Gastrointestinal Helminth Infections in a Ruminant Livestock Farm in Abeokuta, South Western Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors OAS and EUF designed the study and authors OUS and MHO wrote the protocol. Authors OUS, MHO, AAA, AOM anchored the field study, gathered the initial data and performed preliminary data analysis. Authors OUS and MHO managed the literature searches and produced the initial draft. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aim: This study investigated the prevalence of gastrointestinal helminth infections in ruminant livestock at DUFARMS holding of the Federal University of Agriculture Abeokuta, in Ogun State, southwestern Nigeria.
Study Design: Cross sectional study.
Place of Study: The study was conducted in Abeokuta, southwestern Nigeria between November 2013 and August 2014.
Methodology: Faecal samples were collected directly from the rectum of 170 ruminant livestock and processed using ether-concentration method before examination for gastrointestinal helminth ova under the microscope. Data obtained were analyzed descriptively using SPSS 20.0 software and results were considered statistically significant at $p < 0.05$.

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Results: Of the 170 livestock examined, 100 (58.8%) were cattle, 40 (23.5%) were sheep and 30 (17.6%) were goats. Majority of the livestock were females 123 (72.4%) and 47 (27.6%) were males. The overall prevalence for any gastrointestinal helminth infection during the study was 76.5%. Goats were the most infected with a prevalence rate of 96.7%, followed by sheep (82.5%) and cattle (68%). Of the gastrointestinal helminths observed, Strongyle worms were the most predominant with 93.3% prevalence in goats, 77.5% in sheep and 33% in cattle. Other intestinal helminths recorded were *Nematodirus* spp*, Moniezia* spp*, Paramphistomum* spp*, Fasciola* spp*, Toxocara* spp and *Trichuris* spp*.* Significant differences do not exist (p>0.05) for prevalence of gastrointestinal helminth infection by sex, age or breed of the animals examined.

Conclusion: The study showed that gastrointestinal helminth infections are widespread among ruminant livestock of DUFARMS which might have a negative implication on productivity. Therefore, improving farm management system and routine deworming of farm animals is recommended.

1. INTRODUCTION

Livestock systems occupy about 30% of the planet's ice-free terrestrial surface area, employing approximately 1.3 billion people globally and directly supporting the livelihoods of 600 million smallholding farmers in the developing countries [1]. Livestock production is therefore an invaluable component of pastoral and agro-pastoral farming, with human populations depending largely on its meat, fat, milk, farm energy, and dung [2].

In Nigeria, ruminants comprising sheep, goats and cattle constitute the livestock farm animals and about 22.1million sheep, 34.5million goats and 13.9million cattle are currently been reared by farm families in the country [3]. These livestock animals are mostly managed on free range/ extensive system and semi-intensive system, where the animals are allowed to roam the streets and neighborhood to fend for themselves with little or no special provision of supplements for the animals [3]. Although these management systems are cheap and allows animal to feed on freely available pasture and forages all year round, these systems exposes the livestock to environmental dangers, ranging across stealing, getting infected with pathogens and death [4]. In addition, these systems of livestock management accounted for the generally observed poor production performance of the local breeds of ruminants in terms of meat, milk and litter production in Nigeria, and does not allow for proper record keeping of the animals production performance [5].

Gastrointestinal helminth infections is one among the health problems limiting the productivity of livestock animals [6,7], with infected animals having reduced weight gains, reduced food conversion rates, abortion, infertility and reduced meat and milk production rates [8,9]. Environmental characteristics such as favorable climatic and soil conditions considerably influence development of gastrointestinal helminth on pastures and their capacity to infect and inflict damage to livestock [10,11], while diminished nutritional status, compromised immunity and free grazing habits on pastures among the reared livestock increases the susceptibility of livestock to infective stages of gastrointestinal helminth [12].

