



**APPLICATION OF PARTICIPATORY EPIDEMIOLOGY ON *TOXOCARA CANIS* AND *TOXOCARA CATI* IN ARIAM COMMUNITY OF IKWUANO LGA, ABIA STATE, NIGERIA**

**Onyegbula, O. and Edward, I. G.**

Department of Veterinary Public Health and Preventive Medicine  
College of Veterinary Medicine  
Michael Okpara university of Agriculture, Umudike.  
**Corresponding Author's Email:** okmanj2002@yahoo.com

**ABSTRACT**

The study applied participatory epidemiology (PE) approaches to investigate the occurrence, transmission patterns, risk factors, and community perceptions of toxocariasis in Ariam community, Ikwuano Local Government Area of Abia State, Nigeria. Participatory epidemiological tools including semi-structured interviews, pairwise ranking, proportional piling, seasonal calendars, transect walks, and participatory mapping were employed between January and October 2025. Dog owners, cat owners, community leaders, hunters, veterinary personnel, and households participated in the study. Faecal samples from 180 dogs and 75 cats were examined using flotation techniques for *Toxocara* eggs. The overall prevalence of *Toxocara canis* in dogs was 31.1%, while *Toxocara cati* prevalence among cats was 22.7%. Puppies and kittens showed significantly ( $P < 0.05$ ) higher infection rates than adults. Participatory findings identified poor deworming practices, free roaming of animals, indiscriminate disposal of faeces, and inadequate awareness of zoonotic risks as major drivers of transmission. Seasonal calendars revealed an increased infection occurrence during the rainy season. Community mapping identified compounds, playgrounds, refuse dumps, and markets as hotspots for environmental contamination. The study demonstrates that, participatory epidemiology is an effective approach for understanding toxocariasis dynamics in rural Nigerian communities. Integrated One Health interventions involving routine deworming, environmental sanitation, and public health education are recommended.

**Keywords:** *Toxocariasis*, Participatory, Epidemiology, Zoonosis, Dogs, Cats.

**INTRODUCTION**

Toxocariasis is a neglected zoonotic parasitic disease caused primarily by *Toxocara canis* and *Toxocara cati*, intestinal nematodes of dogs and cats respectively. The parasites are globally distributed and constitute important veterinary and public health concerns, particularly in developing countries with poor sanitation and high populations of free-roaming dogs and cats (WHO, 2023). Dogs and cats shed large numbers of resistant eggs into the environment through faeces. Humans become infected through ingestion of embryonated eggs contaminating soil, water, food, or fomites. Children are particularly susceptible because of geophagia and close contact with contaminated environments. Human infections may result in visceral larva migrans, ocular toxocariasis, neurological toxocariasis, and covert syndromes (Holland, 2023).

Studies conducted in Nigeria have demonstrated high prevalence rates of *Toxocara* infections among dogs and significant environmental contamination with parasite eggs. However, information regarding the epidemiology of toxocariasis in rural communities of southeastern Nigeria remains limited (Ugbomoiko *et al.*, 2008). Participatory epidemiology (PE) is increasingly recognized as a valuable approach for investigating animal diseases in resource-limited communities. PE integrates local indigenous knowledge with conventional epidemiological methods to improve disease surveillance, community engagement, and control strategies (Salawu and Akeredolu, 2023).

Ariam community in Ikwuano LGA has increasing dog and cat populations, poor waste management practices, and close human-animal interactions, all of which may favor toxocariasis transmission.

The objectives of this study were therefore to:

