

Gastrointestinal Parasites of Cats (*Felis catus*) in Kwale, Ndokwa West Local Government Area of Delta State

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Abstract

Gastrointestinal parasites in domestic cats have implications for animal health and potential zoonotic transmission. This study investigated their prevalence, seasonal variation, and infection intensity in Kwale, Ndokwa West Local Government Area, Delta State, Nigeria. A total of 210 cats were examined using standard parasitological techniques, with infection intensity assessed in 50 samples using the Kato–Katz technique. Seven parasite taxa were identified: *Toxocara cati* (n = 41), *Ancylostoma* sp. (n = 38), *Taenia* sp. (n = 33), *Giardia* sp. (n = 29), *Platylosomum* sp. (n = 16), *Dipylidium caninum* (n = 12), and *Cystoisospora* sp. (n = 11). Chi-square analysis indicated significant differences in prevalence among parasite taxa ($p < 0.05$). Among samples analyzed using Kato–Katz, *T. cati* had the highest mean infection intensity at 57.39 eggs per gram of feces, whereas *Ancylostoma* sp. had the lowest at 32.06 eggs per gram. Infection rates were highest in June (23.8%) and lowest in February (12.8%), although seasonal variation was not statistically significant ($p > 0.05$). The detection of taxa with potential zoonotic significance highlights the public health relevance of gastrointestinal parasitic infections in cats. These findings provide local epidemiological evidence supporting integrated control measures, including routine deworming, improved sanitation, cat population management, public health education, and One Health collaboration.

Keywords: Gastrointestinal Parasites; *Felis catus*; Seasonal Variation; Infection Intensity; One Health

INTRODUCTION

Domestic cat (*Felis catus*) is one of the most popular animal pet worldwide. Their feeding, roaming and hunting behaviours expose them to numerous gastrointestinal (GI) parasites such as *Toxocara* sp, *Toxascaris leonina*, *Ancylostoma* sp, *Trichuris* sp, *Dipylidium caninum*, *Taenia* sp, *Capillaria* sp, *Paragonimus* sp, *Cystoisospora* sp, *Toxoplasma gondii*, *Sarcocyst* sp, *Isospora* sp, *Blastocystis* sp and *Giardia* sp which cause disease in cats and carry zoonotic risks for people (Darabi *et al.*, 2021; Pereira *et al.*, 2016; Khademvatan, *et al.*, 2014; Ramos *et al.*, 2013; Silaghi *et al.*, 2014). Cats are common in many communities in Nigerian households where they serve as rodent control and companion animal, living in close proximity to humans (Dutton-Regester and Rand, 2024; Centonze & Levy, 2002). Also, cats instinctively bury their faeces in soil after defecation. This behaviour promotes the accumulation and survival of infective parasite stages in shared defecation sites, increasing the risk of environmental contamination, reinfection, and transmission of gastrointestinal parasites among cats. Such a habit is favourable for many parasitic infective stages as it protects them from desiccation (Sowemimo, 2012).

Sowemimo (2012) also highlighted that the role of animal parasites, particularly those of the common household pets, in producing human disease has become increasingly evident. These parasites are of veterinary and public health importance because of their frequency in field surveys and their ability to contaminate the environment with infective stages.

Multiple regional studies report a high prevalence and diversity of feline gastrointestinal parasites across Nigeria. Surveys from southern regions such as Calabar, south-western communities including Ode-Irele and Oyo, as well as Nsukka in south-eastern Nigeria, and areas such as Lokoja and Sokoto, consistently document frequent infections with *T. cati*, hookworms (*Ancylostoma* sp.), *Dipylidium caninum* and *Taenia* sp. Overall prevalence estimates vary widely by cat population sampled, diagnostic methods and local ecology (Sowemimo, 2012; Adeiza *et al.*, 2024).

For example, recent field surveys have reported overall GI parasite prevalence ranging from 50% up to >90% in some cats, with many studies documenting polyparasitism which means multiple parasite species per cat (Sowemimo, 2012; Adeiza *et al.*, 2024). These Nigerian datasets mirror broader regional patterns but emphasize local heterogeneity.

