



EPIDEMIOLOGICAL ASSESSMENT OF *CRYPTOSPORIDIUM* SPP. AND *GIARDIA DUODENALIS* IN UMUNNEOCHI AREA OF ABIA STATE, NIGERIA

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ABSTRACT

The study assessed the epidemiology, prevalence, associated risk factors, and public health implications of *Cryptosporidium* spp. and *Giardia duodenalis* infections in Umunneochi Local Government Area of Abia State, Nigeria. A cross-sectional study was conducted between February and November 2025 involving domestic animals, livestock handlers, and selected households. A total of 420 faecal samples comprising cattle, goats, sheep, pigs, dogs, and humans were collected and analyzed using direct smear microscopy, modified Ziehl–Neelsen staining, and zinc sulphate flotation techniques. Structured questionnaires were administered to evaluate environmental and management-related risk factors. The result revealed that, overall prevalence of *Cryptosporidium* spp. was 18.1%, while that of *Giardia duodenalis* was 14.5%. The result further indicated that, young animals showed significantly ($P < 0.05$) higher infection rates compared to adults. Poor sanitation, contaminated water sources, overcrowding, and extensive management systems were significantly ($P < 0.05$) associated with infection. Spatial epidemiological mapping identified rural communities with poor access to potable water as hotspots of transmission. The study demonstrates that cryptosporidiosis and giardiasis are endemic in Umunneochi and represent important zoonotic diseases requiring integrated One Health interventions involving veterinary, environmental, and public health sectors.

Keywords: Cryptosporidiosis, Giardiasis, Epidemiology, Zoonosis, Protozoa, Health.

INTRODUCTION

Protozoan enteric infections caused by *Cryptosporidium* spp. and *Giardia duodenalis* are major contributors to gastrointestinal disease in humans and animals worldwide. These parasites are particularly important in tropical and subtropical regions where poor sanitation, contaminated water supplies, and close human-animal interactions enhance transmission (Fayer *et al.*, 2010). *Cryptosporidium* spp. are intracellular apicomplexan parasites capable of infecting a wide range of vertebrate hosts. Infection causes cryptosporidiosis characterized by diarrhoea, dehydration, weight loss, and reduced productivity in livestock. The disease is especially severe in immunocompromised individuals and young animals (Odeniran and Ademola, 2019). Similarly, *Giardia duodenalis* is an important flagellated protozoan parasite affecting the small intestine of humans and domestic animals. Giardiasis is associated with diarrhoea, malabsorption, poor growth, and chronic gastrointestinal disorders. Transmission occurs through ingestion of environmentally resistant cysts present in contaminated food or water.

Nigeria remains endemic for both parasites due to inadequate environmental sanitation, poor waste disposal systems, and extensive livestock management practices. Several studies have reported varying prevalence rates among humans and animals across different states of Nigeria (Chukwu, 2019). Umunneochi Local Government Area of Abia State possesses ecological and socio-economic conditions favorable for transmission of enteric protozoan infections. However, there is limited epidemiological information regarding the burden of *Cryptosporidium* spp. and *Giardia duodenalis* in this region.

The objectives of this study were therefore to:

- i. Determine the prevalence of *Cryptosporidium* spp. and *Giardia duodenalis* in Umunneochi.
- ii. Assess associated epidemiological risk factors.
- iii. Evaluate zoonotic and public health implications.

- iv. Map the geographical distribution of infection hotspots.

MATERIALS AND METHODS

Study Area

The study was conducted in Umunneochi Local Government Area, Abia State, southeastern Nigeria. Umunneochi lies within the derived savannah vegetation belt and experiences a tropical humid climate with annual rainfall between 1,700 and 2,000 mm. The area is predominantly rural with extensive livestock farming involving cattle, goats, sheep, pigs, poultry, and dogs. Most communities depend on streams, boreholes, and rainwater harvesting for domestic water supply.

