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Gastrointestinal helminths of Cattle slaughtered at Gwagwalada abattoir, federal capital territory, Nigeria

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Abstract

Gastrointestinal parasites are widespread in cattle worldwide, causing both clinical and sub-clinical infections that can lead to significant financial losses. This study investigated the prevalence of gastrointestinal helminths infection in cattle slaughtered in the abattoir at Gwagwalada area council, federal capital territory, Nigeria. A total of 120 faecal samples were collected and analysed by flotation and sedimentation methods. The results revealed an overall prevalence of 26.67%. The helminths identified were *Toxocara* sp (5.00%), *Schistosoma* sp (10.83%), and *Fasciola* sp (10.83%). These findings were compared to existing studies, with variations attributed to differences in climatic conditions, management practices, and seasonal factors. Age, breed, and sex-specific analyses revealed significant differences in infection rates. While no helminth infection was found in young adult cattle (1≤3 years), a 31.37% prevalence was recorded in older adult cattle (≥3 years). Among the breeds examined, Sokoto Gudali showed the highest prevalence (100%), followed by White Fulani (26.42%) and Red Fulani (16.67%). A significant breed-related difference ($p = 0.0001$) was recorded. Additionally, male cattle exhibited a higher prevalence (31.37%) compared to (0.00%) in females. The study highlighted the impact of geographical, ecological, and environmental factors on helminths infection, as well as the need for strategic anthelmintic treatment, improved livestock management, and educational programs to control these infections. Regular monitoring and selective breeding may further contribute to long-term infection control in cattle populations.

Keywords: Abattoir; Gwagwalada; Cattle; Helminths; Prevalence

1. Introduction

Gastrointestinal (GI) parasites form a diverse group of helminths capable of infecting various vertebrates, including domestic animals like dogs and cats, livestock such as ruminants and poultry, and wildlife. These parasites can trigger a range of symptoms and pose risks to human health, as some species are zoonotic, transmitting from animals to humans. Although some parasites can inhabit other areas of the body, their preferred site is the intestinal wall [1]. In ruminants, the most common GI parasites are nematodes, cestodes (*Moniezia* spp.) and trematodes (*Fasciola* spp., *Schistosoma* spp.). Additionally, protozoa such as *Giardia* spp. and coccidia affect the GI tracts of cattle [2]. Major GI parasites of cattle include *Strongylus*, *Toxocara*, *Paramphistomum*, *Fasciola*, *Trichuris*, *Moniezia*, and *Eimeria*. These parasites are typically transmitted via ingestion of contaminated food and water, ingestion of intermediate hosts, or other routes [3]. Infected cattle may exhibit a range of clinical signs, including diarrhea, emaciation, anemia, and stunted growth [3].

Cattle production plays a vital role in Nigeria's livestock sector, with approximately 21.16 million live cattle recorded in 2021, an increase from 20.95 million in 2020, continuing the steady growth seen since 2010 [4]. Cattle is a key source of animal protein, contributing significantly to daily meat and dairy consumption in both rural and urban areas in countries like Nigeria [5]. Beyond their role in food production, cattle are also valuable for their waste products, which

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are essential in agriculture. Cattle are commonly slaughtered for ceremonial events, including weddings and funerals. However, gastrointestinal parasitism and poor management practices have hindered profitable cattle farming in Nigeria. Despite the large cattle population, productivity is affected by various factors, with parasitic diseases being a major contributor. Helminths and other internal parasites are among the leading constraints on cattle production in Nigeria [6]. These parasites reduce productivity by lowering food intake, fertility, work capacity, meat and milk production, and increasing mortality and morbidity [7]. Recent studies have investigated the prevalence of gastrointestinal parasites in cattle. In Southeastern Nigeria, a recent study reported an overall prevalence of 57.6% [8], and another report of moderately high prevalence of GI helminth infections among trade cattle, with helminths of both zoonotic and economic significance identified [9]. This research aims to assess the gastrointestinal helminth parasite infections in cattle slaughtered at the Gwagwalada abattoir. Some of these parasites may also pose zoonotic risks to consumers, making it essential to investigate and determine their prevalence.

2. Materials and methods

2.1. Study area

This study was conducted in the abattoir at Gwagwalada area council in the federal capital territory, Nigeria. The Gwagwalada area council falls within latitude 8°56' 29" North and longitude 7°5' 31" and 7° 39' East and has a land area of 1043 km2 [10]. Gwagwalada town has a hot, humid, and tropical climate. Its major element has regimes that are intermediate from those of the Southern and Northern regions of the country [11]. The average annual temperature in this region is between 30 and 37 °C, with March being the hottest month. The average annual rainfall in this region is about 1,650 mm [12].

