PREVALENCE OF ZOONOTIC GASTROINTESTINAL PARASITES IN STRAY DOGS IN OYE AND IKOLE LOCAL GOVERNMENT AREAS EKITI STATE, NIGERIA

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Abstract

Stray dogs are known to harbour various gastrointestinal parasites (GIPs), some of which are of zoonotic importance. This study aimed at understanding the prevalence of zoonotic gastrointestinal parasites in stray dogs in Oye and Ikole Local Government Areas (LGAs) of Ekiti State. Fifty (50) faecal samples were randomly collected from stray dogs from each of the LGAs into plastic universal bottles. The universal bottles were properly labelled, transported to Animal and Environmental Biology laboratory, Federal University Oye-Ekiti and stored in the refrigerator at 4ºC for processing. Faecal samples were examined microscopically using sheather's sugar floatation technique. Out of the 100 faecal samples that were examined, 63.0% have single parasite while 37.0% are without parasites. There was no case of double infection. Prevalence of GIP was found to be significantly different in the two locations ($p<0.001$) with Oye having the highest prevalence of 63.5% while Ikole has a prevalence of 36.5%. All the parasites that were found in Oye LGAs were of zoonotic importance while 9 out of 10 GIP observed in Ikole were zoonotic. Overall, Toxocara canis had the highest prevalence of (22.0%), followed by Strongyloides sp (10.0%) while the other zoonotic gastrointestinal parasites have prevalence less than (10.0%). This study emphasized the need to intensify awareness on the role of stray dogs in contaminating the environment with zoonotic parasites.

Keywords: Parasite, dogs,bottles, infections, prevalence

Introduction

Gastrointestinal parasites (GIPs) are commonly reported in dogs worldwide. Most of the GIPs are of zoonotic importance due to their impact on humans (Traversa *et al*., 2017). Commonly reported zoonotic gastrointestinal parasites include, *Giardia* spp, *Cryptosporidium* spp, *Toxoplasma gondii*, *Toxocara canis*, hookworms, and *Echinococcus granulosus* (Kostopoulou *et al*., 2017). Zoonotic transmission occurs when the oocyst or infective larvae of the parasites are accidentally ingested via consumption of contaminated water or food or via consumption of undercooked meat or food (Omonijo *et al*., 2023). Infection with these parasitic agents results in various clinical manifestations ranging from asymptomatic infection to chronic diarrhea caused by *Giardia* spp (Anuar *et al*., 2015); folliculitis, ephemeral and papular/pustular eruptions, penetration of muscle fibers, lung infiltrates and eosinophilic enteritis

caused by hookworms (La Torre *et al*., 2018); human cystic echinococcosis caused by *Echinococcus granulosus* and *Dipylidium caninum* (La Torre *et al*., 2018), and visceral larva migrans (VLM), ocular larva migrans (OLM), and neurotoxocarosis (NT) caused by *Toxocara* spp (La Torre *et al*., 2018). Studies have reported the prevalence of zoonotic infections caused by these parasites worldwide (Tůmová *et al*., 2018; Park *et al*., 2021; Umbrello *et al*., 2021; Narasimham *et al*., 2013). Since transmission is sustained by the presence of the parasites in the environment, it is important to understand their prevalence and the routes of environmental contamination for the purpose of developing control strategies. Dogs are ubiquitous companions of humans worldwide due to their numerous benefits (Jarošová *et al*., 2021), however, poor dog care results in the dogs becoming free roaming or stray (Mota-Rojas *et al*., 2021). Stray dogs contribute to environmental contamination due to their incessant defecation which promote zoonotic transferring of diseases (MagliaBatista, 2019). This study aimed at determining the prevalence of zoonotic gastrointestinal parasites in stray dogs in Oye and Ikole Local Government Areas in Ekiti State.

