decanted and the tube allowed to drain for 5 minutes. The tube was weighed again to determine the weight of the faecal matter. The sediment in each tube was re-suspended in 3ml of distilled water and an equal volume of diethylether was added and the bottle shaken thoroughly for a minute. The suspension was centrifuged again for another 3 minutes at 2000 rpm. Four layer profiles were observed with the three top layer decanted and the egg sediment left inside the tube. The egg sediment was mixed and a drop was transferred onto a clean glass slide, covered with coverslip and then examined for gastrointestinal parasites. The total number of eggs in each drop was estimated. The identification of stomach and intestinal eggs (cestodes and nematodes) in the sample was carried out according to the morphological specifications outlined by Soulsby (1982).

### Statistical Analysis

The association between age, sex, breed and management methods were determined using chi-square test.

## RESULTS

Out of 1263 faecal samples from dogs attending veterinary clinic and 310 from household dogs investigated for gastrointestinal parasites 511 (40.46%) and 112 (36.13%) were found to be positive cases respectively (table 1).

The identified gastrointestinal parasites and their distribution in dogs attending veterinary clinic and household were *Ancylostoma caninum* 49.51% and 35.71%, *Dipylidium canicum* 36.00% and 28.57%, *Toxocara canis* 7.83% and 18.75%, *Ascaris* species 3.33% and 10.71%, *Taenia canis* 0.98% and 0.00%, *Coccidia oocyst* 1.57% and 0.00% and *Trichuris vulpis* 0.78% and 6.25% respectively (table 2).

**Table 1.** Prevalence of gastrointestinal parasites infection in dogs attending veterinary clinic and household dogs.

Dog	Year of study	Number examined	Number positive	Prevalence (%)	X <sup>2</sup>	P-Value
Attending clinic	2011-2012	1263	511	40.46	46.50	0.001
Household dogs	2013	310	112	36.13		
Total		1573	623	39.61		

**Table 2.** Prevalence of gastrointestinal parasites found in dogs attending veterinary clinic and household dogs in Calabar.

Type of parasite	Dogs attending Veterinary clinic (n=511)		Household dogs (n=112)	
	Positive	Prevalence (%)	Positive	Prevalence (%)
<i>Ancylostoma caninum</i>	253	49.51	40	35.71
<i>Dipylidium caninum</i>	184	36.00	32	28.57
<i>Toxocara canis</i>	40	7.83	21	18.75
<i>Ascaris species</i>	17	3.33	12	10.71
<i>Taenia canis</i>	5	0.98	0	0.00
<i>Coccidian oocyst</i>	8	1.57	0	0.00
<i>Trichuris vulpis</i>	4	0.78	7	6.25s

Of the 182 male and 128 female dogs sampled in 2013, males recorded infection rate of 32.97% and females 40.63% (Table 3). There was no statistical significant difference ( $P > 0.05$ ) between male and female dogs infection. Also 188 local and 122 exotic breeds examined, 33.51% and 40.16 showed helminth infection respectively. There was no statistical significant difference ( $P > 0.05$ ) in the prevalence of zoonotic helminthes between local and exotic breeds in 2013. Similarly, there was no statistical significant difference ( $P > 0.05$ ) in parasitism between age group of dogs, although the highest prevalence (42.31%) was shown by young dogs, followed by puppies (36.12%) and finally 20.83% by adults (Table 3).

In respect of dogs attending veterinary clinic, there was significant difference ( $P < 0.05$ ) in helminth infections between age groups. The order of infection was 41.76% in puppies, 39.93% in young dogs and 36.84% in adults (Table 3). There was no significant difference ( $P > 0.05$ ) in gastrointestinal parasite infections between sexes. The breeds showed statistical significant difference ( $P < 0.001$ ) in parasitism, with the local breed having slightly higher prevalence of 35.91% (Table 3).

Dogs attending veterinary clinic were found more likely to be parasitized and presented higher infection rates than household dogs.

There was significant difference ( $P < 0.05$ ) in helminth infection between restricted and unrestricted movement in dogs, in which lower prevalence were recorded in restricted movement (30.21%) in 2011-2012 and 2.46% in 2013, as compared to the higher prevalence of 76.28% in

2011-2012, and 40.90% in 2013. Better methods of dog management by dog owners led to the reduction of helminth infection.

