

Prevalence and Factors Associated with Gastrointestinal Parasites INFECTIONS IN Hunting Dogs in Ilorin Metropolis, Kwara State, Nigeria

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ABSTRACT

Parasitic infections in dogs, especially those used for hunting, pose significant public health and veterinary concerns. This study investigated the prevalence of gastrointestinal parasites in hunting dogs across various locations in Ilorin, Kwara State, Nigeria. A total of 116 hunting dogs were enrolled for this study, comprising 62 (53.4%) males and 54 (46.6%) females, yielding a sex ratio of 1.1:1. The dogs were sampled from different locations between May and July, 2025: Oja Gbooro (24.2%), Shao (21.6%), Tanke (19.8%), Adangba (17.2%), Fate and Oke-odo (17.2%). For detecting ova and oocysts, faecal samples were taken directly from the rectum and examined using the simple flotation and sedimentation methods. The overall prevalence of gastrointestinal parasites in hunting dogs sampled was 27.6% (32/116). Out of 116 animals sampled, 32 animals had one or more gastrointestinal parasite infections. The predominant gastrointestinal parasites identified in this study were *Ancylostoma spp*, *Taenia spp* and *Isoospora spp*, with overall prevalence of 19.8% (23/116), 4.3% (5/116), and 2.6% (3/116) respectively. Age distribution showed that 11.2% were under one year, 18.1% were aged 1–2 years, 15.5% were above two years, while 55.2% had unknown ages. Deworming history revealed that 81.0% had not been dewormed, 8.6% had been dewormed three weeks prior, and 10.3% five weeks prior to sampling. The high prevalence of parasitic infections observed in this study underscores the need for regular parasitic control. Effective surveillance and targeted interventions are recommended to minimize the transmission risk to other animals and humans.

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INTRODUCTION

As hunting partners, working animals, and pets, dogs play a vital role in human culture. As pets, dogs enhance their owners' general well-being, offer companionship, and support mental health (Merkouri *et al.*, 2022). Their responsibilities go beyond companionship; they also help with security, treatment, and supporting people with disabilities, among other things (Gee *et al.*, 2021). Dogs play an essential role in hunting in rural and some urban areas, assisting with tracking and retrieving wildlife, which is essential for cultural customs and food security (Serpell, 2017). Hunting Dogs may constitute a distinct epidemiological group because their behavioral and management traits can expose them to different sources of infections that differ from those encountered by household or confine dogs. They are often allowed to roam extensively during hunting activities and may come into contact with contaminated soil, water, vegetation, fecal material and carcasses (Ridgway 2021). Given their close interaction with humans and their role in daily life, maintaining dog health is vital (Gee *et al.*, 2021). Gastrointestinal parasites can significantly affect the health and performance of dogs and humans (Ayinmode *et al.*, 2016). In hunting dogs, parasitic infections can impair performance, reducing the success of hunting expeditions and affecting the livelihood of their owners (Lesniak *et al.*, 2017). These parasites are not only a veterinary concern but also a public health issue, as some are zoonotic, meaning they can be transmitted to humans (Ayinmode *et al.*, 2016). The

zoonotic potential of many gastrointestinal parasites underscores the importance of studying these infections in dogs. *Ancylostoma caninum*, *Toxocara canis*, *Dipylidium caninum*, *Trichuris vulpis*, and *Echinococcus spp.* are among the several gastrointestinal parasite that have been documented in dogs in Nigeria. (Ehimiyein *et al.*, 2024; Ricci *et al.*, 2025). *Ancylostoma spp* can cause cutaneous larva migrans and have also been associated with eosinophilic enteritis in humans (Kamani *et al.*, 2021)

The prevalence of gastrointestinal parasites in dogs varies by region and is impacted by factors such as climate, hygiene, and overall pet management (Ehimiyein *et al.*, 2024). In many developing countries, including Nigeria, the prevalence is often higher due to less stringent veterinary care and lower awareness among pet owners (WHO, 2017). More recently, a study conducted in kwara central including the Ilorin metropolis reported a higher prevalence among clinically healthy dogs (Ola-Fadunsin *et al.*, 2023). However, despite this reports, there is limited information specifically on the prevalence of gastrointestinal parasites among hunting dogs in Ilorin metropolis, Kwara State

Understanding the prevalence and factors associated with gastrointestinal parasites in hunting dogs in Ilorin is crucial for developing effective control and prevention strategies. This study aimed to determine the prevalence and species distribution of gastrointestinal parasites in hunting dogs in Ilorin Metropolis and evaluate demographic and management factors associated with infection.