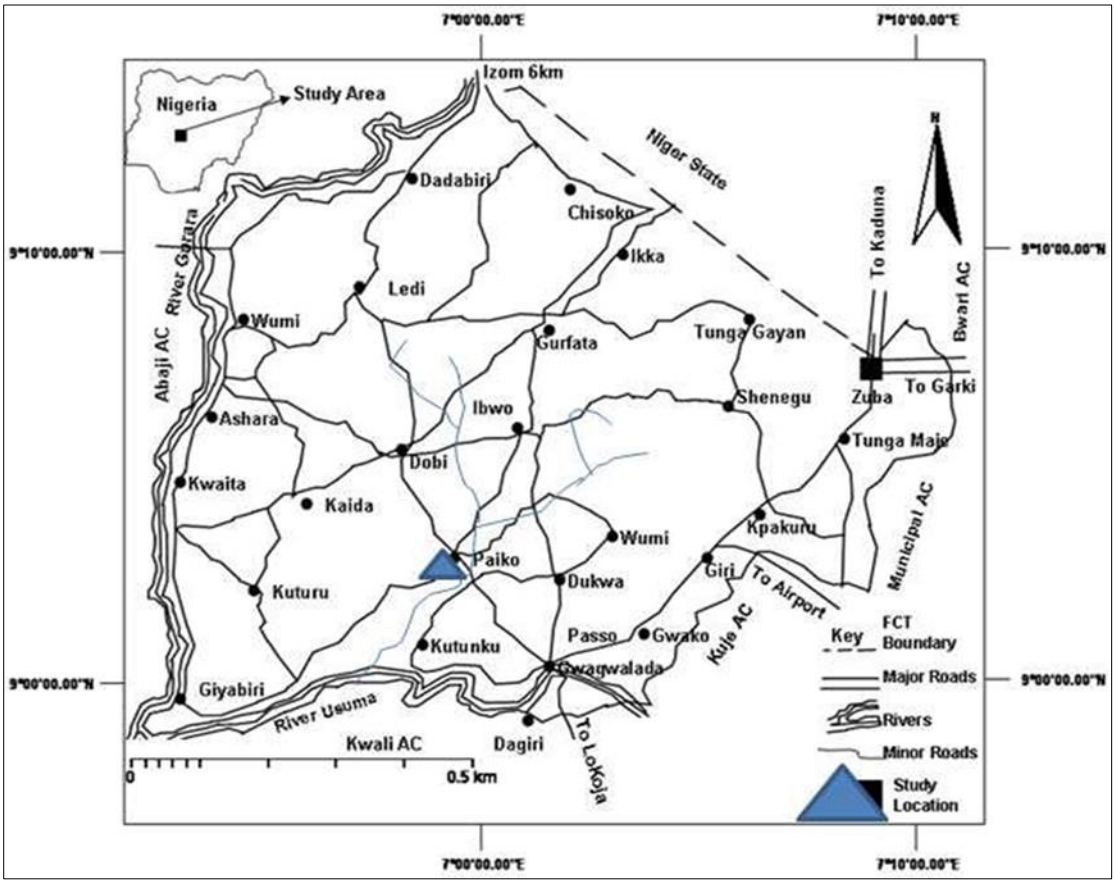

Figure 1 Map of Gwagwalada area council

2.2. Study design

This study employed a cross-sectional design. Faecal samples were randomly collected from cattle slaughtered at the abattoir in November 2023 (late rainy season), and screened for the presence of GI parasites. Age was categorized as (young adult and old adult); Breed (white Fulani, Red Fulani or Sokoto Gudali), Sex (male or female).

2.3. Sample size determination

Sample size was determined using the formula as described by [13], using 50% prevalence.

$N= Z^2pq/d^2$

Where:
N= Sample size q=1-p
Z= 1.96 (normal distribution) constant from table
p= Prevalence rate from the average of previous studies
d=Desired absolute precision of 5% with 95% Confidence Interval

N = 3.841 x 0.5x(1-0.5)/0.5x0.5 = 3.841x0.5x0.5/0.0025 = 384.1

2.4. Faecal sample collection and analysis

A total of 120 cattle were sampled. Faecal samples were collected immediately after slaughter following standard procedure. About 5 mg of faecal sample was collected per rectum into a clean sample bottle using clean, new plastic gloves. The sample bottle was tightly screwed and properly labelled and conveyed to the Parasitology Laboratory University of Abuja for parasitological analysis.

2.4.1. Faecal analysis

Faecal samples were analysed by flotation technique using sugar/salt solution and by sedimentation technique. Eggs were identified under a light microscope at low power (10X objective; 100X magnification) [14].

