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Prevalence of Gastrointestinal Helminth Eggs/Oocysts in Faeces of Ruminants Slaughtered in Sabon Gari Local Government Area, Kaduna State, Nigeria

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ABSTRACT

Ruminants, including cattle, sheep, and goats, are an essential source of animal protein for many Nigerians. However, gastrointestinal parasites pose a significant challenge in ruminant production in developing countries, leading to considerable economic losses. This study aimed to determine the prevalence of gastrointestinal helminth eggs and oocysts in ruminants slaughtered in Sabon Gari Local Government Area, Kaduna State, Nigeria. A total of 150 samples were collected, processed by a simple fecal flotation technique, and examined for helminth eggs and oocysts. Additionally, portions of each sample were processed using the formal-ether concentration technique, with smears stained by the modified Ziehl–Neelsen technique to detect Cryptosporidium oocysts. The overall prevalence of gastrointestinal helminth eggs and oocysts in ruminants was 73.3%. By species, the prevalence was 76.2% in sheep, 72.2% in goats, and 74.0% in cattle. Coccidia was the most common parasite (46.7%), followed by Strongyles (24.7%), Cryptosporidium (17.3%), and Moniezia (11.3%). Coccidia prevalence was significantly higher in goats (p=0.004), while Cryptosporidium prevalence was significantly higher in cattle (p=0.000). There was no significant association between the prevalence of helminth eggs and oocysts and variables such as age, sex, breed, body condition scores, or fecal consistency of the sampled animals. Improved abattoir management practices, including the treatment of feces in septic tanks before discharge into streams or agricultural use, are highly recommended.

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INTRODUCTION

Numerous gastrointestinal (GIT) parasites are prevalent in cattle, sheep, and goats, with many species shared among these animals. The most impactful of these are helminths, including nematodes (roundworms), cestodes (tapeworms), and trematodes (flukes), which significantly affect the growth and reproductive health of ruminants [1]. Intestinal nematodes, which parasitize the abomasum, small intestine, and large intestine, are a major group affecting ruminants. Infections are primarily acquired through contaminated food and water, a risk that is worsened by inadequate hygiene practices [2]. Intestinal helminthiasis has long been recognized as a critical issue in livestock management, with many infected animals showing only mild or asymptomatic infections, often leading to delayed diagnosis until severe clinical signs appear [3].

Protozoa, a diverse group of single-celled organisms, include over 65,000 known species, many of which exist as free-living forms or harmless commensals. However, some protozoan species are responsible for significant parasitic diseases affecting humans and animals globally [4]. In ruminants, protozoa primarily reside in the stomach and intestines, with most being non-pathogenic. However, certain protozoan species, such as Eimeria (causing coccidiosis in young ruminants), Cryptosporidium parvum (causing cryptosporidiosis in various mammals including humans), and Toxoplasma gondii (causing toxoplasmosis, which can lead to abortion and fetal abnormalities in sheep and humans), are notable pathogens [5,6,7]. Cryptosporidiosis, caused by Cryptosporidium, is typically a self-limiting gastroenteritis, with infection rates higher among children under five [8].

Transmission of these infections primarily occurs via the direct animal-to-animal fecal-oral route, facilitated through behaviors such as grooming, nuzzling, coprophagy, and fecal contact with infected animals [9]. The gastrointestinal parasites mainly helminthes and some protozoans are responsible for clinical and subclinical diseases of livestock and this has been a major constraint to livestock production in Nigeria [10]. These gastrointestinal parasites have caused direct production loss to livestock and indirectly by retarding the growth, lowering productivity and increasing susceptibility of animals to other infections [11]. Other indirect economic losses include lowered fertility, reduced work capacity, involuntary culling and treatment cost [11]. Due to lower weight gain and mortality, intestinal nematodes may be detrimental to infected animals and result in economic losses [12,13]. A study conducted in Nigeria estimated that carcass and viscera condemnation due to parasitic diseases in slaughtered cattle in Kwara State, North-central Nigeria, resulted in a total economic loss of US $304,133.82 (₦46,161,433) over a 16-year period reviewed [14]. In addition, pathogenic complications like anemia, diarrhea, edema, and recumbency are brought on by intestinal nematodes, which can result in hypoproteinemia, decreased digestive efficiency, and even death in lambs [15]. Reduced food intake, stunted growth, decreased labor capacity, treatment costs, and control are all associated with lower production [11].

