

ORIGINAL RESEARCH

Prevalence of Gastrointestinal Parasites in Sheep in Selected Markets in Lokoja, Kogi State, Nigeria

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ABSTRACT

Gastrointestinal parasitic infections is a major challenge to sheep production in Nigeria. This study investigated the prevalence and intensity of gastrointestinal parasites in sheep marketed within Lokoja, Kogi State, Nigeria. A total of 100 sheep were randomly sampled from four major markets, namely Ganaja, Felele, Old Market, and New Market. Fresh fecal samples were collected and examined using standard formol-ether concentration and sedimentation techniques, followed by microscopic identification of parasite eggs, oocysts, and larvae. The overall prevalence of gastrointestinal parasitic infection was 66.0%. Seven parasite species were identified, and these were *Eimeria spp.*, *Strongyloides papillosus*, *Trichostrongylus spp.*, *Haemonchus contortus*, *Moniezia spp.*, *Trichuris ovis*, and *Paramphistomum spp.* Parasite intensity were high for *Eimeria spp.*, *Trichostrongylus spp.*, and *Strongyloides papillosus*, but moderate for *Haemonchus contortus*, and lowest for *Moniezia spp.* and *Trichuris ovis*. Pearson's Chi square analysis revealed a significant association between infection prevalence and gender, with male sheep showing a higher prevalence than females ($p = 0.004$). No significant statistical associations were observed between infection rate and breed, age category, or sampling location ($p > 0.05$). The findings confirm that gastrointestinal parasitism remains widespread among sheep in Lokoja, with mixed infections commonly occurring and capable of impairing productivity. The study underscores the need for improved parasite surveillance and appropriate control measures to enhance sheep health and productivity.

Keywords: Gastrointestinal parasites, Sheep, Prevalence, Parasite intensity, Lokoja

INTRODUCTION

Small ruminants constitute a vital segment of livestock agriculture due to their contribution to food security and rural economies. They serve as a source of animal protein, raw materials for textile production, and organic waste useful for soil fertility enhancement (Abdullahi *et al.*, 2020; Agba *et al.*, 2020; Paul *et al.*, 2021).

Ruminants such as sheep possess biological hardiness enabling them to thrive under extensive management systems and fluctuating environmental conditions, thereby encouraging their widespread rearing across diverse agro ecological zones (Kaplan, 2020; Adeyemi *et al.*, 2021). In many developing countries, sheep farming supports household sustenance and income generation while also supplying animals for local markets and cultural activities (Sharma *et al.*, 2023; Baker *et al.*, 2021).

Sustainable sheep production is, however, persistently undermined by health challenges, among which gastrointestinal parasitism is of major concern (Nwosu *et al.*, 2021). These parasitic infections are widespread in grazing systems and are commonly introduced into the host through exposure to contaminated pasture, water sources, or environments harboring infective stages, with certain species capable of penetrating intact skin (Kassa *et al.*, 2021; Maphosa *et al.*, 2022; Maqbool *et al.*, 2021). Once established, gastrointestinal parasites disrupt nutrient absorption and physiological balance, leading to stunted growth and decreased feed efficiency, lowered meat and milk productivity, anemia, and increased susceptibility to other diseases (Abdullahi *et al.*, 2020). Heavy parasite burdens may ultimately result in death, especially in young or immunocompromised animals (Inegbenosun *et al.*, 2021; Nwosu *et al.*, 2021).

Gastrointestinal parasitism in sheep also imposes significant economic losses on sheep farmers through treatment costs. Expenditure on anthelmintics, veterinary services, and preventive measures increases production costs, and the impact of gastrointestinal parasites in the animals could lead to reduced animal performance which ultimately results in limited financial returns (Dominik *et al.*, 2020; Gantuya *et al.*, 2022). Furthermore, the involvement of zoonotic parasite species introduces an additional layer of risk, as infected animals may serve as reservoirs for human infection, particularly among herders and abattoir workers (Idris, 2024; Charlier *et al.*,

2020). Effective mitigation of these impacts requires detailed epidemiological knowledge to guide targeted control programs.

MATERIALS AND METHODS

Study Population and Sample Size

The study was conducted within Lokoja metropolis, the capital of Kogi State, Nigeria, which lies within the guinea savannah belt and is approximately between latitudes 7°48'N and 7°52'N and longitudes 6°44'E and 6°46'E. The metropolis exhibits a relatively high population density compared with surrounding rural settlements, owing to its status as a state capital and a major transit hub linking northern and southern Nigeria. This concentration of human populations, commercial activities, and livestock movements creates close interactions between animals, humans, and the environment, factors that are relevant to the transmission dynamics of parasitic infections.

Four communities (Felele, Ganaja Village, Old Market, and Zango) were purposely selected for the study due to the active livestock and human activities within these communities. The sample size of 100 was calculated using the method described by Michael Thrusfield (2007) for estimating prevalence in epidemiological studies. So, based on a previously reported prevalence of 69% by Atikum *et al.* (2021) a margin of error of 9% was applied to ensure statistical reliability.

