Comparative Analysis on Prevalence of Gastrointestinal Parasites in Cattle, Sheep, and Goats in Kano Metropolis, Nigeria

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Gastrointestinal parasites pose a major health challenge to livestock worldwide, resulting in decreased productivity, economic losses, and compromised animal welfare. In tropical regions like Nigeria, the transmission of these parasites is worsened by poor management practices and environmental conditions. This study aimed to investigate the prevalence and comparative distribution of gastrointestinal parasites in cattle, sheep, and goats within Kano Metropolis, Nigeria. A total of 384 fecal samples (128 from each species) were collected using a stratified random sampling technique. The samples were analyzed using standard parasitological methods, including the direct wet mount and formol-ether concentration techniques. The overall prevalence was 89.3% (95% CI: 85.8–92.0), with cattle showing the highest prevalence (95.3%; 95% CI: 90.2–97.8), followed by sheep (91.4%; 95% CI: 85.3–95.1) and goats (81.3%; 95% CI: 73.6–87.1). Chi-square analysis showed a statistically significant difference in prevalence between cattle and goats (p < 0.001) and between sheep and goats (p = 0.011), but not between cattle and sheep (p = 0.152). Nematodes were the most dominant group, followed by protozoa and trematodes. The study highlights the widespread burden of gastrointestinal parasites in Kano livestock and the urgent need for improved parasite control measures.

Keywords: *Gastrointestinal Parasites, Prevalence, Cattle, Sheep, Goats, Kano Metropolis.*

1. INTRODUCTION

Cattle, sheep, and goats are critical to the socioeconomic welfare of many developing countries, including Nigeria, where over 80% of the livestock is managed by smallholders and traditional groups [8]. However, low productivity due to diseases, especially gastrointestinal parasite infections, has led to a decline in the benefits derived from these animals [12], [8]. These parasites, which include nematodes, cestodes, and protozoa, negatively affect the health, productivity, and economic viability of ruminant livestock, leading to reduced weight gain, lower milk production, and increased susceptibility to other diseases [9], [13].

The epidemiology of GIT parasites in ruminants is influenced by host factors, grazing behavior, environmental conditions, and management practices [7]. Nematodes such as *Haemonchus contortus*, *Trichostrongylus spp.*, and *Oesophagostomum spp.* are particularly important because of their pathogenicity and ability to cause anemia, reduced productivity, and high mortality in small ruminants [15]. Protozoan parasites including *Eimeria spp.* are common in intensively managed systems, while trematodes such as *Fasciola spp.* and *Schistosoma spp.* remain important in areas with abundant water sources [3], [4].

Recent studies across Nigeria have reported high prevalence of GIT parasites in ruminants, but regional and species-specific differences persist. For example, Mohammed *et al.,* [11] reported high nematode prevalence in Borno State abattoirs, while Akeju *et al.,* [2] found

significant variation in parasite occurrence among goat breeds in Ondo State. Similarly, studies in southeastern Nigeria revealed a 40% occurrence in small ruminants, dominated by *strongyles* [3]. These differences highlight the need for localized epidemiological data to inform control programs.

Despite the known impact of these parasites, there is a significant knowledge gap regarding their comparative prevalence in cattle, sheep, and goats within Kano Metropolis. Previous studies in Nigeria have often focused on only one or two livestock types in specific regions without a comprehensive comparative analysis [12], [13]. This lack of data hinders the development of effective control measures. This study addresses this gap by assessing and comparing the prevalence and diversity of gastrointestinal parasites in cattle, sheep, and goats in Kano Metropolis. By identifying the most prevalent parasites in each species, the research provides crucial information for veterinarians and farmers to implement more effective, tailored management practices.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted within Kano Metropolis, the largest urban center in northern Nigeria. The metropolis is characterized by a high human and animal population density, with a significant number of traditional livestock rearers. The climate is semi-arid, with distinct wet and dry seasons, which can influence the seasonal prevalence and transmission of gastrointestinal parasites. Fecal samples were collected from various farms and animal markets within the metropolis, ensuring a broad representation of the livestock population [12]..

2.2 Study Design and Sample Collection

A cross-sectional study was conducted between November 2024 and February 2025. A total of 384 fecal samples were collected using a stratified random sampling technique. This involved collecting 128 samples from each of the three animal species: cattle, sheep, and goats. Samples were collected directly from the rectum of the animals to avoid environmental contamination. Each sample was placed in a labeled sterile universal bottle, stored in a cooler box with ice packs, and transported immediately to the Department of Biological Sciences laboratory at Northwest University Kano for processing.

2.3 Laboratory Examination

Two standard parasitological methods were employed: the direct wet mount and the formol-ether concentration techniques [1], [10], [16]. Identification of parasites was performed microscopically using morphological keys.

2.3.1. Direct Wet Mount:

A small portion of the fecal sample was mixed with a drop of saline solution on a glass slide, covered with a coverslip, and examined under a microscope. This technique was used for the rapid detection of motile protozoan trophozoites and helminth eggs.

2.3.2. Formol-Ether Concentration Technique

This method was used to concentrate parasite eggs, larvae, and cysts for easier identification. Approximately 1 gram of feces was emulsified in 10 ml of 10% formol-saline, sieved, and then centrifuged. After discarding the supernatant, 7 ml of 10% formol-saline and 3 ml of diethyl ether were added, and the mixture was centrifuged again. The resulting sediment was used to prepare a smear on a glass slide, which was then examined under a light microscope at both low (10x) and high (40x) power.