Cattle are a major source of animal protein in Nigeria. It contributes more than seventy percent (70%) of total protein consumed. In Nigeria, majority of these cattle are in the hand of pastoralists who take their cattle on a free-range grazing and thus exposing them to various disease-causing agents including protozoans and parasitic helminthes. Small ruminants have a crucial socioeconomic role in traditional animal husbandry systems in many developing countries, including Nigeria, where small holders and other traditional groups own over 80% of the country's livestock [16]. Over 30% of the rural population is employed in the cattle industry, which generates approximately 17% of Nigeria's agricultural GDP, according to the National Bureau of Statistics [17]. However, benefits from these animals have recently fallen notably short of expectations because of their low production [18,19]. Therefore, this study was conducted to provide preliminary information on the prevalence of gastrointestinal helminth eggs/oocysts in faeces of ruminants slaughtered in Sabon gari local government area, Kaduna State.

MATERIALS AND METHODS

Study Area

The research was conducted in Sabon Gari L.G.A. of Kaduna State, Nigeria, located in the Northwest geopolitical zone at coordinates 11.164° N, 7.697° E. Sabon Gari L.G.A. is situated in northern Kaduna, near Zaria, and consists of rural, urban, and peri-urban settlements. The area falls within a tropical savanna climate zone, characterized by distinct wet and dry seasons.

Study Design and Sample Size

A cross-sectional study was conducted involving cattle, sheep and goats sourced from farms and an abattoir in Sabon Gari L.G.A. Convenience sampling was used, and for each animal, data on age, sex, breed, fecal consistency, and body condition score were recorded. A total of 150 fecal samples were collected over two months (May–June 2024).

Ethical Clearance and Consent

An ethical clearance was obtained from the Ahmadu Bello University Committee on Animal Use and Care (ABUCAUC). Samples were only collected with the farmers' consent and willingness to participate in the research.

Sample Collection

Approximately 5 grams of feces were collected directly from the rectum of each sheep or goat using a disposable polythene bag. Each sample was labeled and transported to the Helminthology Laboratory at the Department of Veterinary Parasitology and Entomology, Ahmadu Bello University, Zaria, for analysis.

Laboratory Procedures

Simple Fecal Floatation Technique

About three grams of feces were thoroughly mixed with 15 ml of flotation medium (Zinc sulphate solution at specific gravity 1.18g) in a centrifuge tube. The mixture was filtered and then topped with more flotation media to create a convex meniscus. A cover slip was placed on top, allowed to stand for 5 minutes, then removed and examined under a light microscope at 10x and 40x magnification for helminth eggs and oocysts

Formol-Ether Concentration Technique

Five grams of feces were mixed in 10 ml of 10% formalin. The homogenized feces were sieved into a centrifuge tube, and 3 ml of diethyl ether was added. The tube was corked, shaken, centrifuged at 5000 rpm, and the supernatant decanted. A thin smear of sediment was made on a clean slide and allowed to air-dry for further examination.

Modified Ziehl-Neelsen Technique

The air-dried smear was fixed with ethanol for 3 minutes, then stained with cold carbol fuchsin for 5 minutes, followed by 1% hydrochloric acid ethanol until decolorization ceased. After rinsing, the smear was counterstained with 0.25% methylene blue, rinsed again, air-dried, and examined microscopically at low magnification for oocysts.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Chi-square tests were used to determine associations between gastrointestinal helminth eggs/oocysts and variables like age, sex, breed, fecal consistency, and body condition score. For dichotomous variables, odds ratios (OR) and 95% confidence intervals were calculated to test the strength of association, with p-values ≤ 0.05 considered significant.

RESULTS

The overall prevalence of gastrointestinal helminth eggs and oocysts in ruminants slaughtered in Sabon Gari Local Government Area, Kaduna State, was found to be 73.3%. Among the species studied, cattle had a prevalence of 74.0%, sheep 76.2%, and goats 72.2%. There was no statistically significant association ($p > 0.05$) between the prevalence of gastrointestinal helminth eggs/oocysts and the specific species of animal sampled (Table 1).