According to Sowemimo, *et al.*, (2011) & Omonijo, *et al.*, (2019) *Toxocara cati* and hookworms are commonly recorded in Nigerian cats.

Human cases of *D. caninum* are rare but documented after accidental ingestion of infected fleas, underlining zoonotic potential in settings with poor flea control (Bonilla-Aldana *et al.*, 2024; Rousseau *et al.*, 2022).

Several feline GI parasites identified in Nigerian surveys are of zoonotic hazards. *T. cati* is a known cause of human toxocariasis which includes visceral or ocular larva migrans. The ingestion of embryonated eggs from contaminated soil or fomites put children who play in contaminated areas at risk (Omonijo, Kalinda, & Mukaratirwa, 2019).

Bonilla *et al.*, (2024) reported that hookworm species can cause cutaneous larva migrans in humans. Though human *D. caninum* infection is uncommon, it has been reported in paediatric cases linked to flea ingestion.

Risk factors consistently identified in Nigerian and regional studies include free-roaming behaviour, lack of routine anthelmintic and ectoparasite control, young age (kittens), predatory behaviour (increasing cestode risk), and low owner awareness (Sowemimo, 2012; Adeiza *et al.*, 2024).

Seasonal effects are reported inconsistently: some studies show higher prevalence during the wet season when humidity and moisture favour survival of environmental stages (e.g., helminth eggs and larvae), while others report no clear seasonal trend; this likely reflects local microclimates, sampling schemes and host population differences (Sowemimo, 2012; Adeiza *et al.*, 2024).

Common field diagnostics for GI parasites include faecal flotation, direct smear and sedimentation techniques. These microscopy-based methods are inexpensive but have limited sensitivity for low-intensity infections, intermittent shedders, and protozoa. Antigen assays and PCR increase sensitivity and allow genotyping which is important for assessing zoonotic assemblages, but their cost and laboratory requirements limit widespread use in some Nigerian settings (Adeiza *et al.*, 2024). Also, recent molecular surveys of *Toxocara* and *Giardia* in companion animals highlight the added value of molecular confirmation for accurate species identification and epidemiological inference.

Although multiple surveys document feline GI parasites across Nigeria, data specific to Delta State and Ughelli North are limited. Local prevalence, intensity (EPG),

and seasonal distribution data are essential for directing practical control measures in communities where cats are commonly free-roaming and veterinary access may be limited.

Given the prevalence of these parasites in domestic and feral cats across Nigeria, there is a clear One Health intersection requiring integrated veterinary and public-health measures such as deworming, ectoparasite control, environmental sanitation, and community education (Sowemimo, 2012; Omonijo & Mukaratirwa, 2019).

Despite these findings, there is a paucity of data on the prevalence, diversity of parasites, and public health significance of gastrointestinal parasites in cats specifically in Kwale, Delta State. The lack of region-specific epidemiological data poses a challenge to the public health authorities and veterinarians in designing targeted control measures, community education programs, and zoonotic disease prevention strategies. Given the potential for these parasites to cause disease in both cats and humans, and considering the socio-environmental conditions in Kwale that may favor parasite transmission, there is a pressing need to investigate the occurrence and intensity of gastrointestinal parasitism in domestic cats in this locality. Such data would provide an evidence base for intervention strategies aimed at improving animal health and reducing zoonotic risks to the local population.

The findings in this present study will provide baseline epidemiology which will serve as an invaluable information in the control of these parasitic infection Nigeria.

MATERIALS AND METHOD

Description of Study Area

This study was conducted in Kwale, the administrative headquarters of Ndokwa West Local Government Area, Delta State, Nigeria. The town lies within the tropical rainforest zone of the state, characterized by annual rainfall of about 2,000–3,000 mm, relative humidity ranging between 70–90%, and average daily temperatures of 24–34°C (Nigerian Meteorological Agency (NiMet), 2020). Kwale is located between latitudes 5°40' and 6°00' North and longitudes 6°08' and 6°25' East. The area is predominantly agrarian, with residents engaged in farming, trading, and public service. Cats are widely kept as pets and for rodent control, with many roaming freely, increasing their exposure to environments contaminated with parasite stages.