Although there are enormous evidence on the impact of gastrointestinal helminth infections on the health and profit of livestock [8,13,14]. However, to the best of our knowledge, there are no published studies investigating the prevalence of gastrointestinal helminth infections among livestock animals in Abeokuta, southwestern Nigeria. Providing information on helminth infections among livestock would assist in prioritization of appropriate intervention measures to improve health conditions and productivity of livestock. This study therefore investigated the prevalence of gastrointestinal helminth infections of ruminant livestock found in DUFARMS, the holding farm of the Federal University of Agriculture Abeokuta, in Ogun State, southwestern Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

This research was carried out at DUFARMS, the livestock holding farm of the Federal University of Agriculture Abeokuta in southwestern Nigeria. Abeokuta, the Ogun State capital has a tropical climate and enjoys double maxima of rainfall

from April –July and September - October with dry season from November to March. There are seven different holding units within the study area for the management of cattle, pigs, turkeys, rabbits, fishes, poultry and other small ruminant animals. The research was carried out between November 2013 and August 2014

2.2 Study Design and Selection of Livestock Animals

This study employed a cross sectional survey design. A total sampling of 170 ruminant livestock including 100 Cattle (*Bos spp*), 30 Goat (*Capra hircus*), and 40 Sheep *(Ovies aries)* was carried out during the study. A census was conducted followed by registration of tags on each of the livestock animals.

2.3 Ethical Considerations

Study protocol was approved by the appropriate ethics committee of Federal University of Agriculture, Abeokuta. Study animals were handled in accordance with the "Guide for the Care and Use of Laboratory Animals" of the NRC.

2.4 Questionnaire Survey

Age and health condition of individual livestock, feeding patterns, general hygiene and deworming practices in the farms were documented using well structured questionnaires administered to livestock handlers. Sexes of livestock were also determined objectively.

2.5 Collection of Feacal Samples

Feacal samples were collected directly from the rectum of study animals using disposable gloves and transferred into properly labelled sterile bottles. 10ml of Sodium-Acetate-Acetic-Acid - Formaldehyde (SAF) solution was added to each sterile bottle to preserve the feacal samples [15]. Samples were transported in ice packs to the Parasitology laboratory, Department of Pure and Applied Zoology for analysis within two hours of collection.

2.6 Laboratory Analysis

One gram of each collected faecal sample was emulsified in already prepared 10 ml of SAF (sodium acetate acetic acid formalin) solution.

Bottle was covered and vigorously agitated to efficiently suspend the stool in the solution. Stool suspension was further strained through a 13mm sieve into a centrifuge tube, and the filtrate was re-centrifuged at 2000 rpm for 5 minutes. The resulting supernatant was discarded; then 7ml of normal saline and 3 ml of petroleum ether was added to the sediment. The resulting mixture was shaken vigorously and centrifuged for 5 minutes at 2000 rpm. The first three layers of the suspension observed after centrifuging was discarded leaving the last layer of sediment. Sediment was pipetted onto a clean, oil free glass slide and examined for the ova of gastrointestinal helminths under x10 objective lens [15].

2.7 Data Analysis

Data obtained were analyzed descriptively IBM SPSS 20.0 software. Descriptive statistics was employed in the presentation of prevalence estimates, and cross tabulations were made in comparing the demographic variables with prevalence estimates. Associations between variables were ascertained using Pearson chi-square and confidence interval was set at $P \leq 0.05$.

3. RESULTS

3.1 Demographic Characteristics of Surveyed Livestock Ruminants in DUFARM, Abeokuta

A total of 170 livestock were examined for gastrointestinal helminths during the study. 100 (58.8%) were cattle, 40 (23.5%) were sheep and 30 (17.7%) were goat. Majority of the animals surveyed were females, 69(69%), 32(80%) and 22(73.3%) for cattle, sheep and goat respectively. However there exist no significant differences in the distribution of the livestock by sex (p>0.05). Distribution of livestock by age also showed that 89(89%), 39(97.5%) and 30 (100%) of the cattle, sheep and goat respectively were 12 months old or above. There was no significant difference (P<0.05) in the distribution of the livestock by age. However, significant differences exist in the distribution of livestock by breed (p<0.05), as majority of the animals were local breeds with 72(72%), 24(60%) and 30(100%) for cattle, sheep and goats respectively (Table 1).

3.2 Prevalence of Gastrointestinal Helminths in Livestock Ruminants of DUFARM, Abeokuta

Seven different helminth egg types were observed during the study with the strongyle eggs being the most prevalent 92(54.1%), followed by *Nematodirus* spp 33(19.4), *Paramphistomum* spp 26(15.3%), *Toxocara* spp 22(12.9%), *Fasciola* spp 10(5.9%), *Monieza* spp 6(3.5) *and Trichuris* spp 2(1.2). Of the 170 livestock examined, 130 (76.5%) were infected with at least one kind of gastrointestinal helminth. Majority of the infected livestock were goat 96.7%, followed by sheep 82.5% and cattle 68%. There were significant variation in the infection of the animals with each of the gastrointestinal helminths (Table 2).

