Technoscience Journal for Community Development in Africa 3 (2024) 184-189
ISSN 2659-0573

Research Article

Sentinel prevalence study of zoonotic parasites of domestic dogs in Moro Local Government Area, Kwara State

Ojo Joseph Sunday[1*], Opeyemi Gbenga Oso[2]

[1]Department of Zoology, Kwara State University Malete, Nigeria
[2]Department of Zoology, University of Ibadan, Ibadan, Nigeria

Abstract: Dogs are pets and they play a significant role as hosts and reservoirs of different pathogens shared with humans and wildlife. Close association between humans and dogs carries the risk of human exposure to parasites. In this study, we examine the prevalence and management of zoonotic parasitic infections in domestic dogs in Moro Local Government Area (LGA) of Kwara State, North-Central, Nigeria. One hundred and seventy-four (174) dog faecal samples collected from selected communities in the LGA were examined for the presence of gastrointestinal parasites. Formol ether concentration technique was used for the identification of the parasites. In the dog faecal samples examined, 53.7% (93/173) were infected, out of which 45.7% (48/105) and 65.2% (45/69) were from males and females, respectively. The parasites occurrence varies with sex, age, and breed, but the highest infection occurred in dogs aged ≥ 12 months old. The parasites found in the faecal samples and their order of occurrence include: *Dipylidium caninum* > *Strongyloides stercoralis* > *Ancylostoma* spp. > *Ascaris lumbricoides* > *Toxocara canis* > *Taenia* spp. > *Balantidium coli*. Tick (31) was the only ectoparasite found on the dogs. These dogs pose a threat to the health of both people and animals by contaminating the environment with endoparasites and ectoparasites. To reduce the potential health risks to the human and animal populations, methods for controlling the dog's faecal samples in the environment should be developed by public health workers.

Keywords: Dogs, Ectoparasite, Endoparasite, Gastrointestinal Parasites

1 INTRODUCTION

Dogs are good companion animals, but this relationship may pose a serious threat to public health. They could increase the risks of infections with zoonotic pathogens originating from animals (Overgaauw *et al.,* 2020). The association between dogs and humans is dynamic and evolving. Reasons for keeping dogs vary with the culture, social and economic status of an owner (Rodriguez *et al.,* 2021). Depending on the practices and behaviours of a dog and its owner, the relationship between a dog and its owner is often viewed as beneficial, detrimental or both. Dogs can be reservoirs of disease-causing parasites. A detrimental relationship becomes more pronounced when a dog owner is unaware of the disease risks associated with his/her dog (Barcelos *et al.,* 2020).

Dogs are hosts to a number of ectoparasites, such as fleas, lice, mites, and ticks, which cause considerable pathological conditions such as allergic dermatitis and non-pruritic skin disorders (Abdulkareem *et al.,* 2019). On the other hand, gastrointestinal parasites from dogs can cause significant morbidity in humans, especially among children and young adults (Barash *et al.,* 2019).

Dogs serve as sentinels to monitor the prevalence and epidemiological effects of zoonosis in a community (Caffrey *et al.,* 2019). Faecal matters of dogs can transmit parasites and contaminate environments with parasites, which in turn increase the risk of human exposure to zoonotic transmission from dogs to humans (Abulude, 2019). In Nigeria, there are

*Corresponding author:
E-mail: ojo.sunday@kwasu.edu.ng

KWASU PRESS AND PUBLISHING

regulations against public defecation by humans; however, such regulations are grossly inadequate in the case of dogs. Hence, the interaction between dogs and humans in different local communities may increase the risks of infections (Abdulkareem et al., 2019; Ezema et al., 2019; Ola-Fadunsin et al., 2023). Although the prevalence of zoonotic helminths in dogs and the potential risk factors for human health have been studied in the country, the continuous update on parasite occurrence in dogs that are in contact with humans is of public health importance. Therefore, this study set out to survey the presence of zoonotic parasites in villages leading to Malete, the host village of Kwara State University (KWASU). We investigated the prevalence of zoonotic parasites in domestic dogs in the selected villages.

