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Epidemiology of Helminthosis in Sheep and Goats Slaughtered at Central Abattoir, Kano State, Nigeria

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Abstract

Helminthosis remains one of the major constraints to small ruminant production in tropical and subtropical regions, resulting in substantial economic losses through reduced productivity, poor growth performance, decreased reproductive efficiency, and mortality. This study investigated the epidemiology of helminth infections in sheep and goats slaughtered at the Central Abattoir, Kano State, Nigeria. A total of 6,050 small ruminants comprising 2,800 sheep and 3,250 goats were examined for gastrointestinal helminth infections using standard parasitological procedures. Data were analyzed using descriptive statistics and Chi-square analysis to determine associations between infection prevalence and host-related factors. The overall prevalence of helminthosis was 66.12% (4,000/6,050). Sheep recorded a significantly higher prevalence (69.64%) than goats (63.08%) ($\chi^2 = 27.56$; $p<0.001$). Young animals showed significantly higher infection rates (81.25%) compared with adults (56.16%) ($\chi^2 = 386.42$; $p<0.001$). Male animals were more infected (73.58%) than females (60.29%) ($\chi^2 = 118.54$; $p<0.001$). Infection prevalence also varied significantly with body condition score ($\chi^2 = 603.47$; $p<0.001$). *Haemonchus spp.* was the most prevalent parasite (43.75%), followed by *Strongyloides* spp. (25.00%), Fasciola spp. (12.50%), *Trichostrongylus* spp. (7.50%), *Oesophagostomum* spp. (7.50%), and *Moniezia* spp. (3.75%). The study demonstrates the high burden of helminth infections among slaughtered sheep and goats in Kano and highlights the need for strategic parasite control programs, improved management practices, and routine deworming interventions.

Keywords: Helminthosis, prevalence, sheep, goats, abattoir, Kano State, gastrointestinal parasites

Introduction

Small ruminants, particularly sheep and goats, play a vital role in the livelihoods of rural households across sub-Saharan Africa. They contribute significantly to food security through the provision of meat, milk, skins, manure, and income generation (FAO, 2023) [6]. In Nigeria, sheep and goats constitute a major component of the livestock industry due to their adaptability to diverse environmental conditions and relatively low production costs (Bello *et al*., 2022) [3].

Despite their economic importance, productivity of small ruminants is severely constrained by parasitic diseases, particularly helminth infections. Helminthosis caused by gastrointestinal nematodes, cestodes, and trematodes remains one of the most important health challenges affecting sheep and goat production globally (Zvinorova *et al*., 2023) [17]. These parasites cause reduced feed efficiency, weight loss, anemia, decreased fertility, poor carcass quality, and increased mortality, leading to substantial economic losses (Hoste *et al*., 2022) [8].

Among the gastrointestinal helminths affecting small ruminants, *Haemonchus contortus*, *Strongyloides papillosus*, *Trichostrongylus* spp., *Oesophagostomum* spp., *Moniezia* spp., and *Fasciola* spp. are frequently reported in tropical environments (Shakya *et al*., 2021) [15]. The epidemiology of these parasites is influenced by several factors including age, sex, species, nutritional status, climatic conditions, management systems, and grazing practices (Mavrot *et al*., 2023) [10].

Abattoir-based surveillance has been recognized as a valuable tool for assessing the prevalence and distribution of parasitic diseases in livestock populations. Such studies provide important epidemiological information that can

guide effective disease control strategies and public health interventions (Abebe *et al*., 2022) [2]. In northern Nigeria, where extensive and semi-intensive livestock production systems predominate, information on the current prevalence and risk factors associated with helminth infections among slaughtered sheep and goats remains limited.

Kano State is one of the major livestock trading centers in Nigeria and receives animals from various parts of the country and neighboring countries. Consequently, the Central Abattoir serves as an important point for monitoring livestock diseases and assessing parasite burdens in small ruminants. Understanding the prevalence and distribution of helminth infections in animals presented for slaughter is essential for developing sustainable control programs.

Therefore, this study was conducted to determine the prevalence of helminth infections in sheep and goats slaughtered at the Central Abattoir, Kano State, and to evaluate the influence of species, age, sex, and body condition score on the occurrence of helminthosis.

Materials and Methods

Study Area

The study was conducted at the Central Abattoir located in Kano Metropolis, Kano State, northwestern Nigeria. Kano State lies between latitude 11°30′N and 12°37′N and longitude 8°22′E and 8°39′E. The state experiences a tropical savannah climate characterized by distinct wet and dry seasons. Annual rainfall ranges from 600 to 1,200 mm, while temperatures vary between 21 °C and 39 °C throughout the year. Livestock production constitutes a major economic activity in the area, with sheep and goats being among the most commonly reared animals.