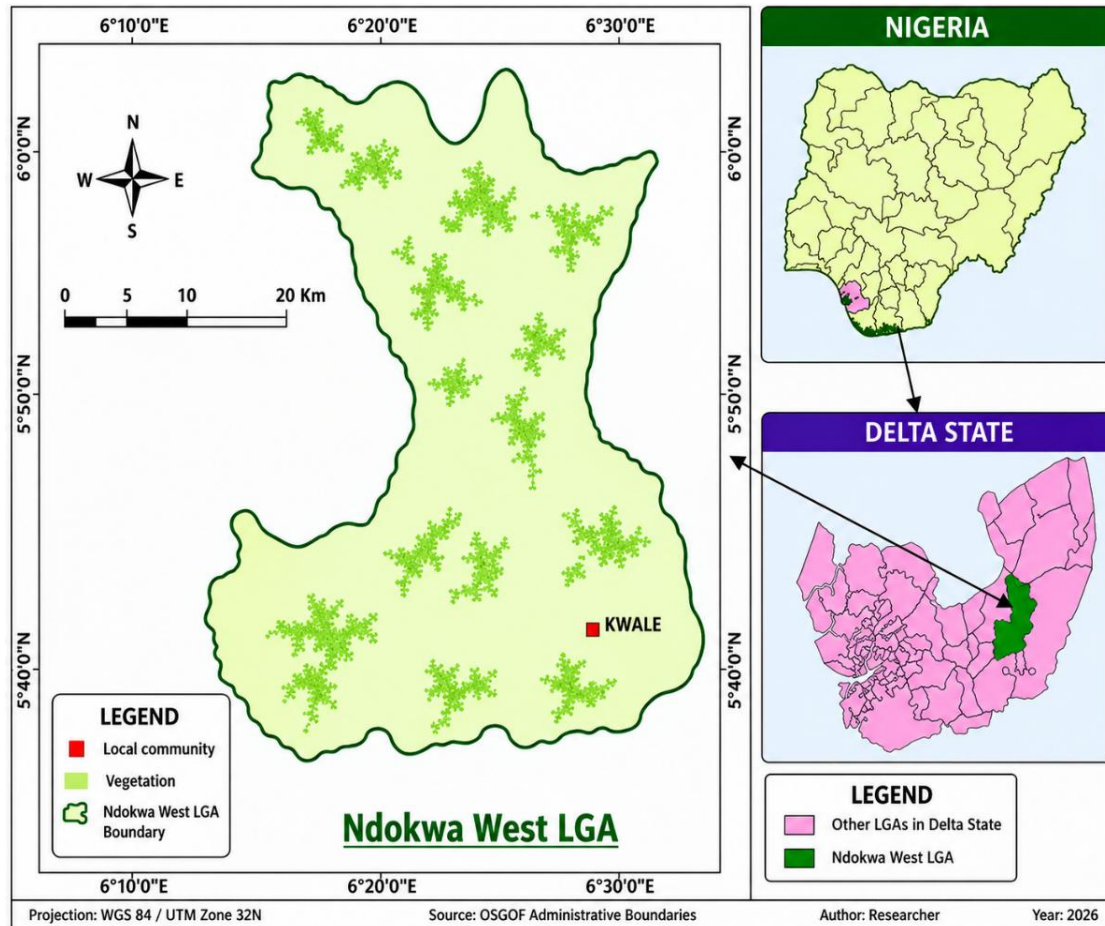


Figure 1: Map of Study Area
Source: Developed using QGIS Version 3.36.0

Research Design

A cross-sectional study was conducted to assess the prevalence of gastrointestinal parasites in cats (*Felis catus*) in Kwale, Ndokwa West Local Government Area, Delta State. The study spanned eight months, covering both wet and dry seasons. A total of 210 cats were enrolled using a stratified random sampling approach, including both sexes and varying age groups. Sample bottles containing 10% formalin were distributed to cat owners, who collected fecal specimens from their cats, which were subsequently retrieved by the research team during follow-up visits.