2 MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Moro Local Government Area (LGA) of Kwara State, north-central, Nigeria. It is located between the latitudes of 8°41'59"N 8°20'00" N and the longitudes of 4°28'0"E and 4°56' 10"E. The selected study area covered four rural settlements along the road from Ilorin to KWASU. Shao is after Sobi barrack, at the cross junction between Sobi road and Ilorin-Jebba express way. After crossing the express, the road continues to KWASU. Along the road is Asomu and Elemere, but the road terminates at Malete. The four villages, with the exception of Malete, which is characterized by a population increase because it is the KWASU host community, are rural farming areas with less than 6,000 residents. Few of the new residents in Malete owned and keep exotic dogs. The mean annual temperature is 26.2 °C, with a peak temperature of 35 °C. The study area witnessed two seasons (dry and rainy) each year. The dry season occurred between November and March, while rainy season is experienced between April and October. Moro LGA has an area of 3,272 km^2 and a population of 108,792 at the 2006 census (Orosun et al., 2020). In most communities in this LGA, solid waste management is at individuals' whims. The streets are unpaved and dogs roam around freely.

2.2 Faecal Sample Collection

A cross-sectional study was conducted from April to June 2022, to determine the prevalence of ectoparasites and endoparasites in dogs. Four communities (Malete, Elemere, Shao, and Asomu) were randomly selected for sample collection. In order to ensure coverage, stratified sampling was adopted for the entire area, while systematic sampling was used to select households within an area. Faecal samples were collected from one hundred and seventy-four (174) dogs into a disposable sterile container directly from the rectum of the dogs by stimulation with a parasitological loop or at the point of defecation with the help of the dog's owner. A single stool sample was collected from each dog to perform the formol ether concentration technique, which also requires the use of ethyl acetate. The stool was preserved immediately after collection in a 10% formol solution. The faeces were treated with the 10% formol solution and ethyl acetate concentration method and examined on a slide under a light microscope with a 40 x and 10 x lens for the presence of parasites. Briefly, the faecal sample involved emulsification in formol-water, using an applicator stick to break up the stool. Approximately 3 ml of ether was added, and the mixture was shaken vigorously for 30 seconds, followed by the addition of 15 ml of formol-water mix. The mixture was poured into a 15 ml conical centrifuge tube through a gauze/sieve to separate parasites from the faecal debris. The filtrate was centrifuged at 1000 rpm for 1 minute. With a disposable plastic bulb pipette, a column of fluid formed between the ether layers after centrifugation was removed and deposited into a second tube. Formal-water was added to the tube containing sediments, and the solution was centrifuged at 1000 rpm for 10 minutes. The supernatant was discarded, and the deposit was divided into two portions; one stained with Lugol's iodine for visualizing cysts and oocytes, and the other portion left unstained for the identification of the types of parasites present. Parasite identification was done based on the morphological features of eggs, cysts, and oocytes (Cheesbrough, 2005).

2.3 Tick Collection

Ticks were collected from dog's bodies directly into disposable sterile containers using hand gloves. Sampled ticks were collected separately into different sterile containers and preserved immediately with a 2% formol solution (Obeta et al., 2020).

2.4 Parasites Quantification

The positive faecal samples were further re-examined by the single thick smear technique. Using

the Kato-Katz template, the number of helminth eggs were counted and multiplied by 24, to quantify the number of eggs per gram (epg) of faeces. For the purposes of consistency, 20% of the slides were randomly selected and read again (Ezema et al., 2019).

2.5 Data Analysis

The data obtained from laboratory analysis was examined using the Chi-square test, and a value of $p<0.05$ was considered statistically significant. A descriptive statistic was used for the analysis of the questionnaire data. All analyses were performed using SPSS.