MATERIALS AND METHODS

Study Area

The study conducted in Nigeria, Kwara State in the city of Ilorin. The State is found between latitude 7°45' and 9° 30' North of the Equator and longitude 2° 30' and 6° 25' East of the Greenwich meridian. It located in the middle belt within Nigeria's forest savannah region (Ola-Fadunsin *et al.*, 2023).

The Benin Republic borders the state on the west, Kogi State borders it on the east, and Oyo, Osun and Ekiti State borders it on the south. Kwara State is home to 2.4 million people and covers 32, 500 square Kilometres, according to the 2006 National Census (Ayanlade *et al.*, 2023). There are two distinct seasons: dry and rainy, with September and October seeing the most of rainfall (Weather Spark, 2026) (Figure 1).

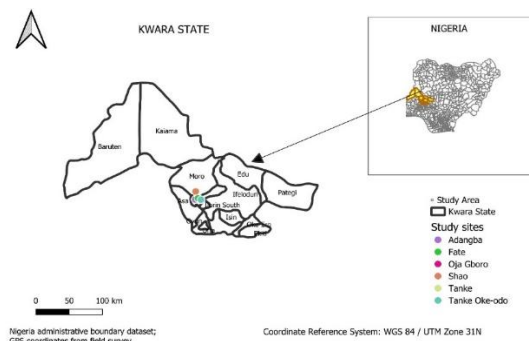


Figure 1: Map of Ilorin Metropolis Showing the Hunting-Dog Sampling Locations in Kwara State, Nigeria (Design Using QGIS Version 3.4.4)

Study Design and Sample Size Determination

A cross sectional study was conducted to calculate the prevalence of gastrointestinal parasites infections among hunting dogs in Ilorin metropolis of Kwara State Nigeria. Data on demographic and managerial factors were collected from the dogs and their owners, while fecal samples were collected and examine for gastrointestinal parasite during the study period. The minimum sample size was calculated using the formula $N = Z^2 P (1 - P) / d^2$, where Z is the standard normal deviate at a 95% confidence level (1.96), P is the expected prevalence of gastrointestinal parasitic infection (54.43%) (Ola-Fadunsin *et al.*, 2023) and d is the desired precision (10%). The calculated minimum sample size was 96 dogs. An attrition rate of 20% was added to give a minimum sample size of 115 dog. However, we sampled a total of 116 hunting dogs from owners who volunteered to participate in this study.

Sample Size and Sample Collection

A convenience sampling technique was used to select dogs for the study based on the dogs allowed by hunters and owners. A total of 116 faecal samples (5g each) were collected directly from the rectum or immediately after defecation from hunting dogs within each area into sterile, well-labelled leather gloves and placed in a cool thermocool box from different areas in Ilorin. These were then transported to the research Laboratory of the Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, where the samples were refrigerated at 4°C until processing.

Ethical Approval

This study followed the ethical standards and guidelines of the Faculty of Veterinary Medicine, University of Ilorin, Institutional Animal Care and Use Committee (IACUC). Approval No. URE/FVM/2025/029.

Faecal Analysis

Faecal analysis was done using two methods, including the simple flotation technique and the simple sedimentation technique.

Flotation Technique

Faecal samples were examined for worm eggs and oocysts using saturated sodium chloride and sugar as flotation medium (400g of NaCl and 500g of sugar in 1000ml of distilled water) with a specific gravity of 1.2. Briefly, 2g of fresh faeces was added to 10ml of flotation solution and, following thorough mixing, the solution was sieved in a test tube, and more flotation solution was added to fill to the top of the test tube and form a slightly positive meniscus (Segura *et al.*, 2023). The tube and cover slip were then left standing for ten to fifteen minute after a cover glass was positioned over the liquid surface. After that, the cover slip was lifted vertically and placed on a slide and examined under the microscope using ×10 and X40 objectives (Segura *et al.*, 2023). Each sample was examine twice to determine the presence of the parasites.