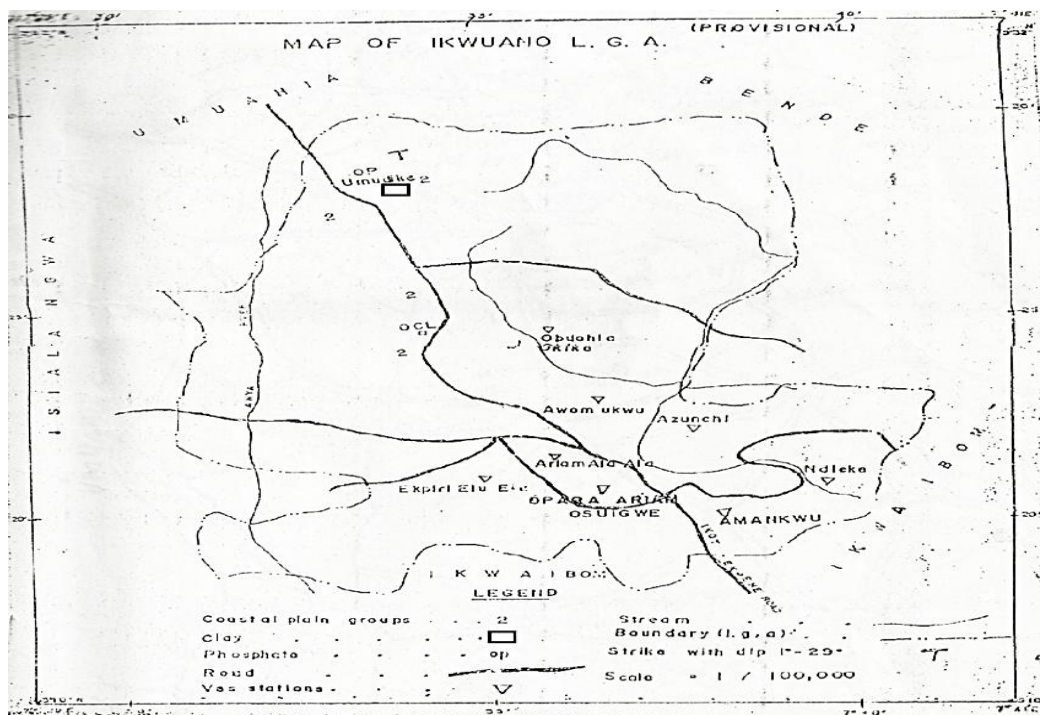
- Assess community knowledge and perceptions of toxocariasis.

- Determine the prevalence of *Toxocara canis* and *Toxocara cati*.
- Identify epidemiological risk factors using participatory tools.
- Map transmission hotspots within the community.
- Recommend sustainable control strategies.

## MATERIALS AND METHODS

### Study Area

The study was conducted at Ariam community, Ikwuano Local Government Area, Abia State, southeastern Nigeria. The area lies within the tropical rainforest belt and experiences annual rainfall ranging from 1,800–2,300 mm with temperatures between 24°C and 31°C. The inhabitants are predominantly farmers, traders, and hunters. Domestic dogs and cats are commonly kept for hunting, security, and rodent control.



**Figure 1:** Map of Ikwuano Local Government the Study Area

### Study Design and Data Collection

Participatory epidemiological tools including semi-structured interviews, pairwise ranking, proportional piling, seasonal calendars, transect walks, and participatory mapping were employed between January and October 2025. Dog owners, cat owners, community leaders, hunters, veterinary personnel, and households participated in the study. Faecal samples from 180 dogs and 75 cats were examined using flotation techniques for *Toxocara* eggs.

### Data Analysis

Data collected were subjected to Chi-square analysis to determine associations between prevalence and risk factors at  $P < 0.05$  using SPSS version 25.

## RESULTS AND DISCUSSION

The pairwise ranking exercise conducted among residents of Ariam community in Ikwuano revealed that mange was perceived as the most important animal health problem affecting dogs and cats, followed by helminthiasis, rabies, tick infestation, and diarrhoea. This outcome reflects the practical experiences and indigenous knowledge of community members regarding the diseases that



most commonly affect companion animals within the locality (Catley *et al.*, 2012; Mariner & Paskin, 2000).

Mange being ranked first suggests that ectoparasitic skin diseases are highly prevalent and easily recognized by pet owners in the community. Clinical manifestations such as hair loss, skin crusting, itching, and emaciation are visually obvious and may have contributed to the high community concern. Similar findings have been reported in rural and peri-urban communities in Nigeria where poor sanitation, inadequate veterinary care, and unrestricted roaming of dogs and cats favour the transmission of mange mites (Soulsby, 1982; Taylor *et al.*, 2016). The prominence of mange in the ranking may also indicate inadequate ectoparasite control practices and limited access to veterinary medications.

Helminthiasis was ranked second and was consistently identified by participants as a major health challenge affecting dogs and cats. This finding is particularly significant because the study focused on *Toxocara canis* and *Toxocara cati*, both of which are important zoonotic gastrointestinal nematodes (Bowman, 2020). The high ranking of helminthiasis demonstrates substantial community awareness of worm infections in companion animals. Participants likely associated helminth infections with clinical signs such as pot-bellied appearance, poor growth, weight loss, vomiting, diarrhoea, and reduced productivity of hunting or guarding animals (Jrquhart *et al.*, 1996). The frequent occurrence of helminthiasis in the community may be linked to poor deworming practices, environmental contamination with infective eggs, The roaming of animals, and close human-animal interactions (Overgaauw & van Knapen, 2013).