Table 1. Prevalence of gastrointestinal helminth eggs and oocysts in ruminants slaughtered in Sabon Gari Local Government Area, Kaduna State.

Species of animal	Number Examined	Number Positive (%)	X^2	P
Sheep	21	16 (76.2)	0.155	0.925
Goat	79	57 (72.2)		
cattle	50	37 (74.0)		
Total	150	110 (73.3)		

Table 2 shows that *Coccidia* (Plate 1 and 2) was the most prevalent parasite at 46.7%, followed by *Strongyles* (24.7%) (Plate 4), *Cryptosporidium* (17.3%) (Plate 5), and *Moniezia* (11.3%) (Plate 3). The prevalence of *Coccidia* was significantly higher in goats ($p = 0.004$) than in other ruminant species, while *Cryptosporidium* was significantly higher in cattle ($p = 0.000$) compared to other species sampled.

Table 2. Distribution of gastrointestinal helminth eggs/oocysts among ruminants slaughtered in Sabon Gari Local Government Area, Kaduna State.

Species of animal	Number Examined	Number Positive (%)			
		Strongyle	***Moniezia***	***Coccidia***	***Cryptosporidium***
Sheep	21	8 (38.1)	3 (14.3)	7 (33.3)	4 (19.0)
Goat	79	18 (22.8)	7 (8.9)	47 (59.5)	5 (6.3)
Cattle	50	11 (22.0)	7 (14.0)	16 (32.0)	17 (34.0)
Total	150	37 (24.7)	17 (11.3)	70 (46.7)	26 (17.3)

Plate.1: Photomicrograph of sporulated *Coccidia* oocyst at Magn. ×40

Plate.2: Photomicrograph of unsporulated *Coccidia* oocyst at Magn. ×40

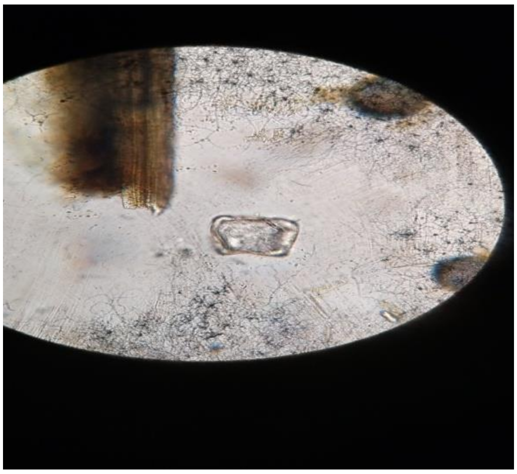

Plate.3: Photomicrograph of *Monezia* egg at Magn. ×40

Plate.4: Photomicrograph of *Strongyle* egg at Magn. ×40

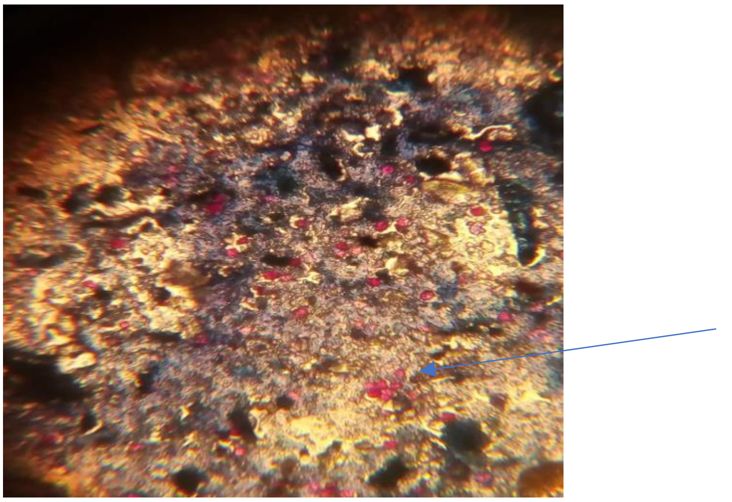

Plate 5: Photomicrograph of *Cryptosporidium* oocyst in cattle faeces. Arrows showing *Cryptosporidium* oocyst using modified Ziehl Nelseen staining method. Magn. ×40

Table 3 presents the prevalence distribution of gastrointestinal helminth eggs/oocysts based on age, sex, breed, body condition score, and fecal consistency. While the prevalence was slightly higher among young animals, males, Bunaji cross and Wadara breeds, animals in good body condition, and those with firm feces, no statistically significant association ($p > 0.05$) was observed between the prevalence and these factors.