Materials and methods

Study Area

The study was conducted in Oye and Ikole Local Government Areas (LGAs) in Ekiti State, Nigeria. Oye LGA is located at 7°47′58″N5°19’42”E while Ikole LGA is located at 7°53′36.5″N 5°30′40.0″E. Both local government areas are known for their agricultural activities and consist of civil servants, students, self-employed workers, and farmers.

Sample Collection

Fifty (50) faecal samples were randomly collected from stray dogs into plastic universal bottles in each of the LGAs. The universal bottles were properly labelled, and transported to Animal and Environmental Biology laboratory, Federal University Oye-Ekiti. The samples were stored in the refrigerator at 4ºC until processed the next day for ova or oocysts detection.

Parasitology Procedure

Faecal samples were processed individually and examined microscopically using sheather’s sugar floatation technique. 1 g of faeces was added to 15 ml of sheather’s sugar solution in a test tube. The content was mixed and strained thoroughly and collected into another test tube and was covered with a covered slip. The filtrate was left to stand for 15 – 30 mins. The cover slip was then transferred to a microscopic slide to be examined under a light

microscope. The samples were identified using the standard procedures.

Data Analysis

Data were analyzed using the statistical package for social sciences IBM-SPSS version 25.0. Chi-square statistic was used to determine the association between locations and parasites prevalence. A p-value < 0.05 was considered statistically significant.

Results

Prevalence of zoonotic gastrointestinal parasites of dogs in Oye LGA, Ekiti

All the eight parasite types that were encountered in Oye LGA, are known zoonotic parasites. The zoonotic parasites that were encountered included *Toxocara canis*, *Strongyloides* sp, *Taenia* sp, *Alaria* sp, *Ancylostoma* sp, *Blasocystis* sp, *Toxoplasma* sp. and *Dipylidium* sp (See Figure 1). *Toxocara canis* constituted the most prevalent zoonotic gastrointestinal parasite in stray dogs in Oye (45.0%), followed by *Dipylidium caninum* (23.0%), and *Strongyloides* sp (15.0%). Prevalence in the rest was less than 10.0%.

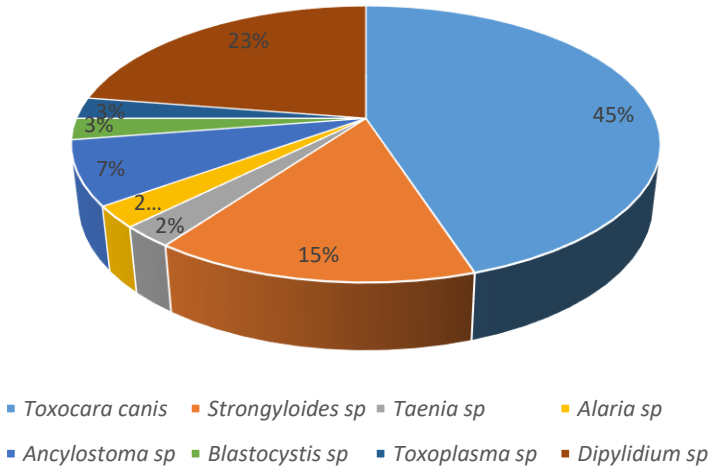

Figure 1: Pie chart showing the prevalence of zoonotic gastrointestinal parasites in Oye Local Government Area, Ekiti State.

2.2 Prevalence of zoonotic gastrointestinal parasites of dogs in Ikole LGA, Ekiti

Out of fifty (50) faecal samples that were examined, 10 gastrointestinal parasites were observed. The GIPs include, *Entamoeba* sp, Coccidia sp, *Ancylostoma* sp, *Blastocystis* sp, *Toxoplasma* sp, *Toxocara canis*, *Strongyloides* sp, *Alaria* sp, *Schistosoma* sp and *Taenia* sp. Out of the 10 GIPs, 9 were found to be zoonotic (See Figure 2). *Ancylostoma* sp, *Toxocara canis*, and *Strongyloides* sp, have the highest prevalence of 18.0% while the rest;

Alaria sp, *Blastocystis* sp, *Entamoeba* sp, and *Taenia* sp have a prevalence less than 10.0%.