Study Animals

The study population consisted of sheep and goats presented for slaughter at the Central Abattoir, Kano. Animals originated from different markets and production systems within Kano State and neighboring states. Information regarding species, age, sex, and body condition score was recorded before sample collection.

Study Design

A cross-sectional study design was employed to determine the prevalence of helminth infections among slaughtered sheep and goats. Animals were selected using a systematic random sampling technique during routine slaughter operations.

Sample Size and Sampling Procedure

A total of 6,050 sheep and goats were examined during the study period. Of these, 2,800 were sheep and 3,250 were goats. Each animal was assigned an identification number and relevant epidemiological information was documented.

Age Determination

Age was estimated based on dentition patterns and classified into two groups: young animals and adult animals.

Body Condition Scoring

Body condition was assessed according to standard small ruminant body condition scoring systems and categorized as: Good, Moderate and Poor

Parasitological Examination

Gastrointestinal contents and fecal samples were collected and examined using standard parasitological techniques. Identification of helminth eggs and adult worms was carried out based on morphological characteristics as described by Soulsby (1982) [18] and Taylor *et al*. (2016).

Parasites identified include; *Haemonchus* spp, *Strongyloides* spp, *Trichostrongylus* spp, *Moniezia* spp, *Fasciola* spp, and *Oesophagostomum* spp.

Data Analysis

Data obtained were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics were used to calculate prevalence percentages. Associations between infection status and risk factors including species, age, sex, and body condition score were assessed using Chi-square (χ^2) tests. Statistical significance was considered at $p<0.05$.

Results

A total of 6,050 sheep and goats were examined for gastrointestinal helminth infections at the Central Abattoir, Kano State. Out of these, 4,000 animals were infected, giving an overall prevalence of 66.12%.

Prevalence of Helminthosis by Species

Table 1: Prevalence of helminthosis among sheep and goats

Species	Examined	Positive	Negative	Prevalence (%)	χ^2	p-value
Sheep	2,800	1,950	850	69.64	27.56	<0.001
Goat	3,250	2,050	1,200	63.08		
Total	6,050	4,000	2,050	66.12		

There was a statistically significant association between species and helminth infection ($\chi^2 = 27.56$; $p<0.001$). Sheep recorded a significantly higher prevalence than goats.

Prevalence of Helminthosis by Age

Table 2: Prevalence of helminthosis according to age

Age group	Examined	Positive	Negative	Prevalence (%)	χ^2	p-value
Young	2,400	1,950	450	81.25		
Adult	3,650	2,050	1,600	56.16	386.42	<0.001
Total	6,050	4,000	2,050	66.12		

Young animals showed a significantly higher prevalence of helminth infection than adults ($\chi^2 = 386.42$; $p<0.001$).

Prevalence of Helminthosis by Sex

Table 3: Prevalence of helminthosis according to sex

Species	Examined	Positive	Negative	Prevalence (%)	χ^2	p-value
Male	2,650	1,950	700	73.58	118.54	<0.001
Female	3,400	2,050	1,350	60.29		
Total	6,050	4,000	2,050	66.12		

Sex significantly influenced helminth infection prevalence ($\chi^2 = 118.54$; $p<0.001$), with males exhibiting a higher infection rate.

Prevalence of Helminthosis by Body Condition Score

Table 4: Prevalence of helminthosis according to body condition score

Body condition	Examined	Positive	Negative	Prevalence (%)	χ^2	p-value
Good	1000	400	600	40.00	603.47	<0.001
Moderate	3,000	2,400	600	80.00		
Poor	2,050	1,200	850	58.54		
Total	6,050	4,000	2,050	66.12		

Body condition score significantly affected the occurrence of helminth infections ($\chi^2 = 603.47$; $p<0.001$).

Frequency of Helminth Parasites Identified

Table 5: Frequency distribution of helminth parasites

Parasite Species	Frequency	Percentage (%)
Haemonchus spp.	1,750	43.75
Strongyloides spp.	1,000	25.00
Fasciola spp.	500	12.50
Trichostrongylus spp.	300	7.50
Oesophagostomum spp.	300	7.50
Moniezia spp.	150	3.75
Total	4,000	100.00

Haemonchus spp. was the predominant helminth parasite encountered, accounting for 43.75% of all infections.

Discussion

The overall prevalence of helminthosis (66.12%) observed in this study indicates that gastrointestinal parasitism remains a major health challenge among sheep and goats slaughtered at the Central Abattoir, Kano State. The prevalence recorded in the present study is comparable to findings reported in several parts of Nigeria and other tropical countries where favorable environmental conditions support the development and transmission of infective larval stages (Biu *et al*., 2021; Hassan *et al*., 2022) [5, 7]. The high prevalence may be attributed to extensive grazing systems, inadequate deworming practices, communal watering points, and poor pasture management.