Table 3. Distribution of gastrointestinal helminth eggs/oocysts based on age, sex, breed, body condition score, and fecal consistency among ruminants slaughtered in Sabon Gari Local Government Area, Kaduna State.

Variables	Category	No. examined	No. Positive (%)	X	P
Age of animal	< 6 months	20	16 (80.0)	0.524	0.469
	> 6 months	130	94 (72.3)		
Sex	Male	22	17 (77.3)	0.205	0.651
	Female	128	93 (72.7)		
Breed	Yankasa	3	2 (66.7)	6.019	0.645
	Uda	18	14 (77.8)		
	Kano Brown	14	12 (85.7)		
	Red Sokoto	33	24 (72.7)		
	Sahel	32	21 (65.6)		
	Bunaji	40	28 (70.0)		
	Bunaji Cross	7	7 (100.0)		
	Wadara	1	1 (100.0)		
	Bokolo	2	1 (50.0)		
Body condition score	Poor	19	13 (68.4)	1.841	0.606
	Medium	69	48 (69.6)		
	Good	54	43 (79.6)		
	Very good	8	6 (75.0)		
Nature of faeces	Watery	5	3 (60.0)	0.472	0.790
	Pasty	53	39 (73.6)		
	Firmly formed	92	68 (73.9)		
Total		150	110 (73.3)		

DISCUSSION

The findings of this study reveal a high overall prevalence (73.3%) of gastrointestinal helminth eggs and oocysts among ruminants slaughtered in Sabon Gari, Kaduna State. This high prevalence aligns with reports from other studies in tropical regions, where favorable environmental conditions support the survival and transmission of helminth eggs and protozoan oocysts. These results reflect ongoing challenges in parasite control in low-resource settings, where factors such as open grazing, close contact between animals, and limited veterinary resources contribute to persistent infections [20].

The lack of a statistically significant association between prevalence and animal species ($p > 0.05$) suggests a similarly high burden of infection across cattle, sheep, and goats in this area. This may indicate that all three ruminant species are equally exposed to similar transmission sources, such as contaminated pastures and water sources, as has been observed in other studies on multi-species grazing systems [1,21]. However, species-specific differences were noted in the types of parasites detected, which underscores the variable host-parasite relationships within ruminants.

Coccidia was the most common parasite overall, affecting 46.7% of sampled ruminants, and was particularly prevalent in goats ($p = 0.004$). This is consistent with findings from recent studies highlighting coccidiosis as a major issue in small ruminants, particularly in goats, which are often more susceptible to stress-related infections due to their grazing habits and husbandry practices [5]. The high prevalence of Strongyles (24.7%) across species also reflects the challenges posed by nematode infections in tropical climates, where warm and moist conditions facilitate larval development in pasture environments [1].

Interestingly, Cryptosporidium was significantly more prevalent in cattle ($p = 0.000$) than in other species. This finding aligns with reports indicating that cattle, particularly calves, are highly susceptible to Cryptosporidium infections, which can cause significant morbidity and affect livestock productivity [22]. Cryptosporidium is also known for its zoonotic potential, underscoring the need for effective control measures to reduce public health risks [5].

When examining prevalence based on host factors such as age, sex, breed, body condition, and fecal consistency, no statistically significant associations were observed ($p > 0.05$). This may suggest that exposure to gastrointestinal parasites in this region is widespread, affecting animals uniformly regardless of these specific attributes. However, the slightly higher prevalence in young animals and those in good body condition could reflect their immune response dynamics or increased exposure due to close grazing practices [1].

CONCLUSION

In conclusion, this study highlights a substantial prevalence of gastrointestinal parasites among ruminants in Sabon Gari, pointing to the need for improved parasite control strategies, particularly in goat populations prone to Coccidia infections and cattle at risk of *Cryptosporidium* transmission.

RECOMMENDATIONS

Integrated approaches including regular deworming, pasture management, and improved hygiene could be beneficial in reducing the infection rates. Future studies should investigate additional risk factors, including seasonality and farm management practices, which could provide insights for targeted control measures.

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