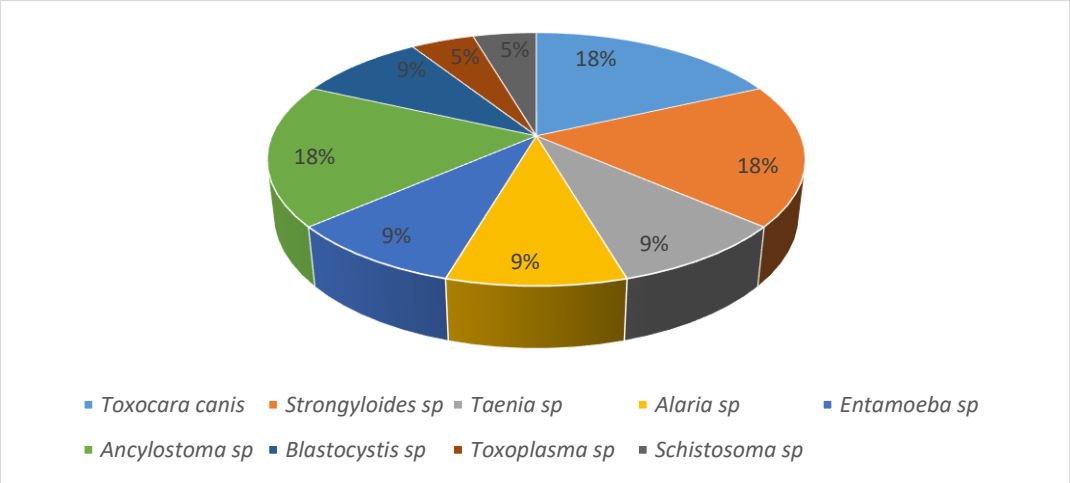

Figure 2: Pie chart showing the prevalence of zoonotic gastrointestinal parasites in Ikole Local Government Area, Ekiti State.

2.3 Infection status of stray dogs with gastrointestinal parasites in Oye and Ikole LGA

Overall, out of the 100 samples that were examined, 37.0% have no parasites, 63.0% have single parasite. There was no case of double infection. Prevalence of GIP was found to be significantly difference in the two locations ($p<0.001$) with Oye having the highest prevalence of 63.5% while Ikole has a prevalence of 36.5%. Overall, *Toxocara canis* had the highest prevalence of (22.0%), followed by *Strongyloides* sp (10.0%) while the prevalence of *Entamoeba* sp, Coccidia sp, *Ancylostoma* sp, *Blastocystis* sp, *Toxoplasma* sp, *Alaria* sp, *Schistosoma* sp, *Dipyllidium* sp, and *Taenia* sp was less than 10.0%. Moreover, Oye has the highest prevalence of *Toxocara canis*, (36.0%) (Table 1).

Table 1. Infection status of stray dogs with gastrointestinal parasites in Oye and Ikole LGA

Parasites found	Oye n=50 (%)	Ikole n=50 (%)	Overall prevalence N=100 (%)
No parasites found	10 (20.0)	27 (54.0)	37 (37.0)
Single parasite	40 (80.0)	23 (46.0)	63 (63.0)
Toxocara canis	18 (36.0)	4 (8.0)	22 (22.0)
Strongyloides sp	6 (12.0)	4 (8.0)	10 (10.0)
Taenia sp	1 (2.0)	2 (4.0)	3 (3.0)
Alaria sp	1 (2.0)	2 (4.0)	3 (3.0)
Entamoeba sp	0 (0.0)	2 (4.0)	2 (2.0)
Ancylostoma sp	3 (6.0)	4 (8.0)	7 (7.0)
Blastocystis sp	1 (2.0)	2 (4.0)	3 (3.0)
Toxoplasma sp	1 (2.0)	1 (2.0)	2 (2.0)
Schistosoma sp	0 (0.0)	1 (2.0)	1 (1.0)
Coccidia	0 (0.0)	1 (2.0)	1 (1.0)
Dipylidium sp	9 (18.0)	0 (0.0)	9 (9.0)
X^2, p-value	31.263, 0.001		