Sedimentation Procedure

Part of the faecal sample collected was subjected to a simple sedimentation technique. About 3g of faeces was weighed into a universal bottle, 40-50 mL of distilled water was added and it was emulsified thoroughly. The suspension was filtered through a sieve into another universal bottle and the filtrate was poured into a centrifugation tube. Centrifugation was done at 2000 revolutions per minute for 5 minutes. The suspension was washed by carefully removing the supernatant with a pipette and resuspended in 5 mL of distilled water. The suspension was centrifuged again at 2000 revolutions per minute for 5 minutes. Supernatant was then discarded. A small drop of the sediment was transferred to a slide using a pipette, then smeared and allowed to air-dry (Murnik *et al.*, 2023). Each sample was examined using X10 and X40 objectives. This procedure was carried out twice for each sample to determine the presence of the parasites.

Identification of Ova/ Oocysts

The helminthological keys as outlined by Soulsby (1982) and Taylor (2007) were used to identify the ova/Oocysts from the processing techniques mentioned above.

Determination of Age, Deworming History and Body Condition Score

Information on the age, deworming history and other relevant management practice of each hunting dog was obtained from the respective owners through direct interview using a structured questionnaire. The body condition of each hunting dogs was accessed by visual observation and classified into three categories: 1= poor/thin, 2=moderate/ normal, and 3=good/ over-conditioned

Statistical Analysis

Data were entered into IBM SPSS® Statistics, version 23 (IBM Corp., Armonk, NY, USA), for statistical analysis. Descriptive statistics were used to summarize the

demographic characteristics of dogs. Categorical variables were described using frequencies and percentages and compared using chi-squared tests or Fisher's exact tests as appropriate. P-value of <0.05 was considered significant.

RESULTS AND DISCUSSION

Results

Overall Prevalence Of Heminths Ova /Oocyst

Three different species of helminths ova and Oocysts (one Nematode, one Cestode and one gastro-intestinal protozoan) were detected from our study. Of the 116 hunting dogs sampled, 19.8% (23/116) were infected with *Ancylostoma* spp, 4.3% (5/116) were infected with *Taenia* spp and 2.6% (3/116) were infected with *Isospora* spp. (figure 2).

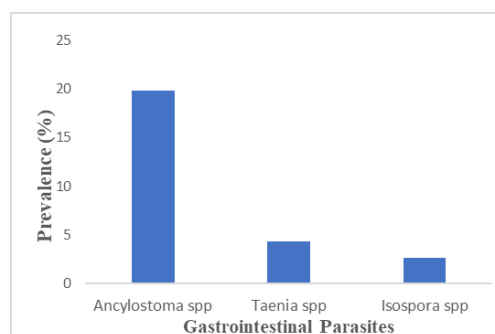


Figure 2: Prevalence of Gastrointestinal Parasite in Hunting Dogs in Ilorin, Kwara State, Nigeria

Demographic Characteristics of The Hunter Dogs

A total of 116 hunting dogs were enrolled for this study. The hunting dogs were recruited from Oja Gbooro 28 (24.2%), Shao 25 (21.6%), Tanke 23 (19.8%), Adangba 20 (17.2%), Fate 12 (10.3%) and Oke-Odo 8 (6.9%). Thirteen (11.2%) of the dogs were less than 1year of age, 21(18.1%) were aged

between 1 and 2 years, 18(15.5%) were more than 2 years, and the age of 64(55.2%) dogs were unknown. Majority of the dogs 94(81.0%) has no deworming history, 10(8.6%) were dewormed 3 weeks before and 12(10.3%) dewormed 5 weeks before. There were 62(53.4%) male and 54 (46.6%) female dogs, with a sex ratio of 1.1:1 (Table 1).

Table 1: Demographic Characteristics of the Hunting Dogs in Ilorin, Kwara State, Nigeria

Characteristics	No.	Percentage (%)
Location	Oja Gbooro	28
	Shao	25
	Tanke	23
	Adangba	20
	Fate	12
	Oke-odo	8
	Total	116
Sex	Male	62
	Female	54
Age group	Less than 1 year	13
	1-2 years	21
	Greater 2 years	18
	Unknown	64
Deworming History	None	94
	3 weeks	10
	5 weeks	12
Body Condition Score	1	18
	2	73
	3	25

About 30% of males were positive for helminth ova, compared with 24% in female dogs ($p=0.430$). The presence of helminth ova was comparable in both male and female dogs. Hunter's dogs aged greater than 2years had a significantly higher prevalence of positive helminth ova (38.9%), and dogs without a deworming history had a

statistically significantly higher prevalence of positive helminth ova (35.9%). Interior areas like Oja Gbooro (39.3%), Shao (36.0%), and Adangba (50%) had a higher prevalence of positive helminth ova than new areas like Fate (0%), Tanke (4.4%), and Oke-Odo (12.5%) (Table 2).