## DISCUSSION

This study revealed that 40.46% and 36.13% of dogs attending Cross River State Ministry of Agriculture veterinary clinic and household dogs examined harboured various zoonotic helminth parasites respectively. The prevalence status reported in this study was lower than that reported in some parts of Nigeria and other parts of the world, 54.0% in Ile-Ife, Nigeria by (Sowemimo and Asaolu, 2008), 68.4% in Ilorin, Nigeria, by (Ugbomoiko et al., 2008), 69.0% in Oweri, Nigeria Anosike et al. (2004), 87.80% in Calabar, Nigeria (Ugochukwu and Ejimadu, 1985), 75.26% and 84.78% in north western Ethiopia (Abere et al., 2013), 59.3% in Tanzania (Swai et al., 2010), 71.33% in southern Spain (Martinez-Moreno, 2007), 41% in Iran (Yagoob and Mashaei, 2011) and 90.7% in southern Ethiopia (Jones, et al., 2011). The result reported in this study was however, higher than that reported by Gaunt and Carr (2011) in Saskatchewan, United States (4.4%) and Onyenwe and Ikpegbu (2004) in Nsuka Nigeria (24.12%). Variation in helminth parasite infection of dogs from different locations of the world could be attributed to availability of better anti-helminth drugs, lack of veterinary care knowledge by dog owners, feeding management and different environmental factors

**Table 3.** Prevalence of gastrointestinal parasites in dogs attending veterinary clinic and household dogs due to influencing factors for development.

Influencing		Number Examined	Number Infected	Prevalence (%)			Number Exam	Number Infected	Prevalence (%)		
Factors	Categories				X <sup>2</sup>	P-value				X <sup>2</sup>	P-value
Age	Puppies	752	314	41.76	11.45	0.05	227	82	36.12	0.18	0.05
	Young	283	113	39.93							
	Adults	228	84	36.84							
Sex	Male	722	269	37.26	.98	0.05	182	60	32.97	0.94	0.05
	Female	541	242	44.73							
Breed	Local	635	228	35.91	82.91	0.05	188	63	33.51	5.24	0.05
	Exotic	628	223	35.51							
Management	Restricted movement	479	145	39.21	0.109	0.05	244	6	2.46	0.068	0.05
	Unrestricted movement	784	598	76.28							

responsible for the development of intestinal parasites. This observation is in consonance with the report of earlier worker Onyenwe and Ikpegbu (2004), Paulos, et al (2012) and Abere, et al. (2013).

Infection of two species of helminth parasites was encountered more than infection with single species in both groups of dogs in this study as earlier (Akao et al., 2003; Swai et al., 2010). Higher overall contributions of helminth parasites were obtained from *A. caninum* (49.51%) and *D. caninum* (36.0%) in dogs attending veterinary clinic. Lower infection rates of (35.71%) *A. caninum* and (28.57%) *D. caninum* were recorded from household dogs. Similar report was given by Abere, et al (2013) between pet and stray dogs in north-western Ethiopia.

The study in 2011-2012 revealed that there was significant difference in helminth infection between age groups of dogs, which was not the case in 2013. Prevalence of gastrointestinal parasites was highest in puppies and young dogs in 2011-2012 and 2013 study periods compared with adults. This finding agrees with earlier work of Swai et al. (2010), Paulos et al. (2012) and Abere, et al (2013). The high prevalence of these helminth infection in puppies and young dogs could be through maternal-foetal placenta route and during feeding through mammary glands. This increased the presence of parasites at an early age, while adults developed immunity with age due to single or repeated exposure (Okon, et al, 2011; Abere, et al, 2013).

Gastrointestinal helminth infection between male and female dogs indicated that there was no statistical significant difference in 2011-2012 and 2013 study groups, even though females were more infected than males (Paulos, et al, 2012). A plausible explanation could

be due to reduction in immunity caused by physiological stress in female dogs as earlier reported Swai, et al (2010), and Abere, et al (2013).

The prevalence was statistically significant in helminth infection between local and exotic breeds in 2011-2012 study group with local breed showing higher infection. This finding confirmed the reports of Sowemimo and Asaolu (2008) and Okon, et al (2011). There was no significant difference between local and exotic breeds in 2013 study group, which was in line with previous study by Swai, et al (2010) in Tanzania. Impliedly, either of them have equal opportunity of getting infected if exposed to infected materials.

Dogs have been incriminated as transmitters of human toxocarasis and cutaneous larva migrans because of their indiscriminate defaecatory habits in residential environment and public parks (Okon, et al, 2011. Aveioglu and Burgu, 2008). Humans are infected by the eggs of dogs contaminating residential environment and public parks where children are more prone to zoonotic infection because of their geophagy attitude and petting of dogs (Aveioglu and Burgu, 2008).