Discussion

Stray dogs are associated with various zoonotic gastrointestinal parasites that are hazardous to human health (Traversa *et al*., 2017; Szwabe & Błaszkowska, 2017). They are important sentinels in investigating environmental contamination of zoonotic gastrointestinal parasites due to their indiscriminate faecal droppings in the environment (Traversa *et al*., 2017). The finding from this study showed the overall prevalence of gastrointestinal parasites in stray dogs to be 63.0%. This is lower than the prevalence of 77.0% reported in household dogs in Argentina (Enriquez *et al*., 2019). It is however, higher than 31.5% that was reported in Maiduguri, Nigeria (Ezema *et al*., 2019).

Zoonotic gastrointestinal parasites that were reported include *Toxocara canis*, *Strongyloides* sp, *Taenia* sp, *Alaria* sp, *Ancylostoma* sp, *Blastocystis* sp, *Toxoplasma* sp, *Schistosoma*, and *Dipylidium caninum.* Similar zoonotic parasites have been reported in dogs in a nation-wide survey in Nigeria (Kamani *et al*., 2021) and Maiduguri, Nigeria (Ezema *et al*., 2019), as well as in Slovakia (Jarošová *et al*., 2021).

The higher prevalence of *T. canis* observed in stray dogs in this study is consistent with reports from other studies (Studzińska *et al*., 2017; Szwabe & Błaszkowska, 2017). This is an indication of high environmental contamination with *T. canis* and may pose high health risks to members of the communities (Sharma *et al*., 2017). *T. canis* has been identified as one of the five common zoonotic infections in dogs in Nigeria (Gado *et al*., 2023) and their role in causing zoonotic infections have been reported (Gyang *et al*., 2015; Sowemimo *et al*., 2017). The observed

prevalence of *T. canis* observed in this study is higher than the prevalence of 10.8% that was reported in Zuru area, Kebbi State Nigeria (Mohammed *et al*., 2012) and 9.8% from Ibadan, Nigeria (Ayinmode *et al*., 2016), however, it is lower than the prevalence of 34.6% reported in Ile-Ife (Akeredolu & Sowemimo, 2014). This may be attributed to difference in management practices involved in dog care and the level of the presence of infective stages of these parasites in the environment (Akeredolu & Sowemimo, 2014).

The prevalence of *Strongyloides* sp (10.0%) observed in stray dogs in this study is higher than the prevalence of (1.6%) reported in a national survey in Nigeria (Kamani *et al*., 2021), (2.0%) reported in Zaria, Kaduna State, (3.9%) reported in Ibadan, and Edo, Nigeria (Ayinmode *et al*., 2016; Inegbenosun *et al*., 2023), and (7.54%) reported in Kwara, Nigeria (Ola-Fadunsin *et al*., 2023). However, the prevalence recorded in this study is lower than 24.2% reported in Sidama, Ethiopia (Dubie *et al* 2023), and (27.70%) reported in Abua, Rivers State (Moro *et al*., 2023). Earlier study has reported a global prevalence of 6% (95% CI 3-9%) in dogs (Eslahi *et al*., 2022). *S. stercoralis* is a zoonotic parasite that affects 100–370 million people globally resulting in gastrointestinal and cutaneous signs, severe pulmonary pathology with auto- and hyperinfection or manifest as asymptomatic (Eslahi *et al*., 2022). *S. stercoralis* has genotypes that infect dogs while another genotype infects both dogs and humans thereby making dogs a reservoir host (Eslahi *et al*., 2022). The observed variation in prevalence may be attributed to the varying climatic conditions (Eslahi *et al*., 2022).