Ethical Consideration

Informed consent was obtained from all cat owners after the study objectives, procedures, and potential benefits were clearly explained to them. Animal handling complied with the World Organisation for Animal Health (WOAH) animal welfare guidelines were applied (OIE, 2021; Thompson, 2024).

Sample Size

The sample size was calculated using the formula by Thrusfield (2018) and Bezabih et al., (2015) for estimating prevalence:

$$n = \frac{1.96^2 \times P_{exp}(1 - P_{exp})}{d^2}$$

Where:

- n = required sample size
- Z = 1.96 (for 95% confidence)
- P_{exp} = expected prevalence (0.50 assumed)
- d = precision

$$n = \frac{Z^2 \times P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.07)^2} = 196$$

Therefore, the sample size required is approximately 196 cats. To account for potential non-response or loss during sampling, a sample size of 210 cats was targeted

Sample Collection

Sample bottles containing 10% formalin were distributed to cat owners and informed to add approximately 2–5 g of fresh fecal material into the clean, labeled, screw-cap plastic containers indicating the cat's identification number and date of collection (Zajac *et al.*, 2019; Su *et al.*, 2022). All samples were transported to the advanced research center where they were processed and analyzed for the parasites.

Diagnosis of Gastrointestinal Parasite Infection

Parasitological Examination

Fecal samples collected from each cat were examined for gastrointestinal parasites using standard parasitological techniques, namely, direct smear methods, and formol-ether concentration techniques (Cheesbrough, 2012; Cheesbrough *et al.*, 2005; Zajac & Conboy, 2012).

RESULTS

Prevalence of Intestinal Parasites in cats in Kwale Ndokwa west as shown in Table 1. A total of two hundred and ten different samples were collected from different cats. Of these one hundred and eighty were infected. *Toxocara* had the highest infection rate (22.7%), followed closely by Hookworm (21.1%) and *Taenia* (18.3%). On the other hand, *Cystoisopora* and *Dipylidium* have the lowest infection rates at 6.1% and 6.6%, respectively. The significant variation in infection rates suggests that some parasites are more prevalent than others, which may be due to environmental, hygienic, or socio-economic factors. Further statistical analysis confirms that these differences are significant. A Chi-square test revealed a statistically significant difference in infection rates across parasite species ($\chi^2 = 36.00, p < 0.05$).

Table 1: Prevalence of Intestinal Parasites in Cat in Kwale Ndokwa west

Parasites species	No. examined	No. infected	Infection rate(%)
<i>Toxocara cati</i>		41	22.7
Hookworm		38	21.1
<i>Taenia</i> sp.		33	18.3
<i>Platylosomum</i> sp.		16	8.8
<i>Giarda</i> sp.		29	16.1
<i>Dipylidium</i> sp.		12	6.6
<i>Cystoisopora</i> sp.		11	6.1
Total	210	180	99.7
	$(\chi^2 = 36.00, p < 0.05)$.		