3 RESULTS

A total of 174 dogs were examined for helminth parasites. In Malete, 63 dogs were examined, consisting of 38.1% males and 61.9% females; in Elemere, 24 dogs were examined, consisting of 75% males and 25% females; in the Shao community, males (69.6%) were higher than females (30.4%); and in the Asomu community, males (83.3%) were higher than females (16.7%). In the age group ≥12 months old, 47.6% and 62.5% of dogs were examined in Malete and Elemere communities, respectively, while in Shao and Asomu, 47.8% and 66.7% of dogs, were examined in the age group 0-6 months. Local breed (Ekuke) was found in all the four communities while four breeds (German Shepherd, Eskimos, Siberian husky, and Caucasian) were also found in Malete community but not in Elemere, Shao, and Asomu communities (Table 1).

Table 1: Characteristics of Dogs in Studied Communities

Variables	Malete		Elemere		Shao		Asomu	
	N	%	N	%	N	%	N	%
Sex								
Male	24	38.1%	18	75.0%	48	69.6%	15	83.3%
Female	39	61.9%	6	25.0%	21	30.4%	3	16.7%
Age (months)								
0-6	18	28.6%	3	12.5%	33	47.8%	12	66.7%
7-11	15	23.8%	6	25.0%	24	34.8%	0	-
≥12	30	47.6%	15	62.5%	12	17.4%	6	33.3%
Types of Dog								
Ekuke	24	38.1%	24	100%	69	100%	18	100%
German shepherd	27	42.9%	-	-	-	-	-	-
Eskimo	3	4.8%	-	-	-	-	-	-
Siberian husky	3	4.8%	-	-	-	-	-	-
Caucasian	6	9.5%	-	-	-	-	-	-

Table 2 shows the total number of ectoparasites and endoparasites collected from dogs during the study. Out of 174 dogs examined in all the studied areas, the highest number of infections occurred in Shao, while the least infections occurred in the Asomu community (18). In Malete and Shao communities, the highest infection rates were found in females, at 53.8% and 85.7% respectively. However, no infection occurred in females in the Asomu community. Age-related infection in the Malete community shows that 50% of infection occurred in the age groups 0-6 months and ≥12 months, while the least infection (20.0%) occurred in 7-11 months. In Shao community, the highest infection rate was found in 7-11 month age group with 62.5%, while the least infection occurred in 0-6 month age group. On the other hand, in the Asomu community, all dogs examined in ≥12 month age group had an infection.

Table 2: Infections in Dogs in Relation to Sex and Age

Variables	Malete		Elemere		Shao		Asomu	
	N	%	N	%	N	%	N	%
Sex								
Male	24	6 (25)	18	18 (100)	48	18 (37.5)	15	6 (40.0)
Female	39	21 (53.8)	6	6 (100)	21	18 (85.7)	3	0
Age (months)								
0-6	18	9 (50.0)	3	3 (100)	33	15 (45.5)	12	0
7-11	15	3 (20.0)	6	6 (100)	24	15 (62.5)	0	0
≥12	30	15 (50.0)	15	15 (100)	12	6 (50.0)	6	6 (100)

In this study, seven gastrointestinal parasites were identified, namely: *Dipylidium caninum* > *Strongyloides stercoralis* > *Ancylostoma* spp.> *Ascaris lumbricoides* > *Toxocara canis* > *Taenia* spp. > *Balantidium coli*. The identified parasites were more widely distributed in Elemere and Shao communities, while Asomu had the least distribution. In addition, the prevalence of infection was higher (40.6%) in the Shao community compared to Asomu, which had the least prevalence (6.0%). Age-related infections among investigated dogs show that ≥12-month-old dogs harboured more (40.6%) parasites, while the least occurred in 0-6 month-old. *Dipylidium caninum* occurred in all dogs investigated, with the highest occurrence (37.5%) among dogs examined in the Shao community. *Ancylostoma* spp. was found in dogs examined in four of the five communities investigated. More females (70%) were infected with *Ancylostoma* spp. compared to males (30%). On the other hand, *S. stercoralis* infection was higher in males (55.6%) than females (44.4%). Meanwhile, the *B. coli* parasite was found only in males and occurred in

both age groups investigated. An ectoparasite (tick) was found in dogs examined in all communities, and in each community, both sexes and all age groups were infected. Although five breeds of dogs were sampled during this study, two breeds (Ekuke and German shepherd) were infected with parasites (Table 3).