Furthermore, the prevalence of (9.0%) of *Dipylidium* sp observed in this study is lower than the prevalence of 16.5% reported in Mexico (Trasviña-Muñoz *et al*., 2020), 20.0% reported in sub-Saharan Africa (Chidumayo, 2018), 21.0% (95% CI: 16.6–24.9) reported in dogs in Ethiopia (Gutema *et al*., 2020), and 40.0% reported in Texas (Olave-Leyva *et al*., 2019), however, it is higher than the prevalence of 3.1% reported in Sudan (Sulieman *et al*., 2020), 4.5% and 8.2% reported in Nigeria (Ezema *et al*., 2019; Esonu *et al*., 2019), and 6.0% reported in Portugal (Silva *et al*., 2020). *Dipylidium caninum*, commonly known as dog tapeworm is a zoonotic parasite that is responsible for dipylidiasis in dogs, cats, and rarely in humans (Gutema *et al*., 2020). Manifestations include, abdominal pain, diarrhea, and anal pruritus in some individuals while mild infection can be asymptomatic (Gutema *et al*., 2020). The intermediate hosts are the fleas while dogs act as the final host. Humans become

infected through fecal–oral routes via the accidental ingestion of infected flea containing *D. caninum* cycsticercoid (Gutema *et al*., 2020).

In addition, the prevalence of 7.0% of *Ancylostoma* sp reported in this study is lower than the prevalence of 38.7% reported in Kigali, Rwanda (Ntampaka *et al*., 2021), and 60.8% reported in West Indies (Kim *et al*., 2022). *Ancylostoma* sp are zoonotic helminths that are capable of causing eosinophilic enteritis and cutaneous *larva migrans* in humans (Loukas *et al*., 2016). Pathogenicity of *Ancylostoma* sp infection includes hematophagy, which results in intense blood loss (Bowman, 2014), and gastroenteric disorders, namely diarrhea and dysentery (Kopp *et al*., 2007). The most susceptible dogs are the newborn puppies and juvenile dogs which may suffer severe intestinal hookworm infections via infection through transmammary route (Dos Santos *et al*., 2020).

Also, the prevalence of 3.0% for *Alaria* sp observed in this study is comparable with report from Erzurum province (Kirman *et al*., 2023).

On the other hand, the prevalence of taeniid eggs observed in this study is comparable to the prevalence observed in pet dogs in Bilda, North-Central Algeria (Ziam *et al*, 2022), but, lower than the prevalence of 4.0% reported in Slovakia (Jarošová *et al*., 2021), 4.87% reported in Oyo State (Awosanya and Ndiaye, 2021) and 9.0% reported in Basrah Iraq (Abdulhameed *et al*., 2020). Moreover, the prevalence of *Toxoplasma gondii* observed in the faeces of dogs in this study is lower than the prevalence of 5.6% reported in Lokoja, Kogi State, Nigeria (Budiono *et al*., 2023). Also, the prevalence of *Entamoeba* sp 2.0% observed in the faeces of dogs in this study is higher than 0.84% reported in Jataí, Brazil (Souza *et al*., 2023).

Finally, the prevalence of eggs of *Schistosoma* sp observed in this study is lower than 32.86% reported in West Lore, Indonesia (Budiono *et al*., 2022). Other zoonotic parasites *Blastocystis* sp observed in this study has been reported from a similar study (Latif *et al*., 2020). The prevalence of *Blastocystis* sp reported in this study is higher than the 1.9% reported in Baghdad, Iraq (Latif *et al*., 2020). The reasons for variability in prevalence of various zoonotic gastrointestinal parasites of dogs may be attributed to varying mode of dog care, varying parasitological procedure in identification of parasites as well as geographical and seasonal variation.

Conclusion

In conclusion, the public health importance of the observed zoonotic GIPs cannot be overemphasized and their prevalence in the study areas is an

indication of possible zoonotic transmission in the LGAs and underscores the need to adopt good dog care practices and embrace adequate deworming practices for dogs in the study areas.

Recommendations

The general public should be educated on the zoonotic risk associated with the presence of stray dogs in the environment. This study also recommends that the population of stray dogs in the communities be kept under control.

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