3.3 Prevalence of Gastrointestinal Helminths by Sex, Age and Breed of Ruminant Livestock in DUFARM, Abeokuta

Of the 130 infected livestock, 93 (71.5%) were females, 123(94.6%) were 12 months old or above and 99 (76.2%) were of local breeds. Of the 68(100) cattle examined, 45(66.2) were females, 62(91.2) were 12 months old or above and 50(73.5) of them were of the local breed. Also, of the 33(100) sheep and 29(100) goat examined, 27(81.8) and 21(72.4) were females, 32(97.0) and 29(100) were 12 months old or above, 13(39.4) and 0(0) were local breeds respectively. However, there was no significant (P < 0.05) difference in the prevalence of infection by sex, age or breed among the livestock (Table 3).

3.4 General Information on Hygiene Conditions of Holding Farm and Health of Surveyed Livestock in DUFARM, Abeokuta

Table 4 shows that all the animals examined have been dewormed 3 months prior to collection of stool specimen using Albendazole for cattle and Ivomec for sheep and goats (Table 4). However, information obtained from interviewed animal keeper showed that livestock animals are allowed to graze freely on pastures within the university system. Also their holding area are usually cleaned once daily (in the morning during grazing).

4. DISCUSSION

This study revealed an overall prevalence of 76.5% with 96.7%, 82.5% and 68% in goats, sheep and cattle respectively. These findings are consistent with those reported in studies outside and within the country [16-18]. The high prevalence recorded in goats in our study corroborates with those Dantako and Idris in Nigeria [19], Ntonifor and colleagues in Cameroon [18]. The differences in grazing areas and retarded immune development in goats might be a probable factor exacerbating susceptibility to infections [18].

Table 1. Demographic characteristics of surveyed livestock ruminants in DUFARM, Abeokuta

	Cattle NE (%)	Sheep NE (%)	Goat NE (%)	Total NE (%)	*P* value
Sex					
Male	31 (31)	8 (20)	8 (26.7)	47 (27.6)	
Female	69 (69)	32 (80)	22 (73.3)	123 (72.4)	
Total	100 (100)	40 (100)	30 (100)	170 (100)	0.42
Age					
≥12 months	89 (89)	39 (97.5)	30 (100)	158 (92.9)	
≤12 months	11 (11)	1 (2.5)	0 (0)	12 (7.1)	
Total	100 (100)	40 (100)	30 (100)	170 (100)	0.05
Breed					
Local	72 (72)	24 (60)	30 (100)	126 (74.1)	
Cross-breed	28 (28)	16 (40)	0 (0)	44 (25.9)	
Total	100 (100)	40 (100)	30 (100)	170 (100)	0.00

*NE: number examined, *Pearson Chi Square test were used to ascertain associations

Table 2. Prevalence of gastrointestinal helminth among livestock ruminant surveyed in DUFARM, Abeokuta

	Cattle		Sheep		Goat		Total		*P* value
	NE (%)	NI (%)	NE (%)	NI (%)	NE (%)	NI (%)	NE (%)	NI (%)	
Strongyle worms	100	33 (33)	40	31(77.5)	30	28 (93.3)	170	92 (54.1)	0.00
Trichuris spp	100	0 (0)	40	0 (0)	30	2 (6.7)	170	2 (1.2)	0.01
Moniezia spp	100	0 (0)	40	0 (0)	30	6 (20)	170	6 (3.5)	0.00
Nematodirus spp	100	23 (23)	40	0 (0)	30	10 (33.3)	170	33 (19.4)	0.00
Paramphistomum spp	100	26 (26)	40	0 (0)	30	0 (0)	170	26 (15.3)	0.00
Fasciola spp	100	10 (10)	40	0 (0)	30	0 (0)	170	10 (5.9)	0.02
Toxocara spp	100	13 (13)	40	9 (22.5)	30	0 (0)	170	22 (12.9)	0.02
Any helminth infection	100	68 (68)	40	33 (82.5)	30	29 (96.7)	170	130 (76.5)	0.00

*NI= number infected; NE= number examined.
*Pearson Chi Square test were used to ascertain associations

Of the seven gastrointestinal helminths identified, the strongyle worms were the most predominant. These parasites negatively affect productivity of farm animals as they induce anaemia, oedema and intestinal disturbances [20]. On the other hand, the larvae of some of these strongyle worms may develop successfully to the infective stage in feaces but might not emerge until moisture levels are optimal. However, infective stages build up on farm lands and pasture contamination rise rapidly when moisture level are optimal [18].