Sheep exhibited a significantly higher prevalence of infection than goats. This observation agrees with the findings of Mohammed *et al*. (2021) [11] and Nwosu *et al*. (2023) [13], who reported higher susceptibility of sheep to gastrointestinal helminths. Sheep generally graze closer to the ground, increasing their exposure to infective larvae present on pastures. Goats, being natural browsers, tend to feed on shrubs and higher vegetation, thereby reducing their chances of ingesting infective parasite stages.

Age was found to be an important risk factor for helminth infection. Young animals recorded a significantly higher prevalence (81.25%) than adults (56.16%). Similar findings have been reported by Shakya *et al*. (2021) [15], Mavrot *et al*. (2023) [10], and Yusuf *et al*. (2022) [16]. The higher prevalence among young animals may be associated with immature immune systems and limited acquired resistance against parasitic infections. Adult animals often develop partial immunity following repeated exposure, which contributes to reduced parasite establishment and lower infection rates.

The significantly higher prevalence observed among male animals is consistent with reports by Abdullahi *et al*. (2021) [1] and Odo *et al*. (2022) [14]. Several factors may explain this observation, including hormonal influences, physiological stress, and management differences. Testosterone has been reported to exert immunosuppressive effects, potentially increasing susceptibility to parasitic infections. In addition, males are often managed under extensive production systems and may receive less veterinary attention than breeding females.

Body condition score showed a significant association with helminth infection. Animals with moderate and poor body conditions recorded higher infection rates than those with good body condition. This finding corroborates earlier reports by Hoste *et al*. (2022) [8] and Zvinorova *et al*. (2023) [17], who observed that parasitic infections negatively affect nutrient utilization, growth performance, and overall body condition. Helminths compete with the host for nutrients, damage the gastrointestinal mucosa, and impair digestion and absorption, ultimately leading to weight loss and poor physical condition.

Among the parasite species identified, *Haemonchus spp.* was the most prevalent. This finding agrees with numerous studies conducted in tropical and subtropical regions where Haemonchus contortus is regarded as the most economically important gastrointestinal nematode of small ruminants (Besier *et al*., 2022; Hoste *et al*., 2022) [4, 8]. The predominance of Haemonchus spp. can be attributed to its high fecundity, short life cycle, and ability to survive under favorable climatic conditions.

Strongyloides spp. constituted the second most common parasite identified. The occurrence of this parasite may be associated with poor sanitation and environmental contamination, which facilitate the development and transmission of infective larvae. Similar observations have been documented by Abebe *et al*. (2022) [2] and Molla and Sisay (2021) [12].

The occurrence of Fasciola spp. indicates the presence of suitable ecological conditions that support intermediate host snails. Previous studies have shown that fasciolosis remains an important parasitic disease affecting ruminants in areas characterized by irrigation activities, wetlands, and seasonal flooding (Khan *et al*., 2022) [9]. The identification of *Trichostrongylus*, *Oesophagostomum*, and *Moniezia* species further demonstrates the diversity of helminth parasites affecting small ruminants in the study area.

The findings of this study confirm that helminthosis remains highly prevalent among sheep and goats presented for slaughter in Kano State. The significant associations observed between infection prevalence and species, age, sex, and body condition score underscore the importance of host-related factors in the epidemiology of gastrointestinal helminth infections.

Conclusion

The study revealed a high prevalence (66.12%) of helminth infections among sheep and goats slaughtered at the Central Abattoir, Kano State. Sheep were more affected than goats, while young and male animals exhibited significantly higher infection rates. Body condition score was significantly associated with infection prevalence. Haemonchus spp. was the most prevalent parasite identified. The findings highlight

the need for improved parasite control strategies, routine deworming programs, pasture management, and farmer education to reduce the burden of helminth infections and improve small-ruminant productivity.

Recommendations

1. Strategic deworming programs should be implemented regularly.
2. Routine parasitological screening of animals should be encouraged.
3. Farmers should adopt improved grazing and pasture management practices.
4. Veterinary extension services should intensify awareness campaigns on helminth control.
5. Further studies should investigate seasonal dynamics and anthelmintic resistance patterns among helminths in Kano State.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

Statement of Ethical Approval

This research was conducted in accordance with ethical guidelines governing the use of animals and genetic materials in scientific research as stipulated by the Ethical Committee of Department of Animal Health and Production Technology, School of Science and Technology, Federal University of Science and Technology Kabo, which is in line with Animal health care constitution.

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