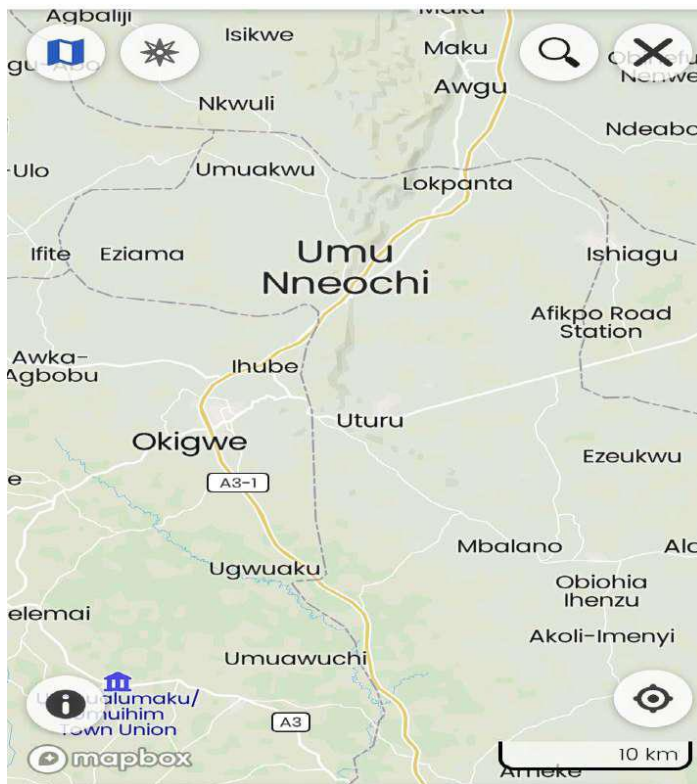


Figure 1: Map of the Study Area

Study Design and Data Collection

A cross-sectional study was conducted between February and November 2025 involving domestic animals, livestock handlers, and selected households. A total of 420 faecal samples comprising cattle, goats, sheep, pigs, dogs, and humans were collected and analyzed using direct smear microscopy, modified Ziehl–Neelsen staining, and zinc sulphate flotation techniques. Structured questionnaires were administered to evaluate environmental and management-related risk factors

Sample Size

Table 1: Faecal Samples Collected

Host species	Number examined
Cattle	90
Goats	80
Sheep	60
Pigs	70
Dogs	50
Human	70
TOTAL	420

Sample Collection and Laboratory Analysis

Fresh faecal samples were collected using sterile universal containers and transported in ice packs to the Veterinary Parasitology Laboratory.

Detection of *Cryptosporidium* spp.

Modified Ziehl–Neelsen. staining technique was used for detection of *Cryptosporidium* oocysts.

Detection of *Giardia duodenalis*

Zinc sulphate flotation and direct wet mount techniques were employed for identification of *Giardia* cysts and trophozoites.

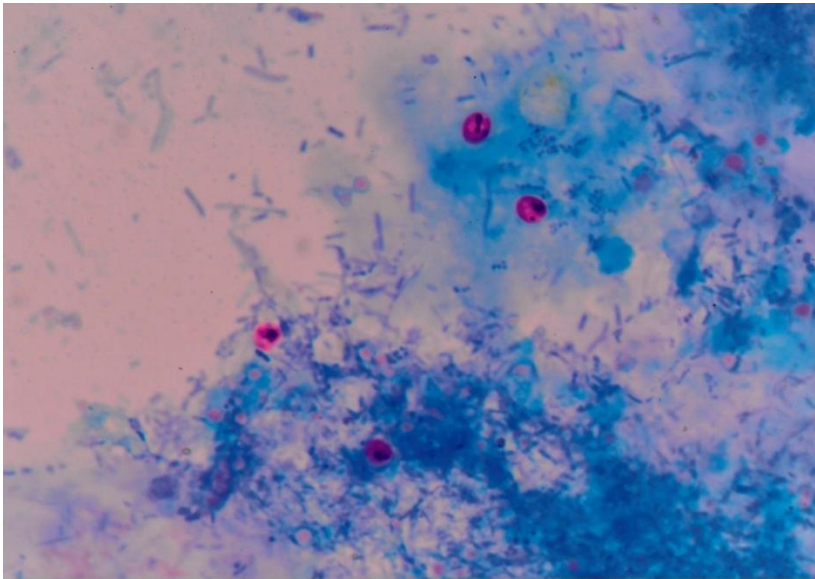


Figure 2: Diagnostic Morphology

Questionnaire Survey

Structured questionnaires were administered to livestock owners and households to collect information on:

- Water source
- Sanitation practices
- Animal management system
- Diarrhoeal history
- Veterinary care access
- Hygiene practices

Statistical Analysis

Data were analyzed using SPSS version 25. Chi-square tests and logistic regression analyses were used to determine associations between risk factors and infection prevalence at 95% confidence interval.