Although this study has revealed lower infection of dogs in 2013, than in 2011-2012, the persistent prevalence of *A. caninum*, *D. caninum* and *T. canis* in 2013 study had public health concern. Oladele, et al (2006) revealed that the persistent prevalence of *A. caninum* in dogs have zoonotic implication in the pathogenesis of cutaneous larva migrans in humans. *Toxocara canis* causes a condition known as visceral larva migrans in children and ocular migrans in adult human beings (Omudu, et al 2003; Wang et al, 2006; Onyenwe and Ikpegbu, 2008; Swai, et al, 2010). Akao, et al (2003), revealed that occasional invasion of the central

nervous system by *Toxocara canis* larvae causes neurological problems such as epilepsy, neuropsychologic deficits and ataxia in humans. According to Akao et al. (2003), in ocular larval migrans, loss and permanent blindness may occur.

Worthy of note in this study was the complete absence of *Tania canis* and *Coccidia oocyst* in 2013 study group. This could be due to increased number of primary and secondary levels of animal care services evidenced by high number of private veterinary outfits established recently in Calabar, South Eastern Nigeria. In addition, the advent of modern antihelminth drugs which have captured greater acceptability among dog owners and clinicians for their efficacy with minimal effect, could be the reason for this decreased infection in 2013 (Onyenwe and Ikpegbu 2004; Gaunt and Carr, 2011). Also the awareness of better methods of dog management by dog owners in 2013 as exemplified by the lower prevalence of helminth infection in dogs could be a factor. Hayward (2004), believed that dogs which are more cared for by their owners have lower incidence of helminth infection than dogs lacking such privileges.

## CONCLUSION

This study revealed the presence of lower gastrointestinal helminth infection in dogs studied in 2013 than those in 2011-2012, due to better methods of dog management by dog owners. Despite the reduction in helminth infection of dogs, the persistent prevalence of *A. caninum*, *D. caninum* and *T. canis* have implications on public health. The need for quality education on dog management (restriction of dog movement, better feeding and antihelminth regime) for dog owners is a necessity to reduce helminth infection of dogs.

## Authors Contributions

Iboh, C.I. was the leader of this research work and provided the statistical analysis of this work. Iboh C. I. and Ajang, R.O. were in charge of data collection and preparation of the draft. The Parasitological procedure was performed by Iboh, C.I. and Abraham, J.T. The final manuscript was vetted and approved by the authors.

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## REFERENCES

- Abere T, Bogale B, Melaku A (2013). Gastrointestinal helminth parasites of pet and stray dogs as a potential risk for human health in Bahir Dar Town, North-Western Ethiopia. *Vet. World* 6 (7): 388-392.
- Akao N, Tomoda M, Hayashi E, Suzuki R, Shimizu-Suganuma M, Schichionohe K, Fujita K (2003). Cerebellar ataxia due to *Toxocara* infection in Mongolian gerbils, *Meriones unguiculatus*. *Vet. Parasit.* 113: 229-237.
- Anosike JC, Nwoke BE, Ukaga CN, Madu NGJ, Dozie INS (2004). Aspect of intestinal helminth parasites of dogs in World Bank assisted housing estate New Owerri, Nigeria. *Afr. J. Appl. Zoo. Env. Biol.* 6: 25-29.
- Aveioglu H, Burgu A (2008). Seasonal prevalence of *Toxocara* ova in soil samples from public parks in Ankara Turkey. *Vector-Borne zoono. Dis.* 8: 345-350.
- Beck AM (2000). The human dog relationship: a tale of two species. In: Macpherson CNI., Meslin FX, Wandeler AL (eds) *Dogs, zoonoses and public health* CABI, Wallingford. 1-16.
- Brownman DD (2009). *Georgisiparasitology for veterinarians*. 9th ed WB Saunder Elsevier St. Louis. 45.
- Dada BJO, Belino FD (1979). Prevalence and public significance of helminth ova in dog faeces deposited on streets of Zaria, Nigeria. *Ann. Trop. Med. Parasit.* 73: 495.
- Equia- Aguilar P, Cruz-Reyes A, Martinez- Maya JJ (2005). Ecological analysis and description of the intestinal helminthes present in dogs in Mexico city. *Vet. Parasit.* 127: 139-146.
- Gaunt MC, Carr AP (2010). A survey of intestinal parasites in dogs from Saskatchewan. *Can. Vet. J.* 52 (5): 497-500.
- Gracenea M, Gomez Ms, Toress J (2009). Prevalence of intestinal parasites in shelter dogs and cats in the metropolitan area of Bcelona (Spain). *Acta parasitol.* 54: 73-77.
- Hayward M (2004). Risk of zoonoses from dogs on sporting fields. *Aust. Vet. Association*. Available at: <http://www.litter.vic.gov.au/resources/document/zoonoses-sport-fields>.
- Jones O, Kebede N, Kassa T, Tilahun G, Macias C (2011). Prevalence of dog gastrointestinal parasites and risk perception of zoonotic infection by dog owners in Wondo Genet, Southern Ethiopia. *J. Pub. Hlth Epidemiol.* 3 (11): 550-555.
- Lappin MR (2002). Pet ownership by immunocompromised people. *Bayer zoonosis Symposium, North Am. Vet. Confer.* 24(5): 16-25.
- Lindbald-Toh K (2005). Genome sequence, Comparative analysis and halotype structure of the domestic dogs. *Nature.* 438: (7069): 803-819.
- Martinez-Moreno FJ, Hernandez S, Lopez-cobes C, Becerra C, Acosta I (2007). Estimation of canine intesti-