Sample Collection and Laboratory Analysis

Fecal samples were obtained directly from the rectum of each sheep or immediately after defecation to prevent contamination from the environment (Mohamed *et al.*, 2024). During collection, detailed information on the animal's age, sex, breed, and sampling location was recorded. Each sample was placed in a clean, appropriately labeled container and transported to the Zoology Laboratory at the Federal University Lokoja in a cooler box to preserve sample integrity prior to analysis.

Approximately three grams of fecal material from each sample were processed using simple sedimentation and formalin–ether concentration techniques as described by Mohamed *et al.* (2024). Samples were emulsified in physiological saline, filtered through cheesecloth, and centrifuged to concentrate eggs, oocysts or larvae. The resulting sediments were examined microscopically at 10× and 40× magnifications, with identification of parasite stages based on morphological characteristics following standard parasitological keys (Gantuya *et al.*, 2022).

Data Analysis

All data were recorded in Microsoft Excel and subsequently analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 27. Prevalence of gastrointestinal parasites was calculated as percentages while mean parasite intensity for each species was calculated by dividing the total parasite count by the number of infected sheep.

RESULTS

Out of the one hundred sheep examined for intestinal parasites, 66 (66%) animals tested positive (Table 1). The highest prevalence of infection was recorded in Old Market (72%) and Zango, (72%) of sheep infected, followed by Felele (64%), and Ganaja Village (56%) [Table 1].

However, Chi-square analysis indicated that these differences were not statistically significant ($\chi^2 = 0.88$, $p = 0.830$).

Table 1: Prevalence of Gastrointestinal Parasites in Sheep by Locations

Location	No. Examined	No. Positive (%)	No. Negative (%)	χ^2	P-value
Felele	25	16(64.0)	09(36.0)	0.88	0.83
Ganaja	25	14(56.0)	11(44.0)		
Old Market	25	18(72.0)	07(28.0)		
Zango	25	18(72.0)	07(28.0)		
Total	100	66(66.0)	34(34.0)		

The three breeds of sheep identified during the study were: Balami, Yankasa, and Uda. The prevalence of infection amongst breed appeared: Yakasa [67.4%], Balami [66.7%], Uda (Table 2) and Chi-square analysis showed no statistically significant association between breed and rate of gastrointestinal parasite infection ($\chi^2 = 0.127$, $p = 0.939$).

However, sex showed a significant association with parasite prevalence ($\chi^2 = 8.236$, $p = 0.004$). Out of the 66 male sheep examined, 75.8% were infected whereas only 47.0% females harboured gastrointestinal parasites (Table 2). Age-related analysis indicated that, among sheep younger than one year (<1 year), 63.3% were infected and in contrast, sheep older than one year (>1 year) recorded a prevalence of 70.6%. Although infection appeared slightly higher in the older age group, the difference was not statistically significant ($\chi^2 = 1.51$, $p = 0.68$).

Table 2: Parasitic Infections According to Host Factors

Host Factors	No. Examined	No. Positive (%)	No. Negative (%)	χ^2	P-value
Age					
<1year	49	30(63.3)	19(36.7)	1.51	0.68
>1year	51	36(70.6)	15(29.4)		
Total	100	66(66.0)	34(33.0)		
Breed					
Balami	24	16(66.7)	8(33.3)	0.12	0.94
Uda	33	21(63.6)	12(36.4)		
Yankasa	43	29(67.4)	14(32.6)		
Total	100	66(66.0)	34(34.0)		
Gender					
Male	66	51(75.8)	13(24.2)	8.23	0.00
Female	34	16(47.0)	20(53.0)		
Total	100	66(66.0)	34(34.0)		

Seven parasite species were identified: *Eimeria spp.* (Plate 1), *Strongyloides papillosus* (Plate 2), *Trichostrongylus spp.*, *Haemonchus contortus*, *Moniezia spp.*, *Trichuris ovis* (Plate 3), and *Paramphistomum spp* (Plate 4) [Table 3]. *Eimeria spp.*(253), *Trichostrongylus spp.*(191), and *Strongyloides papillosus* (135) recorded higher parasite counts when compared to *Moniezia spp.*(22) and *Trichuris ovis* (08) [Table 3]. Consequently, *Eimeria spp.*, *Strongyloides papillosus*, and *Trichostrongylus spp.* recorded the highest mean egg counts ($\approx 5-6$ eggs per gram) with *Haemonchus contortus* showing moderate intensity (≈ 5 epg), *Moniezia spp.* and *Trichuris ovis* were lowest (1–2 epg) [Table 3].