RESULTS

Overall Prevalence

The result as presented in Table 2 revealed that, out of 420 samples examined, 76 samples were positive for *Cryptosporidium* spp. (18.1%) while 61 samples were positive for *Giardia duodenalis* (14.5%). Studying host specie on the other hand, the result indicated that, dogs had the highest prevalence (18.0%) followed by Human (17.1%) and Pigs (15.7%) with sheep having the lowest (11.7) prevalence of Giardiasis. Cryptosporidiosis on the other hand, the result showed that cattle (22.2%) had the highest prevalence followed by pigs (20.0%) and the least was recorded for sheep (15.0%).

Table 2: Prevalence According to Host Species

Host species	Number examined	<i>Cryptosporidium</i> positive (%)	<i>Giardia</i> positive (%)
Cattle	90	20(22.2)	12(13.3)
Goats	80	13(16.3)	10(12.5)
Sheep	60	9(15.0)	7(11.7)
Pigs	70	14(20.0)	11(15.7)
Dogs	50	8(16.0)	9(18.0)
Human	70	12(17.1)	12(17.1)

Young animals showed significantly higher infection rates, likely due to immature immune systems and increased environmental exposure. Similar observations have been reported in sheep and cattle studies conducted in southwestern Nigeria (Obianuju, 2021).

Table 3: Age-related Prevalence

Age Group	Examined	Positive for <i>Cryptosporidium</i> (%)	Positive for <i>Giardia</i> (%)
Young	180	45(25.0)	34(18.9)
Adult	240	31(12.9)	27(11.3)

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

Table 4 revealed that several management and environmental factors were significantly associated with the occurrence of *Cryptosporidium* spp. and *Giardia duodenalis* infections in the study area, as all identified factors had p-values less than 0.05, indicating statistically significant associations. Untreated water use had an odds ratio (OR) of 3.0, suggesting that animals or households using untreated water were three times more likely to acquire infection compared to those using treated or clean water sources. This finding agrees with previous reports that contaminated drinking water serves as one of the major transmission routes for both *Cryptosporidium* oocysts and *Giardia* cysts because the infective stages survive for long periods in water environments. The result also supports findings from several epidemiological studies in developing countries where inadequate access to potable water increased protozoal enteric infections among humans and livestock. Contaminated streams, ponds, and shallow wells commonly used in rural communities may therefore contribute greatly to transmission in Umunneochi.

Open defecation showed the highest odds ratio (OR = 4.1), indicating that respondents practicing open defecation were over four times more likely to experience infection. This strong association may be due to environmental contamination of soil, pasture, and water with infective cysts and oocysts shed in feces. Similar observations were reported in systematic reviews where lack of toilet facilities and open defecation significantly increased the risk of cryptosporidiosis in low and middle-income countries. Open defecation facilitates direct fecal-oral transmission and promotes contamination of grazing fields and communal water sources used by animals and humans.

Extensive management system was also significantly associated with infection (OR = 2.9). Animals reared extensively often roam freely in contaminated environments and share water points and grazing fields with other infected animals, thereby increasing exposure to infective stages of the parasites. Free-range management also encourages contact between livestock, wildlife, and contaminated environmental materials. Previous studies have shown that animal contact and poor biosecurity practices are important epidemiological factors in the spread of *Cryptosporidium* and *Giardia* infections. The extensive husbandry system commonly practiced in rural Nigeria may therefore enhance environmental dissemination of protozoan cysts and oocysts.

Poor housing sanitation had an odds ratio of 3.2, indicating a strong relationship between unhygienic housing conditions and infection occurrence. Accumulation of fecal matter, poor drainage systems, and inadequate cleaning practices create suitable conditions for persistence and transmission of infective stages. Environmental contamination has been recognized as a major factor sustaining

Cryptosporidium and *Giardia* infections in endemic communities. Poor sanitation around animal pens and household surroundings may therefore contribute to repeated exposure and reinfection.'

Overcrowding was another significant risk factor (OR = 2.7). Overcrowded animal housing or human settlements facilitate close contact and rapid spread of infectious agents through contaminated feces, feed, water, and surfaces. Similar findings were reported in previous studies where overcrowded living conditions significantly increased the prevalence of *cryptosporidiosis* and *giardiasis*. High stocking density in livestock management systems may enhance transmission because infected animals continuously shed large numbers of oocysts and cysts into the environment.

Overall, the findings of this study demonstrate that poor sanitation, unsafe water sources, open defecation, overcrowding, and extensive livestock management practices are major epidemiological drivers of *Cryptosporidium* spp. and *Giardia duodenalis* infections in Umunneochi area of Abia State. These observations emphasize the importance of improved hygiene, provision of safe drinking water, proper waste disposal, and better animal management systems in reducing the burden of zoonotic enteric protozoan infections.