The recognition of helminthiasis as a major disease problem also has important public health implications. *Toxocara* species are known causes of zoonotic *toxocariasis* in humans, leading to conditions such as visceral larva migrans and ocular larva migrans, especially among children exposed to contaminated soil (Despommier, 2003). In rural communities such as Ariam, where dogs and cats often roam freely and defecate indiscriminately, the risk of environmental contamination and transmission to humans becomes substantial (Robertson *et al.*, 2000). The participatory epidemiology approach therefore provided valuable insight into local perceptions that may support future zoonotic disease control programmes.

Rabies ranked third among the identified diseases. Although rabies may not occur as frequently as mange or helminthiasis, its high fatality rate and public health significance likely influenced community concern. The ranking indicates that residents are aware of the danger associated with dog bites and rabies transmission. This awareness may have resulted from previous exposure to rabies outbreaks, public health campaigns, or local experiences with suspected rabid dogs (WHO, 2023). The finding highlights the need for sustained rabies vaccination programmes and community education on responsible pet ownership.

Tick infestation was ranked fourth, suggesting that ticks are commonly encountered but may be considered less severe than the previously ranked conditions. Tick infestations are nevertheless important because they cause irritation, anaemia, reduced animal wellbeing, and transmission of tick-borne pathogens (Jongejan & Uilenberg, 2004). Their relatively lower ranking may reflect adaptation by community members to the common presence of ticks in tropical environments or the perception that tick infestations are manageable through local treatment practices.

Diarrhoea was ranked fifth among the disease conditions. The lower ranking may indicate that diarrhoea is perceived more as a clinical sign associated with other diseases rather than as a distinct health problem. Nevertheless, diarrhoeal conditions in dogs and cats remain important because they may result from parasitic infections, bacterial diseases, viral infections, or poor nutrition (Greene, 2012). Persistent diarrhoea can contribute to dehydration, weakness, and increased susceptibility to secondary infections.

Overall, the pairwise ranking exercise demonstrated the usefulness of participatory epidemiology in identifying priority animal health problems from the perspective of local communities (Catley *et al.*, 2012). The findings emphasize that parasitic diseases, particularly helminthiasis associated with *Toxocara canis* and *Toxocara cati*, remain major concerns in Ariam community. The results further underscore the need for regular deworming programmes, improved veterinary extension



services, public awareness campaigns on zoonotic risks, proper sanitation, and strengthened community-based animal health interventions in the study area.

**Table 1:** Pairwise Ranking of Major Animal Health Problems

Disease condition	Community rank
Mange	1
Helminthiasis	2
Rabies	3
Tick infestation	4
Diarrhoea	5

Helminthiasis was consistently identified as a major health challenge affecting dogs and cats.

### Prevalence of *Toxocara* Infection

The prevalence of *Toxocara canis* observed in this study (31.1%) agrees with previous Nigerian reports indicating widespread infection among dogs (Sowemimo, 2007).

**Table 2:** Prevalence of *Toxocara canis* and *Toxocara cati*

Host Species	Number Examined	Positive	Prevalence (%)
Dogs	180	56	31.1
Cats	75	17	22.7

### Age-related Prevalence

The high prevalence among puppies and kittens may be attributed to transplacental and transmammary transmission, immature immunity, and poor veterinary care

**Table 3:** Age Distribution of Infection

Age Group	Examined	Positive (%)
Puppies/Kittens	110	45(40.9)
Adults	145	28(19.3)

Young animals had significantly higher infection prevalence ( $P < 0.05$ ).

### Participatory Risk Factors Identified

The participatory epidemiology exercise conducted in Ariam community of Ikwuano identified several important risk factors associated with the transmission and persistence of *Toxocara canis* and *Toxocara cati*. Community respondents ranked lack of deworming as the most important risk factor, followed by free roaming animals, poor waste disposal, open defecation, and children playing on contaminated soil. These findings demonstrate strong indigenous knowledge regarding factors that promote helminth infections in dogs, cats, and humans.