2.4.2. Flotation technique

The flotation solution was prepared by dissolving 150 grams of salt with 454 grams of sugar in 380 ml of water. The specific gravity was approximately 1.27. Using a stir stick, fecal sample was placed into a wide-mouthed cup and enough flotation solution was poured to cover them. A stirring rod was used to mash the fecal sample. The solution containing the faecal sample was suspended through a tea strainer into a clean test tube with the use of a funnel. The test tube was filled with more flotation solution until a positive meniscus forms and a coverslip was placed over the top and care was taken to prevent air bubbles. The cover slip was removed carefully after 10 minutes and was placed gently on a microscopic slide. It was examined on a light microscope under (10X objective;100X magnification) [15].

2.4.3. Simple sedimentation technique

Two gram of faeces was suspended in 10mls of water and thoroughly mixed using a glass rod. The suspension was passed through a funnel covered with a gauze pad into a test tube. The faecal suspension was allowed to sediment for 5-10 min, to allow the parasite eggs and oocyst to settle to the bottom of the tube. After sedimentation, the supernatant was carefully removed, and 1 to 2 drops of the sediment was deposited on a microscope slide, with the aid of a Pasteur pipette. A cover slip was placed gently on the microscopic slide and examined at low power (x4 objective (40x magnification) and 10x objective (100x magnification)) [16].

2.4.4. Identification of the parasite eggs

The parasite eggs were identified based on the morphological appearance of the eggs viewed during the examination of each sample under magnification X40 objective. The microscopic appearance of the eggs was then carefully compared with those in standard texts, literature, and micrographs for proper identification [2].

2.5. Data analysis

Data obtained was statistically analyzed, using simple statistical methods such as percentage, using simple statistical method such as percentage, and Chi square (χ^2). The test statistics was applied at 0.05 level of significance, to test whether or not there were significant differences.

3. Results

The prevalence of gastrointestinal parasites in cattle slaughtered at the Gwagwalada abattoir showed that, out of 120 cattle faeces examined, 32 were infected with gastrointestinal helminths, representing 26.67% prevalence. The ova of *Toxocara* sp, *Schistosoma* sp, and *Fasciola* sp were identified with a prevalence of 5%, 10.83% and 10.83% respectively. P-value was less than 0.05 (0.0001), thus there was a statistical difference between cattle infected with different species of helminths (Table 1).

Table 1 Prevalence of gastrointestinal parasites in cattle slaughtered at the Gwagwalada abattoir n=120

Parasite	Number infected	Prevalence (%)	Chi-square value (p≤0.05)
Toxocara spp	6	5	12.1
Schistosoma spp	13	10.83	26.22
Fasciola spp	13	10.83	26.22
Total	**32**	**26.67**	**60.54**

P value: <0.0001

Prevalence of gastrointestinal parasites infection in cattle slaughtered at the Gwagwalada abattoir based on age, showed that out of the 18 young adult (≤3 years) cattle faeces examined, none was infected with gastrointestinal helminths while ova of gastrointestinal helminths were observed in 32 of the faeces of old adult cattle (≥ 3 years) with a prevalence of 31.37%. P-value was less than 0.05 (0.0001), thus there was a statistical difference between cattle infected based on age (Table 2).

Table 2 Prevalence of gastrointestinal parasites in cattle slaughtered at the Gwagwalada abattoir based on Age

Age	Number examined	Number infected	Prevalence (%)	Chi-square value (p≤0.05)
Young adult (1-3 years old)	18	0	0.00	0.00
Old adult (>3 years old)	102	32	31.37	64.53
Total	**120**	**32**	**26.67**	**64.53**

P value: <0.0001

Prevalence of gastrointestinal parasites infection in cattle slaughtered at the Gwagwalada abattoir based on cattle breed. Three (3) breeds of cattle were sampled including White Fulani, Red Fulani and Sokoto Gudali, with a Prevalence of 26.42%, 16.67% and 100% respectively (Table 3). P-value was less than 0.05 (0.0001), thus there was a statistical difference between cattle infected based on breed.

Table 3 Prevalence of gastrointestinal parasites infection in cattle slaughtered at the Gwagwalada abattoir based on Breed

Breed	Number examined	Number infected	Prevalence (%)	Chi-square value (p≤0.05)
White Fulani	106	28	26.42	56.5
Red Fulani	12	2	16.67	4.03
Sokoto Gudali	2	2	100	4.03
Total	**120**	**32**	**26.67**	**64.56**

P value: <0.0001

The prevalence of gastrointestinal parasites **infected** in cattle slaughtered in Gwagwalada abattoir based on sex, showed a prevalence of 31.37% in male as compared to female cattle with a prevalence of 0.00% (Table 4). P-value was less than 0.05 (0.0001), thus there was a statistical difference between cattle infected based on sex.