Table 4: Risk Factors Associated with Infection

Risk factor	Odds Ratio	P-value
Untreated water use	3.8	<0.05
Open defecation	4.1	<0.05
Extensive management	2.9	<0.05
Poor housing sanitation	3.2	<0.05
Overcrowding	2.7	<0.05

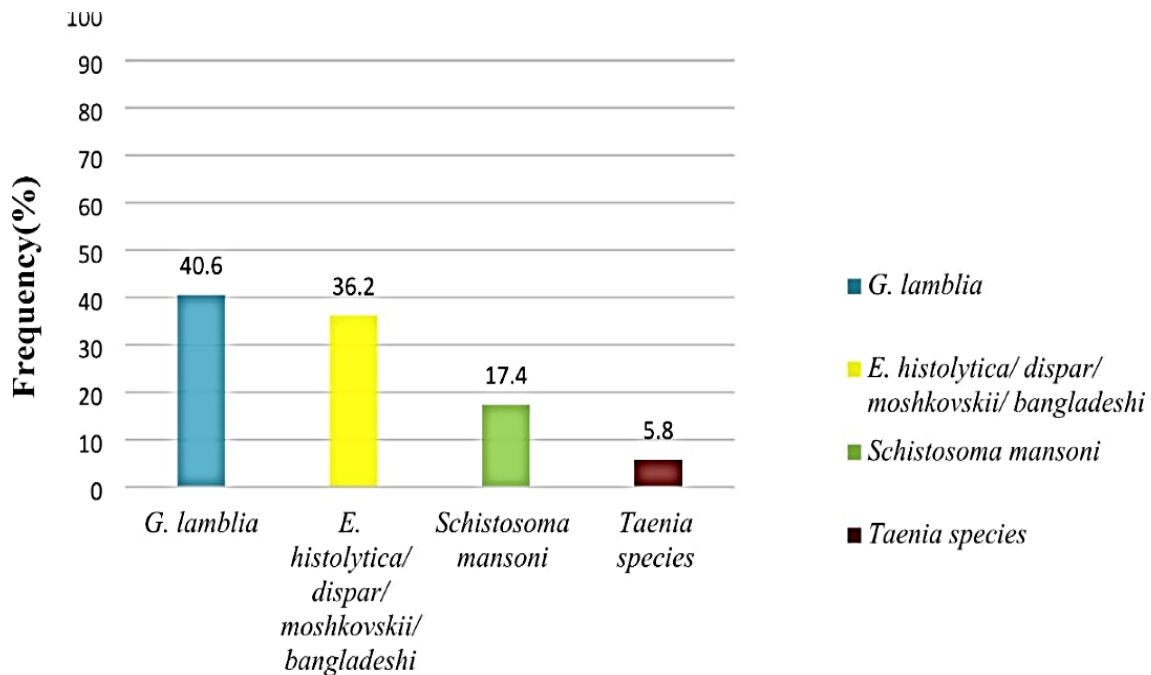
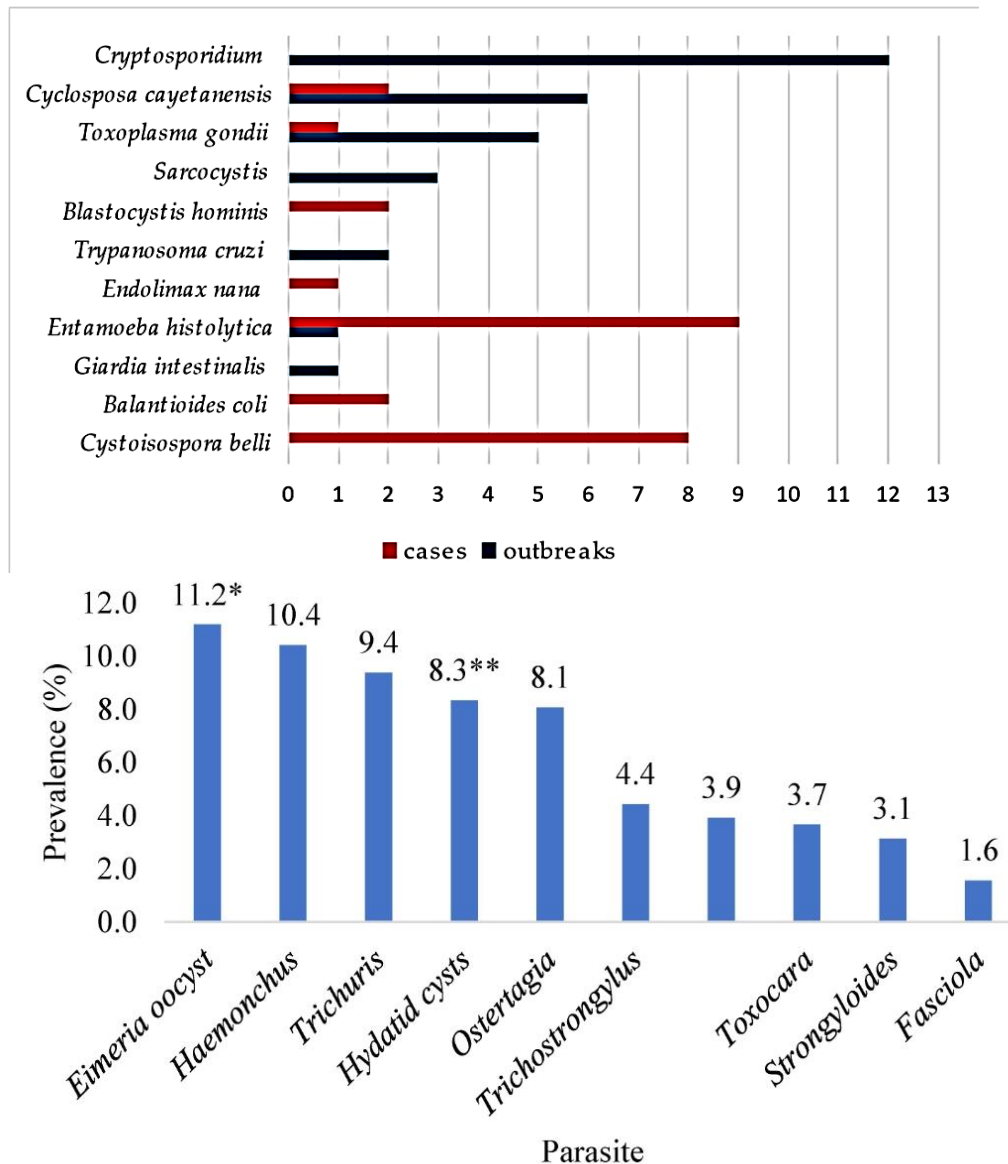