Lack of deworming recorded the highest frequency (85%), indicating that the majority of participants recognized inadequate anthelmintic treatment as a major contributor to helminthiasis. Regular deworming is essential for reducing intestinal parasite burdens and limiting environmental contamination with infective eggs (Bowman, 2020). In many rural Nigerian communities, routine veterinary care is often neglected because of financial limitations, poor access to veterinary services, and low awareness of preventive animal healthcare (Taylor *et al.*, 2016). The high ranking of this factor suggests that dogs and cats in Ariam community may serve as continuous reservoirs of *Toxocara* infection due to irregular or complete absence of deworming practices.

Free roaming animals constituted the second most important risk factor with a frequency of 79%. Free roaming dogs and cats have unrestricted access to refuse dumps, contaminated environments, and communal spaces where they can acquire and disseminate parasitic infections (Robertson *et al.*, 2000). Such animals also defecate indiscriminately, thereby increasing environmental contamination with *Toxocara* eggs. This practice is common in many rural communities in southeastern Nigeria where companion animals are rarely confined (Overgaauw & van Knapen, 2013). The movement of infected



animals across households and public spaces enhances the transmission cycle of zoonotic helminths.

Poor waste disposal was identified by 71% of respondents as a major risk factor. Accumulation of refuse around households creates unhygienic environmental conditions that attract stray dogs and cats and facilitate the spread of parasites and other infectious agents (WHO, 2022). Improper disposal of animal faeces further contributes to contamination of soil and water sources with infective *Toxocara* eggs. Since *Toxocara* eggs can survive in the environment for prolonged periods under favourable conditions, poor sanitation practices greatly increase the risk of transmission to both animals and humans (Despommier, 2003).

Open defecation ranked fourth with a frequency of 64%. This finding reflects the poor sanitary infrastructure commonly observed in many rural settings. Open defecation contributes to environmental contamination and may increase opportunities for mechanical spread of parasitic organisms between humans and animals (Robertson *et al.*, 2000). Areas contaminated with human and animal waste become important transmission points for zoonotic pathogens. The identification of this factor by participants demonstrates local awareness of the relationship between sanitation and disease occurrence.

Children playing on contaminated soil was also identified as an important risk factor with a frequency of 58%. This observation is highly relevant because children are particularly vulnerable to *toxocariasis* due to frequent hand-to-mouth behaviour and close contact with contaminated environments (Despommier, 2003). Public playgrounds, school compounds, and household surroundings contaminated with dog and cat faeces may harbour infective *Toxocara* eggs. Several studies have shown that children living in environments contaminated with canine and feline faeces are at increased risk of visceral larva migrans and ocular larva migrans (Overgaauw & van Knapen, 2013). The community's recognition of this risk factor highlights a substantial level of awareness regarding zoonotic disease transmission.

Overall, the participatory identification of these risk factors demonstrates the effectiveness of participatory epidemiology in generating community-based epidemiological intelligence (Catley *et al.*, 2012). The findings indicate that environmental sanitation, responsible animal management, and regular deworming are essential components for controlling *Toxocara canis* and *Toxocara cati* infections in Ariam community. Public health education programmes emphasizing hygiene, proper disposal of animal waste, restriction of free roaming animals, and routine veterinary care are therefore necessary to reduce the burden of zoonotic helminthiasis in the study area.