Table 3: Intensity of Gastrointestinal Parasites in Goats in Lokoja

Parasite species	Total parasite count	No. of Infected Goats	Intensity
<i>Strongyloides papillosus</i>	135	24	5.6
<i>Eimeria spp.</i>	253	43	5.9
<i>Trichostrongylus spp.</i>	191	34	5.6
<i>Haemonchus contortus</i>	64	12	5.3
<i>Moniezia spp.</i>	22	09	2.4
<i>Trichuris Trichiura</i>	08	08	1.0
<i>Paraphistomum</i>	13	04	3.3



Plate 1: *Eimeria spp.* Egg

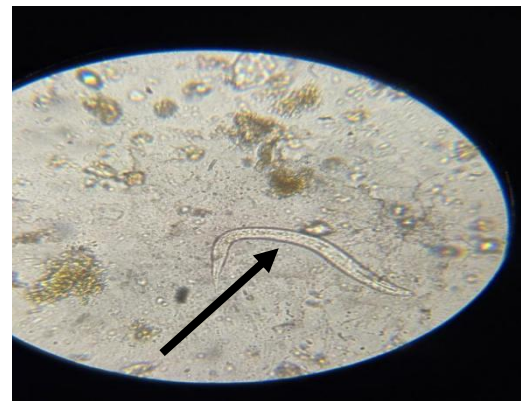


Plate 2: *Strongyloides papillosus* Larva



Plate 3: *Trichuris ovis*

Plate 4: *Paraphistomum spp*

DISCUSSION

The high infection rate observed in the study highlights a considerable parasitic burden within the animal population. This level of infection is similar to the 64.2% reported in Kwara State by Adeyemi et al. (2021) and the 67.1% observed in Plateau State by Terfa et al. (2023). However, higher prevalence rates have been reported in Nsukka (82.5%) (Eke, et al 2019), while lower rates have been documented in Edo State (55.3%) (Inegbenosun *et al.*, 2021).

The absence of statistically significant variation in the prevalence of gastrointestinal parasites across the sampled markets indicates a relatively uniform distribution of infection among sheep populations in Lokoja. Although Ganaja recorded a lower prevalence (56%) compared to Old Market and Zango (72%), these differences were not statistically significant and therefore do not establish spatial variation in infection risk. The observed numerical differences may reflect underlying environmental or management-related factors (Maqbool *et al.*, 2021).

Breed did not also show a statistically significant association with infection prevalence, suggesting comparable susceptibility among the breeds examined. Although the Yankasa breed recorded a slightly higher prevalence (67.4%), this difference was not statistically significant and does not indicate a distinct breed-related predisposition. Research by Maqbool *et al.* (2021) have associated variations in parasite burden with genetic and immunological factors among sheep breeds.

Age-related differences in prevalence were also not statistically significant, despite higher infection rates observed in older sheep (>1 year) compared to younger animals (<1 year). This pattern may be indicative of cumulative exposure; however, within the framework of the present findings, age cannot be considered a determining factor even though previous studies have

suggested that younger animals may exhibit increased susceptibility due to underdeveloped immunity (Kassa *et al.*, 2021). In contrast, sex was significantly associated with parasitism and this could be attributed to behavioral differences, including wider grazing ranges and more aggressive feeding of males, while females may have restricted movement during gestation and lactation (Rose *et al.*, 2020).

Among the gastrointestinal parasites identified, *Eimeria* spp. Seemed to be the most predominant, followed by *Trichostrongylus* spp. and *Strongyloides papillosus*, while *Moniezia* spp. and *Trichuris ovis* occurred less frequently. The distribution of these parasite species remained relatively consistent across location, breed, age, and sex, indicating a broadly uniform pattern of occurrence within the study population. This observed pattern is consistent with findings reported in Plateau State (Terfa *et al.*, 2023), where cestodes and whipworms were similarly less prevalent, a trend often associated with environmental constraints affecting the survival and transmission of their intermediate hosts. The predominance of *Eimeria* spp. and strongyle-type nematodes also corresponds with the observations of Idris (2024), who reported that these parasite groups are well adapted to prevailing tropical conditions, which support their persistence and transmission.

Overall, these findings highlight the significant impact of gastrointestinal parasites on sheep production, including potential reductions in growth, feed efficiency, reproductive performance, and survival, particularly under mixed infections. The study underscores the importance of integrated control measures, including rotational grazing, improved hygiene, and targeted anthelmintic treatment, to reduce parasite loads and enhance flock health and productivity in Lokoja.

CONCLUSION

The study demonstrated that gastrointestinal parasitism is highly prevalent among sheep in Lokoja. Mixed infections were common, with *Eimeria spp.*, *Trichostrongylus spp.*, and *Strongyloides papillosus* being the most dominant in terms of prevalence and intensity. Gender emerged as a significant risk factor, with male sheep showing higher infection rates than females, while age, breed, and location had no significant influence. While the study provides valuable baseline data on parasite prevalence and intensity in the local sheep population, it was limited by the cross-sectional design and the relatively small sample size from selected markets, which may not fully capture seasonal or regional variations. Nonetheless, the findings underscore the substantial effects of gastrointestinal parasites on sheep health, productivity, and the associated economic and welfare outcomes for farmers. Effective parasite control in the region requires integrated strategies, including improved hygiene, rotational grazing, targeted monitoring of susceptible animals, and strategic use of anthelmintics. Implementing such measures is essential for sustaining flock health, enhancing productivity, and supporting the livelihoods of sheep farmers in Lokoja.

AUTHOR'S CONTRIBUTION

Okunola, J.V: Conceptualization, methodology, data curation, original draft preparation. Audu,

H.O: Data curation, final review, and final editing.

CONFLICT OF INTEREST

The authors declare they have no competing interest.

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