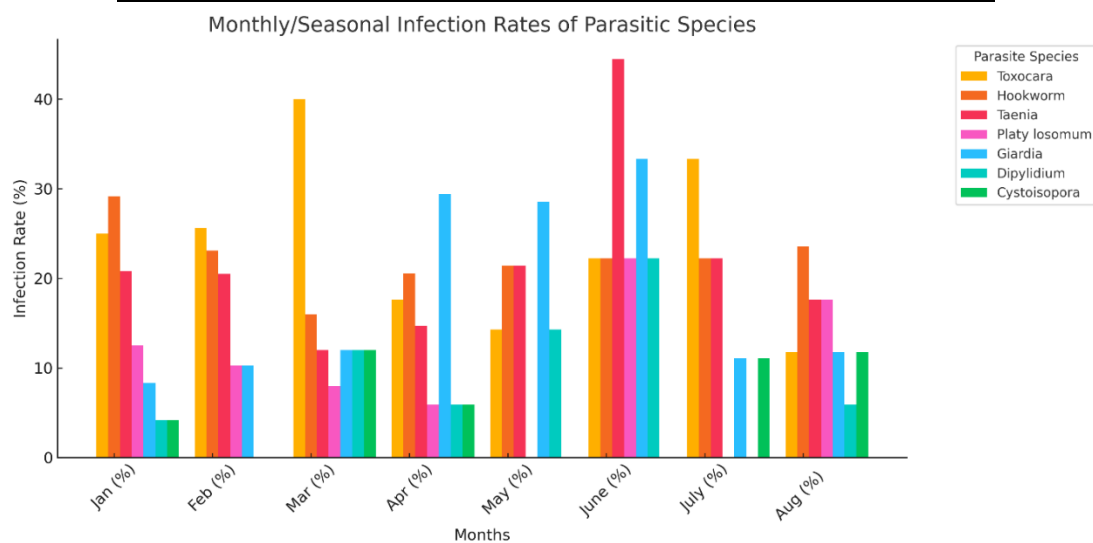


Figure 2: The Seasonal Distribution of Parasitic Species in Cat

The Seasonal distribution of Parasites in Cat as shown in Table 2. The highest mean infection rate was recorded in June (23.8%), followed by March (16.0%), whereas February exhibited the lowest mean infection rate (12.8%). Variability in infection rates was greatest in June (standard deviation = 13.4) and lowest in August (standard deviation = 5.7). The Chi-square test indicated no statistically significant difference in infection rates across months ($\chi^2 = 2.60$, $p > 0.05$). Strong positive correlations were observed between January and February ($r = 0.96$) and between February and July ($r = 0.84$). Conversely, weak negative correlations were found between June and January ($r = -0.11$) and between August and March ($r = -0.13$), suggesting potential seasonal shifts in infection patterns.

Table 2: Prevalence and Intensity of Parasite Infections in Cat Fecal Samples

Parasite Species	Positive Samples (n)%	Mean epg $\pm$ SD (Positive Samples)	Range (epg)
<i>Toxocara cati</i>	23(27.7)	57.39 $\pm$ 34.04	24–120
hookworm	18(21.6)	32.06 $\pm$ 11.55	24–48
<i>Taenia</i> sp.	12(14.4)	36.00 $\pm$ 24.13	24–96
<i>Platylosomum</i> sp.	8(9.6)	39.00 $\pm$ 16.74	24–72
<i>Giardia</i> sp.	11(6.0)	–	–
<i>Dipylidium caninum</i>	7(8.4)	37.71 $\pm$ 23.53	24–72
<i>Cystoisospora</i> sp.	4(4.8)	–	–

Table 2 shows the prevalence and intensity of Parasite Infections in Cat Fecal Samples. A total of seven intestinal parasite species were identified among the positive samples. *Toxocara cati* was the most prevalent parasite, occurring in 23 (27.7%) samples, and recorded the highest mean EPG (57.39 $\pm$ 34.04; range: 24–120). This was followed by *Ancylostoma* sp. (18; 21.7%), *Taenia* sp. (12; 14.5%), *Giardia* sp. (11; 13.3%), *Platylosomum* sp. (8; 9.6%), *Dipylidium caninum* (7; 8.4%), and *Cystoisospora* sp. (4; 4.8%).

DISCUSSION

The present study demonstrates that cats harbored a total of seven intestinal parasites, including two nematodes, two cestodes, one trematode, and two protozoans. This indicates high parasite burden and diversity among cat in this locality. Generally, this high number of parasites recorded in this study, reflects the inadequate veterinary care that exist in this part of the country (Sowemimo *et al.*, 2012). In contrast, cats from Oyo and Ode-Irele communities in Southwest Nigeria exhibited a higher parasite diversity, with 13 species identified, comprising eight nematodes, three cestodes, one trematode, and one

protozoan. This disparity in species richness and composition may be attributed to regional differences in environmental conditions such as the differences in the type of soil and climate.