Table 3: Prevalence of Endoparasite and Ectoparasite of Dogs Based on Breeds

PARASITE	SEX (%)		AGE (%)			BREED (%)	
	Male	Female	0-6 Months	7-11 Months		LD	GS
MALETE							
***Ancylostoma* spp.**	1(16.7)	5(83.3)	2(33.3)	1(16.7)	3(50)	6(100)	0(0)
D. cannium	3(50.0)	3(50.0)	5(83.3)	0(0)	1(16.7)	3(50.0)	3(50.0)
B. coli	3(100)	0(0)	1(33.3)	1(33.3)	1(33.3)	2(66.6)	1(33.3)
S. stercoralis	1(33.3)	2(66.6)	0(0)	0(0)	3(0)	3(100)	0(0)
Tick	2(22.2)	7(77.8)	2(22.2)	1(11.1)	6(66.7)	5(55.6)	4(44.4)
ELEMERE							
***Ancylostoma* spp.**	2(100)	0(0)	1(50.0)	1(50.0)	0(0)	2(100)	-
D. caninum	5(62.5)	3(37.5)	3(37.5)	2(25.0)	3(37.5)	8(100)	-
***Taenia* spp.**	1(20.0)	4(80.0)	0(0)	2(40.0)	3(60.0)	5(100)	-
S. stercoralis	3(50.0)	3(50.0)	2(33.3)	1(16.7)	3(50)	6(100)	-
T. canis	3(100)	0(0)	1(33.3)	1(33.3)	1(33.3)	3(100)	-
Tick	6(100)	0(0)	0(0)	0(0)	6(100)	6(100)	-
SHAO							
***Ancylostoma* spp.**	0(0)	2(100)	2(100)	0(0)	0(0)	2(100)	-
D. caninum	3(33.3)	6(66.7)	6(66.7)	3(33.3)	0(0)	9(100)	-
A. lumbricoides	6(66.7)	3(33.3)	0(0)	3(33.3)	6(66.7)	9(100)	-
S. stercoralis	6(66.7)	3(33.3)	0(0)	6(66.7)	3(33.3)	9(100)	-
T. canis	3(100)	0(0)	0(0)	3(100)	0(0)	3(100)	-
Tick	6(54.5)	5(45.5)	4(36.4)	6(54.5)	1(9.1)	12(100)	-
ASOMU							
D. caninum	1(100)	0(0)	0(0)	0(0)	1(100)	1(100)	-
Tick	5(100)	0(0)	1(20)	2(40)	2(40)	5(100)	-
TOTAL	**60(56.6)**	**46(43.4)**	**30(28.3)**	**33(31.1)**	**43(40.6)**	**98(92.5)**	**8(7.5)**

Key - LD = Local Dog (Ekuke); GS = German shepherd

4 DISCUSSION

The results of our study showed that different species of parasites infect dogs both in local areas as well as in urban settings. In some areas, there were records of polyparasitism in dog breeds, and these parasites varied among age groups, sexes, and breeds of dogs. The overall prevalence of 53.4% gastrointestinal parasites was recorded in dogs in the studied communities. The prevalence observed in the study was low compared to the 61.4.9% reported by Abulude (2019) in Lagos metropolis, Lagos State, Nigeria. However, the prevalence was higher than in other studies conducted in the southern part of Nigeria (Amadi et al., 2021; Ogbu et al., 2021), where 39.1% and 30.67% were recorded. The occurrence of the gastrointestinal parasite may be due to the inadequate deworming of dogs (Kamani et al., 2021); differences in management systems and health care; and the degree of environmental contamination with infective stages and exposition to natural infection.