Table 2: Comparison of Demographic Characteristics of Dogs with Parasites Ova/Oocyst and those Without Ova

Variables	Positive ova/oocyst	Negative ova/oocyst	P value
Sex			0.430
Male	19 (30.6%)	43(69.4%)	
Female	13 (24.1%)	41(75.9%)	
Age Group			0.006*
<1year	1(7.7%)	12(92.3%)	
1-2years	1(4.8%)	20(95.2%)	
>2years	7(38.9%)	11(61.1%)	
Unknown	23(35.9%)	41(64.1%)	
Location			0.002*
Oja Gbooro	11(39.3)	17(60.7%)	
Shao	9(36.0)	16(64.0%)	
Tanke	1(4.4%)	22(95.6%)	
Adangba	10(50.0%)	10(50.0%)	
Fate	0(0%)	12(100%)	
Oke-Odo	1(12.5%)	7(87.5%)	
Deworming History			0.002*
3 week	0(0%)	10(100%)	
5weeks	0(0%)	12(100%)	
Not Dewormed	32(34%)	62(66.0%)	
Body Condition			0.059
1	8(44.4%)	10(55.6%)	
2	21(28.8%)	52(71.2%)	
3	3(12%)	22(88%)	

* - Significant at $p < 0.05$ Using Chi-Square

All helminth ova species were equally distributed in both male and female dogs; *Ancylostoma* spp. were more common in Shao and Adangba than in other locations. These findings were statistically significant ($p=0.006$). *Ancylostoma* spp was also the most common helminthic ova in dogs with body

condition score 1 and 2 but less common in those with body condition score 3 (Table 3)

This result indicates mixed infection of *Taenia* spp. and *Ancylostoma* spp. in a male hunting dog. *Ancylostoma* spp, *Taenia* spp. and *Isospora* spp. are also slightly more prevalent in male compared to female hunting dogs (Table 3)

Table 3: Prevalence of Parasites ova/oocyst According to Location, age Group, Body Condition and Sex of the Hunter Dogs

Variables	Gastrointestinal Parasite Species (helminth ova)				Total Positive	P value
	Mixed <i>Ancylostoma</i> spp + <i>Taenia</i> spp	<i>Ancylostoma</i> spp	<i>Isospora</i> spp	<i>Taenia</i> spp		
Sex						1.000
Male	1	13	2	3	19	
Female	0	10	1	2	13	
Age Group						0.805
<1year	0	1	0	0	1	
1-2years	0	1	0	0	1	
>2years	0	4	1	2	7	
Unknown	1	17	2	3	23	
Location						0.006*
Oja Gbooro	1	5	0	5	11	
Shao	0	6	3	0	9	
Tanke	0	1	0	0	1	
Adangba	0	10	0	0	10	
Oke-Odo	0	1	0	0	1	
Body Condition						0.123
1	0	6	0	2	8	
2	1	16	3	1	21	
3	0	1	0	2	3	

* - significant at $p < 0.05$ using Chi-square.

Discussion

The present study revealed that 32 of the 116 faecal samples examined were positive for gastrointestinal parasite eggs, with both single and multiple infections observed, giving an overall prevalence of 27.6%. This finding is lower than the

overall prevalence of 38% reported in Maiduguri (Mustapha et al., 2016) and 31.15% reported in Zaria (Ehimiyen et al., 2018). Similarly, when compared with studies conducted outside Nigeria, the prevalence recorded in this study is lower than the 56.6% reported in southern Italy (Ricci et al., 2025)

and 40.7% reported in Pennsylvania, USA (Jones *et al.*, 2026). The variation between the overall prevalence recorded in this study and those reported both within Nigeria and internationally may be attributed to several interacting factors, including climate and environmental conditions, the level of veterinary care, access to antiparasitic drugs, animal husbandry practices, the socioeconomic status of dog owners, the breed and age of the animals studied, study location, sample size, period of sampling, and cultural or traditional practices surrounding dog ownership (Ayinmode *et al.*, 2016; Ehimiyein *et al.*, 2024).