- nal parasites in Cordoba (Spain) and their risk to public health. *Parasitol.* 143: 7-13.
- Morey D (2006). Burying key evidence: The social bond between dogs and people. *J. Archaeol. Sci.* 33: 158-175.
- Okon OE, Opara KN, Ikpe U, Adejimi A, Iboh CI (2011). Prevalence and public health significance of helminth ova in domestic dogs in Calabar, Southern Nigeria. *Wild. J. Appl. Sci. Tech.* 3 (1): 1-6.
- Oladele SB, Ibrahim NDG, Fatihu MY, Mohammed B, Sambo SJ, Aluko RK (2006). Twenty-six years retrospective studies of the prevalence of gastrointestinal helminthes isolated from necropsied animals in Zaria, Nigeria. *Bull. Anim. Alth. Prod. Afr.* 54: 234-240.
- Omudu EA, Amuta EU, Unoqur LB, Okoye LA (2003). Prevalence of *Toxocara canis* ova in dog faeces and soil samples collected from public parks in Makurdi. *Nig. J. Parasit.* 24: 137-142.
- Onyenwe IW, Ikpegbu EO (2004). Prevalence of gastrointestinal helminth parasites (GIHP) of dogs presented at the University of Nigeria Veterinary Teaching Hospital (UNVTH) between 1994-2002. *Nig. Vet. J.* 25 (1): 21- 25.
- Paulos D, Addis M, Fromsa A, Mekibib B (2012). Prevalence of gastrointestinal helminthes among dogs and owners perception about zoonotic dog parasites in Hawassa Town, Ethiopia. *J. Pub. Epidemiol.* 4 (8): 205-209.
- Salvolainen P, Zang Y, Luo J, Lundeberg J, Leitner T (2002). Genetic evidence for an East Asian origin of domestic dogs. *Science* 298(5598): 1610-1613
- Soulsby EJI (1982). *Helminths, Arthropods and protozoa of domesticated animals.* 7th edition. Bailliere Tindall, London.
- Sowemimo OA, Asaolu SO (2008). Epidemiology of intestinal helminth parasites of dogs in Ibadan , Nigeria. *Nig. J. Nhelminthol.* 8 (2): 89-93.
- Sowemimo OA, Asaolu SO (2008). The daily egg production of *Ancylostoma caninum* and the distribution of worm along the digestive tract of the dog. *Res. J. Parasit.* 3: 92-97.
- Yagoob G, Mashaei SS (2011). Prevalence of gastrointestinal helminthic infestation in pet and stray Dogs in Tabriz (East-Azerbaijan province), Iran. *Journal of Animal and veterinary Advances* 10(11): 1477-1479.
- Swai ES, Kaaya EJ, Mshanga DA, Mbise EW (2010). A survey of gastrointestinal parasites of Non-Descript dogs in and around Arusha Municipality, Tanzania. *Inter. J. Anim. Vet. Adv.* 3 (2): 63-67.
- Traub RJ, Robertson ID, Irwin PJ, Mencke N, Thompson RC (2005). Canine gastrointestinal parasitic zoonosis in India. *Trends parasitol.* 21: 42-48.
- Ugbomoiko US, Ariza L, Heukelbach J (2008). Parasites of importance for human health in Nigerian dogs: high prevalence and limited knowledge of pet owners. *BMC Vet. Res.* (4): 49.
- UgochukwuEI, Ejimadu KN (1985). Studies on the prevalence of gastrointestinal helminthes of dogs in Calabar, Nigeria. *Int. J. Zoonoses.* 12 (3): 214-218.
- Wang H, Chai JJ, Liu FJ, Jiang L, Jiao W (2006). A study on Qinghai Chin. *J. Parasit. Dis. Con.* 15 (5): 284-286. [www.colinsmap.com](http://www.colinsmap.com)
- Yagoob G, Mashaei SS (2011). Prevalence of gastrointestinal helminthic infestation in pet and stray dogs in Tabriz (East-Azerbaijan province), Iran. *Anim. Vet. Adv.* 10 911): 1477-1479.