In this study, the infection status in dog breeds was sex-related, and there was a significant difference between the sexes of the dogs sampled. Although more males were examined compared to females, the number of infections in both sexes was minimal. However, the difference in the prevalence of infection in relation to sex was significant. This is

consistent with previous studies in Nigeria and Africa (Ezema *et al*., 2019; Guagliardo *et al*., 2020). The age of the dog breed in this study was one of the factors that were related to the infection status. The highest prevalence of infection occurred in ≥12-month age group compared to other age groups. Our result aligned with the findings of Akande *et al*. (2022). The immune system did not adequately develop a defence against infection in infancy, which made it easy for parasites to establish themselves. In a similar vein, older age groups that do not adequately develop an immunological response to parasitic infection during early life could easily be compromised when exposed to a higher load of parasitic infection. The lower infection status observed in this study does not align with a study in Ghana, where puppies had a high prevalence of 86.7%. More so, the result obtained for an old dog (52.0%) was higher than the result (40.6%) obtained for this present study (Amissah-Reynolds et al., 2016).

Dipylidium canium, *Strongyloides,* and *Ancylostoma canium* were the most common gastrointestinal parasites found in the study area. *Dipylidium canium* and ticks were found in all the sampling locations. Meanwhile, *Ancylostoma* spp. was more prevalent in female dogs in the Malete community. Also, female dogs in the Elemere community had the highest prevalence (80.0%). Furthermore, the highest polyparasite was found in the Ekuke, perhaps because it was the most examined breed across the studied areas. This study indicated that there was a low prevalence of tick infestation in dogs in Elemere and Asomu communities; however, the prevalence of ticks was higher in the Shao community. The low prevalence of tick infection in this study is in deviance from the previous study conducted by Adetayo *et al*. (2021), where 56.2% prevalence was recorded in Ibadan, southwestern, Nigeria. It was obvious in this study that the majority of dog owners neither bathed nor treated their dogs. Also, there is an indication that the general health and productivity of dogs in the study area are being affected due to the presence of parasites. This study, therefore, advocates for an increase in dog owners' awareness of the public health implications of parasitic infestation in dogs.

5 CONCLUSION

In conclusion, two breeds of dog (Local Dog (Ekuke) and German shepherd) from the sampled communities in Moro LGA of Kwara State, were infected with gastrointestinal parasites of zoonotic importance. The parasites found in the faecal samples of the two breeds were *Dipylidium caninum, Strongyloides stercoralis, Ancylostoma* spp. *Ascaris lumbricoides, Toxocara canis, Taenia* spp. and *Balantidium coli*. These dogs are therefore potential threat to the health of man, his farm animals and pets by contaminating the environment with zoonotic diseases of dog origin. To reduce the potential health risks to the human and animal populations, provision of health education to dog owners and the general public by veterinary practitioners is recommended. Also, measures to control indiscriminate defecation should be established and implemented by LGA authority through the public health workers.

References

Abdulkareem, B. O., Christy, A. L., & Samuel, U. U. (2019). Prevalence of ectoparasite infestations in owned dogs in Kwara State, Nigeria. *Parasite Epidemiology and Control, 4*(3)*, 1-6*

Abulude, O. A. (2019). Prevalence of Intestinal Helminth Infections of Stray Dogs of Public Health Significance in Lagos Metropolis, Nigeria. *International Annals of Science, 9*(1)*, 24–32.*

Adetayo, O. A., Makinde, O. E., Odeniran, P. O., & Adetayo, C. O. (2021). Prevalence and risk factors of tick infestation in dogs in Ibadan, Nigeria. *African Journal of Biomedical Research, 24*(1)*, 135–140.*

Akande, F. A., Obisesan, O. ., Adeniji, S. D., & Adelakun, D. . (2022). Detection and identification of gastrointestinal parasites in dogs presented to veterinary clinics in Abeokuta, South western Nigeria. Sokoto. *Journal of Veterinary Sciences, 20*(1)*, 19–25.*

Amadi, A. N. C., Obeten, P. I., & Chukwuemeka, B. C. (2021). Prevalence of Helminths Parasites among Dogs and Risk Factors of Zoonotic Infections by Dog Owners in Bende Local Government Area, Abia State, Nigeria. *Nigerian Journal of Parasitology, 42*(2)*, 275–286.*

Amissah-Reynolds, P. K., Monney, I., Adowah, L. M., & Agyemang, S. O. (2016). Prevalence of Helminths in Dogs and Owners' Awareness of Zoonotic Diseases in Mampong, Ashanti, Ghana. *Journal of Parasitology Research, 2016*(1)*, 1-6*