For individual parasite species, this study recorded a comparatively high prevalence of *Ancylostoma* spp. (19.8%) relative to the 1.64% reported in Zaria (Ehimiyein *et al.*, 2024), although this was considerably lower than the 24.6% recorded in Ibadan (Ayinmode *et al.*, 2016) and 53.2% recorded in Maiduguri (Mustapha *et al.*, 2016). By contrast, lower prevalence values for *Ancylostoma* spp. were reported in Palestine 8.0% (Othman & Abuseir, 2021) and Pennsylvania 6.8% (Jones *et al.*, 2026). The comparatively higher prevalence observed in the present study may be associated with the study area, the age distribution of the sampled animals, and poor hygiene and sanitation practices among dog owners. *Taenia* spp. was identified as one of the common gastrointestinal parasites of hunting dogs in Kwara State, with an overall prevalence of 4.3%. This is lower than the 7.3% reported in Maiduguri (Mustapha *et al.*, 2016) and 19.67% reported in Zaria (Ehimiyein *et al.*, 2024). *Isospora* spp. recorded the lowest prevalence in this study at 2.6%, which was higher than the 1.64% reported in Zaria (Ehimiyein *et al.*, 2024) but lower than the values reported in Maiduguri 10.5%; (Mustapha *et al.*, 2016), Ibadan 14.2% (Ayinmode *et al.*, 2016), and Palestine 9.0% (Othman & Abuseir, 2021). Regarding age distribution, 13 of 116 dogs (11.2%) were less than 1 year old, 21 (18.1%) were aged 1–2 years, 18 (15.5%) were more than 2 years, and 64 (55.2%) were of unknown age, as their owners could not recall or ascertain their exact age. Notably, this unknown-age group recorded the highest prevalence of infection. Because age could not be verified for this majority subgroup, a direct comparison with age-stratified findings elsewhere is limited; however, in the study conducted in Zaria, dogs aged 1–3 years recorded the highest prevalence, at 30% (Ehimiyein *et al.*, 2024). The large proportion of dogs with unknown age in the present study reflects the semi-free-roaming, loosely supervised management typical of hunting dogs in the study area, and may itself be indirectly linked to elevated parasite exposure, since owners who cannot account for their dogs' age are also less likely to have implemented consistent deworming or veterinary care.

By sex, even though the prevalence in male dogs (30.6%) is higher than the female dogs (24.1%), it was not statistically significant. This findings is consistent with findings from Maiduguri (Mustapha *et al.*, 2016) and Zaria (Ehimiyein *et al.*, 2024) and may be attributed to male dogs' greater tendency to roam long distances in search of mates during the breeding season, increasing their exposure to infective parasite stages. In contrast, Palestine reported higher prevalence in females than males (Othman & Abuseir, 2021), suggesting that sex-related differences in parasite prevalence may also be influenced by local husbandry practices and study context.

Gastrointestinal parasite infection was more prevalent among hunting dogs with moderate/ normal body condition score compared with those in poor or over conditioned categories. However, this was not statistically significant ($P > 0.05$). The relatively higher prevalence observed in hunting dogs with

moderate/ normal body condition score may reflect the fact that clinically apparent changes in body condition are not necessary associated with gastrointestinal parasitism particularly when infections are mild or subclinical.

Finally, deworming history strongly affected infection status. Dogs dewormed 3 and 5 weeks prior to sample collection recorded zero parasite prevalence, whereas dogs with no deworming history recorded an overall prevalence of 34%, underscoring the effectiveness of routine antiparasitic treatment in reducing gastrointestinal parasite burdens in hunting dogs.

This study was limited by the accessibility of hunting dogs,

CONCLUSION

Gastrointestinal parasites were detected in 27.6% of the hunting dogs examined in Ilorin Metropolis, with *Ancylostoma* spp. being the predominant parasite. Infection prevalence varied significantly with location, reported deworming history and age category in the univariable analyses, whereas sex and body condition were not statistically significant at $p < 0.05$. The findings support improved veterinary surveillance, regular evidence-based parasite control and owner education. Further studies incorporating larger probability-based samples and multivariable analysis are required to establish independent risk factors.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest among them.

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