Table 3. Prevalence of gastrointestinal helminths by sex, age and breed of ruminant livestock in DUFARM, Abeokuta

	Cattle NI (%)	Sheep NI (%)	Goat NI (%)	Total NI (%)
Sex				
Male	23 (33.8)	6 (18.2)	8 (27.6)	37 (28.5)
Female	45 (66.2)	27 (81.8)	21 (72.4)	93 (71.5)
Total	68 (100)	33 (100)	29 (100)	130 (100)
P value	0.37	0.53	0.54	0.67
Age				
≤12 months	6 (8.8)	1 (3.0)	0 (0)	7 (5.4)
≥12 months	62 (91.2)	32 (97.0)	29 (100)	123 (94.6)
Total	68 (100)	33 (100)	29 (100)	130 (100)
P value	0.31	0.64		0.12
Breed				
Local	50 (73.5)	20 (60.6)	29 (100)	99 (76.2)
Crossbreed	18 (26.5)	13 (39.4)	0 (0)	31 (23.8)
Total	68 (100)	33 (100)	29 (100)	130 (100)
P value	0.62	0.87		0.28

*NI: number infected, *Pearson Chi Square test were used to ascertain associations*

Table 4. General information on the management and health of the ruminant livestock in DUFARM, Abeokuta

	Cattle	Sheep	Goat
Have there been an outbreak of disease among these animals in the past 6 months?	Yes	Yes	Yes
What was it?	Trypanosomiasis	Pneumonia	Pneumonia
Who diagnosed them?	Veterinary physician	Veterinary physician	Veterinary physician
What were the major symptoms observed?	Paleness, eye dilation and loss of appetite.	Lack of appetite, rough coat and diarrhea.	Sneezing and diarrhea.
What was the duration of the outbreak?	Less than 3 months	Less than 2 months	Less than 2 months.
How many animals were affected in the herd?	2 of 100	2 of 40	None specified
Have you ever dewormed the animals?	Yes	Yes	Yes
When last did you deworm them?	Less than 3 months	Less than 3 months	Less than 3 months
What did you use for deworming	Albendazole	Ivomec	Ivomec
How frequent do you clean their holding area?	Daily (only in the morning)	Daily (only in the morning)	Daily (only in the morning)
How do you feed the animals?	Grazing in the university	Grazing in the university	Grazing in the university

Generally, susceptibility to gastrointestinal helminths infection might be influenced by factors such as age, breed, health status, pregnancy and history of early infection [21]. However, the high prevalence recorded in this study despite the routine deworming of the animals could be closely attributed to the poor management system in the holding farm. Majority of the ruminant livestock are allowed to graze on pastures within the university system and in nearby farm lands. This land might have been contaminated with infective stages of these parasites [16]. Grazing animals therefore become infected when they pick up infective stages of these parasites on the fields they graze. Moreover, already infected ones can also re-populate such grazing lands with loads of the infective stages when they defecate around while grazing. Livestock can then easily get re-infected after deworming activities when they visit such infected sites every seven days, rendering deworming activities ineffective.

Moreover, some gastrointestinal helminth of livestock are becoming resistant to dewormers, leading to ineffective curative rates [22-24]. Even if deworming drugs are effective as expected, high gastrointestinal helminth load resulting from continuous re-infection due to unabated exposures to grazing lands might mask the curative potential of dewormers. However, to establish concrete evidence, re-infection patterns could be monitored after effective deworming of the animals using the findings from this study as a baseline for the prevalence of gastrointestinal nematode infection of ruminant livestock in the study area.

5. CONCLUSION

The study showed that gastrointestinal helminth infections are widespread among ruminant farm animals of DUFARMS which might have a negative implication on productivity. Therefore, improving farm management system and routine deworming of farm animals is recommended.

6. LIMITATION OF THE STUDY

A weakness of the present study is that no attempt was made to quantitatively measure the parasitic burden of gastrointestinal helminth infections among the ruminant animals.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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