Barash, N. R., Thomas, B., Birkenheuer, A. J., Breitschwerdt, E. B., Lemler, E., & Qurollo, B. A. (2019). Prevalence of Babesia spp. and clinical characteristics of Babesia vulpes infections in North American dogs. *Journal of Veterinary Internal Medicine, 33*(5), *2075–2081.*

Barcelos, A. M., Kargas, N., Maltby, J., Hall, S., & Mills, D. S. (2020). A framework for understanding how activities associated with dog ownership relate to human well-being. *Scientific Reports, 10*(1), *11363*

Caffrey, N., Rock, M., Schmidtz, O., Anderson, D., Parkinson, M., & Checkley, S. L. (2019). Insights about the epidemiology of dog bites in a canadian city using a dog aggression scale and administrative data. *Animals, 9*(6), 324.

Cheesbrough, M. (2005). District Laboratory Practice in Tropical Countries Part 1, Cambridge, Cambridge University Press, 178 - 309.

Ezema, K. U., Malgwi, S. A., Zango, M. K., Kyari, F., Tukur, S. M., Mohammed, A., & Kayeri, B. K. (2019). Gastrointestinal parasites of dogs (Canis familiaris) in Maiduguri, Borno State, Northeastern Nigeria: Risk factors and zoonotic implications for human health. *Veterinary World, 12*(7), *1150–1153.*

Guagliardo, S. A. J., Roy, S. L., Ruiz-Tiben, E., Zirimwabagabo, H., Romero, M., Chopid, E., Ouakou, P. T., Hopkins, D. R., & Weiss, A. J. (2020). Guinea worm in domestic dogs in chad: A description and analysis of surveillance data. *PLoS Neglected Tropical Diseases, 14*(5), *1–17.*

Kamani, J., Massetti, L., Olubade, T., Balami, J. A., Samdi, K. M., Traub, R. J., Colella, V., & González-Miguel, J. (2021). Canine gastrointestinal parasites as a potential source of zoonotic infections in Nigeria: A nationwide survey. *Preventive Veterinary Medicine, 192, 105385.*

Obeta, S. S., Ibrahim, B., Lawal, I. A., Natala, J. A., Ogo, N. I., & Balogun, E. O. (2020). Prevalence of canine babesiosis and their risk factors among asymptomatic dogs in the federal capital territory, Abuja, Nigeria. *Parasite Epidemiology and Control, 11*(2020), *e00186*

Ola-Fadunsin, S. D., Abdulrauf, A. B., Abdullah, D. A., Ganiyu, I. A., Hussain, K., Sanda, I. M., Rabiu, M., & Akanbi, O. B. (2023). Epidemiological studies of gastrointestinal parasites infecting dogs in Kwara Central, North Central, Nigeria. *Comparative Immunology, Microbiology and Infectious Diseases, 93*(1), *101943.*

Ogbu, K. I., Chukwudi, I. C., Mira, F., Eze, U. U., Di Bella, S., Olaolu, O. S., Tion, M. T., Purpari, G., Cannella, V., Nwosuh, I. C., Guercio, A., & Anene, B. M. (2021). Current status and risk factors of canine parvovirus type 2 in North Central Nigeria. *Comparative Immunology, Microbiology and Infectious Diseases, 74*(1), *101578*

Orosun, M. M., Oniku, S. A., Peter, A., Orosun, R. O., Salawu, N. B., & Hitler, L. (2020). Magnetic susceptibility measurement and heavy metal pollution at an automobile station in Ilorin, north-central Nigeria. *Environmental Research Communications, 2*(1), *015001.*

Overgaauw, P. A. M., Vinke, C. M., van Hagen, M. A. E., & Lipman, L. J. A. (2020). A one health perspective on the human-companion animal relationship with emphasis on zoonotic aspects. *International Journal of Environmental Research and Public Health, 17*(11), *3789.*

Rodriguez, K. E., Herzog, H., & Gee, N. R. (2021). Variability in Human-Animal Interaction *Research. Frontiers in Veterinary Science, 7*(619600), *1-9.*