**Table 4:** Major Risk Factors

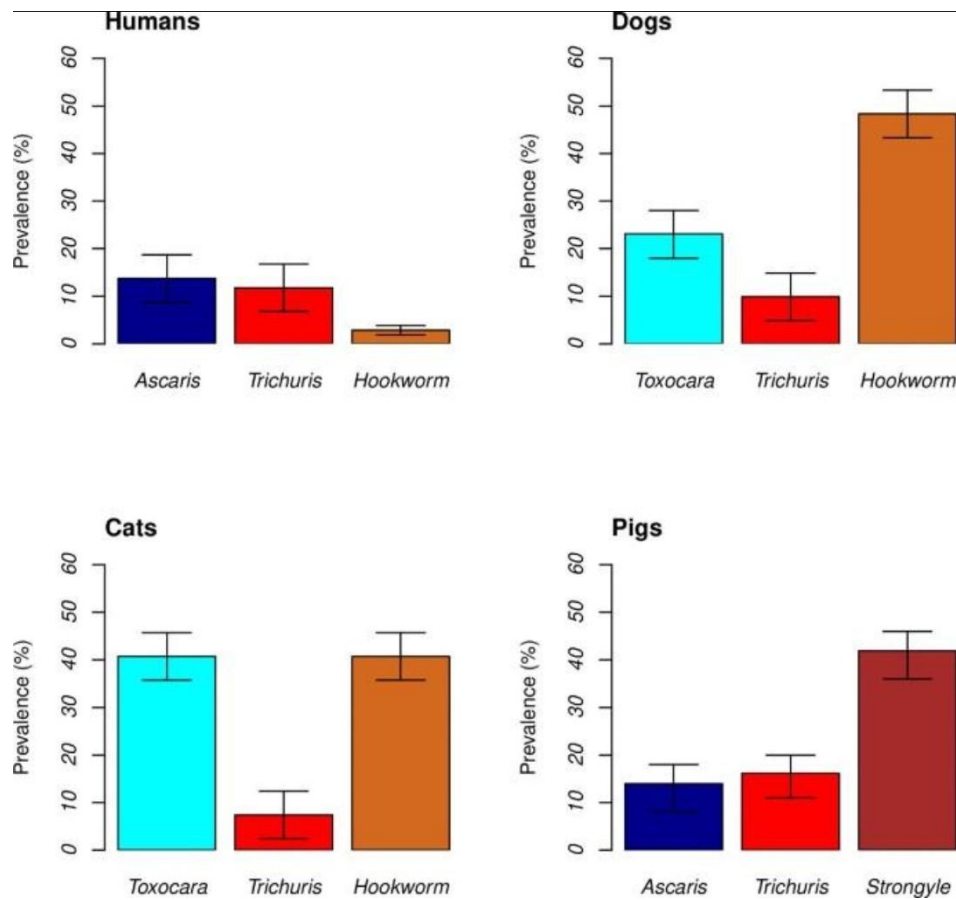
<b>Risk factor</b>	<b>Frequency Mentioned (%)</b>
Lack of deworming	85
Free roaming animals	79
Poor waste disposal	71
Open defecation	64
Children playing on contaminated soil	58

### **Seasonal Calendar of Infection**

Community participants indicated:

- Higher infection occurrence during rainy season
- Increased environmental contamination during flooding
- Higher puppy and kitten births during rainy periods
- Epidemiological Charts and Environmental Hotspots

### Epidemiological Charts and Environmental Hotspots



The prevalence of *Toxocara canis* observed in this study (31.1%) agrees with previous Nigerian reports indicating widespread infection among dogs (Sowemimo, 2007). The high prevalence among puppies and kittens may be attributed to transplacental and transmammary transmission, immature immunity, and poor veterinary care. Participatory epidemiology tools proved highly effective in identifying community-level transmission factors and indigenous knowledge regarding toxocariasis. Community members recognized poor hygiene, roaming animals, and contaminated environments as important contributors to infection.

The identification of playgrounds and refuse dumps as hotspots supports findings that environmental contamination plays a major role in human exposure. *Toxocara* eggs are highly resistant and may survive for extended periods in moist soils (WHO, 2023). The low awareness of zoonotic implications among participants represents a major public health concern. Similar findings have been reported in Nigerian dog owner studies (Ugbomoiko *et al.*, 2008).

#### Public Health Importance

Human toxocariasis may result in:

- Visceral larva migrans
- Ocular toxocariasis
- Neurological disorders
- Allergic manifestations
- Chronic eosinophilia

Children are particularly vulnerable because of exposure to contaminated soils.



### One Health Implications

The findings emphasize the importance of One Health collaboration involving:

- Veterinary services
- Public health agencies
- Environmental health officers
- Community leaders

Integrated control strategies are necessary for sustainable prevention (CDC, 2024).

### CONCLUSION AND RECOMMENDATIONS

This study demonstrated that *Toxocara canis* and *Toxocara cati* are endemic in Ariam community, Ikwuano LGA, Abia State. Participatory epidemiology effectively identified risk factors, transmission hotspots, and community perceptions of toxocariasis.

Poor deworming practices, environmental contamination, and free roaming of animals were major contributors to transmission. Strengthening community education, environmental sanitation, and routine veterinary care will significantly reduce disease burden. Based on the result of this study, the following recommendations were made:

- i. Establishment of regular community deworming programs for dogs and cats.
- ii. Improve public awareness on zoonotic risks of toxocariasis.
- iii. Encourage proper disposal of animal faeces.
- iv. Restrict free roaming of dogs and cats.
- v. Improve environmental sanitation around schools and playgrounds.
- vi. Strengthen veterinary extension services in rural communities.
- vii. Promote One Health surveillance systems.

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