Figure 3: Epidemiological Charts and Spatial Distribution



DISCUSSION

The prevalence of *Cryptosporidium* spp. recorded in this study (18.1%) confirms active transmission within Umunneochi communities and is comparable to reports from Ogun, Kwara, and Enugu States, Nigeria (Chukwu, 2019). The detection of infections among humans indicates zoonotic transmission potential, particularly in households practicing poor sanitation and extensive livestock rearing. Water contamination remains a major transmission route for both parasites.

The occurrence of *Giardia duodenalis* alongside *Cryptosporidium* spp. suggests environmental contamination of water sources and shared transmission pathways. Poor waste disposal systems and close human-animal contact further contribute to parasite dissemination. The findings support previous Nigerian epidemiological reviews indicating that cryptosporidiosis remains underdiagnosed despite its considerable public health importance (Odeniran and Ademola, 2019).

Public Health and Veterinary Importance

The economic and health implications of these infections include:

- Reduced livestock productivity
- Weight loss and poor growth in animals



- Increased treatment costs
- Diarrhoeal diseases in children
- Waterborne outbreaks
- Occupational exposure among livestock handlers

The diseases therefore represent important One Health concerns requiring integrated control measures.

CONCLUSION AND RECOMMENDATION

This study demonstrated that *Cryptosporidium* spp. and *Giardia duodenalis* are endemic in Umunneochi Area of Abia State, Nigeria. Poor sanitation, contaminated water sources, and extensive livestock management systems significantly contribute to transmission.

The presence of infection in both humans and domestic animals highlights the zoonotic importance of these parasites and the need for coordinated veterinary and public health interventions. Based on the result of this study, the following recommendation were made:

- Improve access to potable water in rural communities.
- Promote proper sanitation and hygienic practices.
- Encourage routine veterinary screening of livestock.
- Educate livestock owners on zoonotic disease prevention.
- Implement integrated One Health surveillance programs.
- Improve environmental waste management systems.
- Encourage confinement and improved housing of domestic animals.

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