Table 4 Prevalence of gastrointestinal parasites in cattle slaughtered in Gwagwalada abattoir based on Sex

Sex	Number examined	Number infected	Prevalence (%)	Chi-square value (p≤0.05)
Male	102	32	31.37	64.53
Female	18	0	0.00	0.00
Total	120	32	26.67	64.53

P-value: <0.0001

4. Discussion

Parasites pose a significant threat to the world's cattle industry [17]. Due to variables like environment, nutrition, and inadequate sanitation, reports have indicated that the gastrointestinal diseases are most common in tropical and subtropical regions, especially in Africa and other nations [18]. Parasitic worms that cause anaemia, diarrhoea, stunted growth, reduced weight gain, decreased reproductive efficiency, organ condemnation, and mortality in infected animals include nematodes, trematodes, cestodes, and protozoa, which result in severe economic losses [19]. The blood, liver, lungs, gallbladder, and intestinal tissues or cells are among the sites in which these parasites reside in their hosts. When an animal excretes, it usually sheds eggs or oocysts in its faeces. When susceptible animals graze in contaminated environment, they could become infected; humans could also get infected by eating contaminated food or drink, coming into close contact with sick animals, or through other routes [18].

In the present study, the 5% prevalence of *Toxocara* spp. recorded was similar to the 3.12% reported in a previous study conducted in Edo State, Nigeria [20]. However, it significantly differs from the prevalence of 30% and 12.4% reported in previous studies conducted in Ethiopia and Cambodia, respectively [21] and [22]. These variations could be due to differences in climatic conditions, management practices, and the season when the research was conducted. The 10.83% prevalence of *Schistosoma* spp. was within the range of 5.9% to 53.3% reported in a study conducted in Côte d'Ivoire [23]. Similarly, the 10.83% prevalence of *Fasciola* spp. recorded in this study was close to the 10.27% found in Ghana but lower than the 41.9% and 48.0% reported in North-Central and North-Eastern Nigeria, respectively [24]; [25] and [26]. These variations may be attributed to differences in geographical, climatic, and ecological factors, as the presence of trematode infections often depends on the availability of suitable intermediate hosts.

Interestingly, among the 18 faecal samples from young adult cattle examined, no evidence of gastrointestinal helminth infection was found. In contrast, gastrointestinal helminth ova were detected in 32 fecal samples from adult cattle aged three years and above, resulting in a prevalence rate of 31.37%. This finding aligns with earlier studies showing a greater prevalence of gastrointestinal helminths in adult cattle as compared to younger cattle, such as studies in South-Central Ethiopia [27] and North-Central Nigeria [28]. The variation might be linked to geographical, climatic, and ecological factors.

In this study, the breeds of cattle encountered were Fulani, Red Fulani, and Sokoto Gudali, with prevalence of 26.42%, 16.67%, and 100%, respectively. This result was consistent with previous research on helminth prevalence in cattle breeds. For example, a study in Ibadan, South-Western Nigeria, reported an overall prevalence of 41.6% for helminth infection in the White Fulani breed [9]. The differences observed in infection rates among the breeds may be due to the sample size, as the White Fulani breed had the highest number of samples (106), compared to only two Sokoto Gudali sampled.

Additionally, the study revealed a 31.37% prevalence of gastrointestinal helminth infection in male cattle, compared to no infection in female cattle (0.00%). This finding aligns with earlier research showing a higher prevalence of gastrointestinal helminths in male cattle compared to females, as seen in studies from South-Central Ethiopia [3] and North-Central Nigeria [29]. However, a study in Ibadan, South-Western Nigeria, found minimal differences in infection rates between males (40%) and females (41.25%) [9].

The differences in the prevalence of gastrointestinal parasites observed in this study could be attributed to several factors, including seasonal variations, climatic conditions in different regions, livestock management systems, diagnostic methods, and sample sizes. Other contributing factors may include the frequency of anthelmintic treatments and the presence of vectors or intermediate hosts.

5. Conclusion

This study highlighted the prevalence of gastrointestinal helminths among cattle in the study area, revealing *Toxocara* sp., *Schistosoma* sp., and *Fasciola* sp as the parasites encountered in the sampled slaughtered cattle. The variation in infection rate cattle of different breed, age and sex, reinforce the need for targeted anthelmintic interventions and management strategies, considering the ecological, geographical, and seasonal factors affecting helminth prevalence. Addressing these factors are essential to improving cattle health and productivity in the region.

Compliance with ethical standards

Acknowledgement

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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