The findings in this study recorded *Toxocara cati* and *Ancylostoma sp.* as the highest parasite, followed by *Taenia sp.*, *Dipylidium caninum* and *Giardia sp.*, *Cystoisospora sp.* This profile is consistent with patterns reported in Nigeria and in other tropical/subtropical regions where environmental conditions favour parasite transmission (Idika *et al.*, 2016). Furthermore, Donato (2012) reported that ascarids and ancylostomatids are among the most important parasites affecting cats worldwide, due to their widespread distribution and significant risk to both animal and human health.

In the present study, the overall prevalence of gastrointestinal helminth infection in cats was 85.7%, which is comparable to previous reports of 85.5% from 200 cats in Nigeria, 94% from 47 cats in Iran, 83% from 658 cats from Qatar, and 85.2% from 27 cats in India (Sowemimo *et al.*, 2012; Hajipour *et al.*, 2016; Abu-Madi *et al.*, 2010; Borthakur and Mukharjee, 2011).

In this study, *Toxocara cati* had the highest mean intensity of parasitemia, with 23 in fecal egg per gram (EPG), showing the greatest variability in EPG values of 57.39 ± 34.04 , indicating that *T. cati* also exhibited the highest parasite burden among the sampled population. These results contrast with those reported by Sowemimo *et al.*, (2012) who found hookworm to be the most prevalent parasite in Nigerian cats with 57.0% and EPG of $194.0 \pm 28.$, followed by *T. cati* with 48.5% and EPG of 391.4 ± 101.2 , *Isospora sp.* with 30.5%, and *Taenia sp.* as the least prevalent with 7.5% and EPG of 103.0 ± 59.2 . Such discrepancies may be due to differences in study location, sample size, seasonal variations, and methodological approaches, including fecal sampling and EPG determination.

Similarly, in 83 cats from the Lake Kainji area, Nigeria, *Ancylostoma sp.* was the most prevalent intestinal parasite, 44.1%, consistent with global reports identifying hookworm as the most frequently observed intestinal parasite in cats. The public health relevance of hookworm is notable, as it contributes to creeping eruptions or cutaneous larva migrans in humans.

The highest mean infection rate was observed in June at 23.8%, followed by March at 16.0%, while February recorded the lowest rate at 12.8%. Infection rates also varied more widely in June and were most consistent in August, suggesting that parasite burden

tends to fluctuate more during peak transmission periods. This pattern agrees with the findings of Okoye *et al.* (2013), who reported that parasitic infections were highest during the summer months of June to August and lowest between December and February. They also noted that factors such as age, residency status, and seasonal changes play important roles in determining infection levels. Overall, the similarity between both studies suggests that conditions during the rainy season likely promote the survival and spread of parasites, leading to higher infection rates in cats.

Considering the high parasites burden in our study area, improved sanitation, health education, regular surveillance, and effective control measures are recommended to reduce this burden of parasitic infections.

CONCLUSION

This study identified seven gastrointestinal parasite taxa in domestic cats in Kwale, Delta State, Nigeria, with *Toxocara cati* and *Ancylostoma* sp. being the most frequently detected. Among the 50 samples examined using the Kato–Katz technique, *T. cati* exhibited the highest mean infection intensity at 57.39 eggs per gram of feces. Although infection rates peaked in June and were lowest in February, seasonal variation was not statistically significant; therefore, these findings do not establish a seasonal association. The detection of taxa with potential zoonotic significance underscores the relevance of feline parasite control to animal and public health, although transmission to humans was not assessed. The findings support integrated control measures encompassing routine veterinary care and deworming, improved sanitation, responsible cat population management, public health education, and continued parasitological surveillance. Collaboration between veterinary and public health services within a One Health framework could guide coordinated prevention and control efforts in the study area.

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