3. RESULTS

The study revealed an overall prevalence of 89.3% for gastrointestinal parasites across all sampled animals. The prevalence rates differed by species: cattle had the highest infection rate at 95.3%, followed by sheep at 91.4%, and goats at 81.3% (Table 1). The Chi-square analysis indicated a significant difference in prevalence between cattle and goats ($p < 0.001$) and between sheep and goats ($p = 0.011$). However, there was no significant difference in prevalence between cattle and sheep ($p = 0.152$). The analysis also showed no significant association between the host species and the parasite group type ($p = 0.183$).

Table 1. Prevalence of Gastrointestinal Parasites in Cattle, Sheep, and Goats.

Species	Number Examined	Number Infected	Prevalence (%)	95% CI
Cattle	128	122	95.3%	90.2–97.8
Sheep	128	117	91.4%	85.3–95.1
Goats	128	104	81.3%	73.6–87.1
Total	384	343	89.3%	85.8–92.0

Eggs/cysts of 13 parasite species were identified, belonging to three major phyla: Protozoa, Nematoda, and Platyhelminthes. Nematode species are the most dominant (Table 2)

Table 2. Phyla of Parasites Found in Cattle, Sheep, and Goats.

Parasite Group	Number of Species	Identified Species (Examples or Complete List)
Protozoa	2	*Giardia lamblia, Eimeria spp.,*
Nematoda	7	*Haemonchus contortus, Toxocara spp., Strongyloides spp., Nematodirus spp., Dictyocaulus spp., Trichuris spp., Hookworm spp.*
Cestodes	1	*Moniezia spp.*
Trematodes	3	*Schistosoma spp., Dicrocoelium spp., Fasciola spp.*

The total number of parasites identified was highest in sheep, followed by cattle, and lowest in goats (Table 3). A chi-square test was conducted to evaluate whether the distribution of intestinal parasite groups (Protozoa, Nematodes, and Platyhelminthes) varied significantly across host species (cattle, sheep, and goats). The results were as follows: $\chi^2 = 3.98$, df = 4, p = 0.408. This indicates no significant variation in parasite species distribution across host species (p > 0.05).

Table 3. Distribution of Individual Parasite Species by Host.

Host Species	Parasite Type	Most Prevalent Parasite Species	Number of Cases
Sheep	Protozoa	*Giardia lamblia*	64
	Nematoda	*Toxocara spp.*	29
Goats	Protozoa	*Eimeria spp.*	54
	Platyhelminthes	*Fasciola spp.*	10
Cattle	Protozoa	*Giardia lamblia*	42
	Nematoda	*Toxocara spp.*	27

4. DISCUSSION

The high overall prevalence of gastrointestinal parasites (89.3% 95% CI: 85.8–92.0) observed in this study is a major concern and is consistent with the findings from other regions of Nigeria and tropical environments [12] [13]. This high parasite burden can be attributed to several factors, including the favorable climatic conditions in Kano, which provide an ideal environment for the survival and development of parasite eggs and larvae. The semi-arid climate with distinct wet and dry seasons, along with poor sanitary practices, significantly contributes to the high prevalence [12].

The narrow confidence intervals for cattle (90.2–97.8%) and sheep (85.3–95.1%) suggest precise prevalence estimates, whereas the wider interval in goats (73.6–87.1%) indicates greater variability, reflecting browsing feeding habits and reduced pasture exposure compared to cattle and sheep. The significant differences between goats and the other two species highlight species-specific epidemiology. Similar patterns were reported in Zamfara and Borno States where small ruminants showed varying susceptibility to nematodes [15], [11]. Nematodes dominated in this study, particularly *Haemonchus contortus*, which is highly pathogenic and widely reported in Nigerian livestock [7], [9]. Recent surveys in Ondo and Enugu States also found *strongyles* as the most prevalent parasites in small ruminants [2], [3]. The presence of protozoa (*Eimeria spp.* and *Giardia lamblia*) and trematodes (*Fasciola spp.* and *Schistosoma spp.*) indicates diverse transmission pathways, including contaminated water bodies that sustain trematode cycles in semi-arid northern Nigeria [4]. These findings emphasize the complexity of parasite epidemiology in ruminants under mixed management systems.

Limitations include reliance on morphological identification, which may misclassify parasites; and the cross-sectional design that excluded seasonal variation. On the other hand, while chi-square testing and confidence intervals strengthen reporting, advanced multivariable modeling would better capture host and environmental risk factors [8], [14].

The findings from this study fill a critical knowledge gap regarding the comparative prevalence of gastrointestinal parasites in different livestock species within Kano Metropolis. This information is vital for the development of effective, targeted control and prevention strategies. The high prevalence and diversity of parasites necessitate urgent action to reduce economic losses and improve animal welfare.

5. Conclusion

This study successfully conducted a comparative analysis of gastrointestinal parasites in cattle, sheep, and goats in Kano Metropolis, revealing a high overall prevalence of 89.3% across all species. The highest infection rate was found in cattle, followed by sheep and goats. A total of 13 parasite species were identified. Nematodes were the most dominant group across species, although protozoa and trematodes were also detected. The study also identified both shared and host-specific parasites.

6. Recommendations

Based on these findings, the following recommendations are made:

i. Veterinary authorities and livestock owners should implement regular deworming schedules using broad-spectrum anthelmintics.

ii. Strict sanitary measures, including proper disposal of animal waste and regular cleaning of animal shelters, should be adopted to reduce environmental contamination.

iii. Community-based campaigns should be conducted to educate livestock owners on the dangers of parasitic infections and the importance of early detection and control.

iv. Animals should be given access to clean feed and water to prevent the ingestion of infective parasite stages.

v. Molecular diagnostics (PCR, sequencing) should be incorporated in future studies for precise species identification.

Abbreviations

GIT	Gastrointestinal Tract
CI	Confidence Interval

Conflicts of Interest

The authors declare that there were no conflicts of interest during the research and regarding the publication of this manuscript.

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