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Gastrointestinal parasitic load of sheep in selected abattoirs in Imo State

Jane Chinaza Okoro *, Ferdinand Ozurumba Osuala and Michael Oluchukwu Nwachukwu

Department of Biology, School of Biological Sciences, Federal University of Technology Owerri, Imo State Nigeria.

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Abstract

Gastrointestinal parasites constitute one of the major health challenges affecting the productivity of the animals. This study was aimed at determining the gastrointestinal parasitic load of sheep in selected abattoirs in Imo State. A total of 120 feacal samples of male and female sheep were collected. The samples were prepared using sedimentation and floatation techniques. 62.10% of gastrointestinal parasites were identified in sheep (Obinze 32.36%, Osina 15.74% and Orieagu 13.99%). The highest parasitic load was recorded for *Fasciola spp.* (26.7%) followed by *Strongyle spp*. (16.04%). Female sheep were at higher risk of infection with the gastrointestinal parasites. The study also revealed a high prevalence of gastrointestinal parasite in sheep in the study areas. Therefore, proper understanding of the epidemiology of the parasite is a prerequisite for the design of effective prevention and control programs to boost live stocks production, increase source of animal protein to humans and alleviate poverty.

Keywords: Gastrointestinal parasites; *Fasciola spp*.; *Strongly spp*.; Sheep; Parasitic load

1. Introduction

Gastrointestinal parasites (GIPs) constitute one of the major health challenges affecting the productivity of animals [2,5]. It generally poses serious health threat to small ruminants like sheep due to associated morbidity, mortality, and cost of treatment [16,18]. Factors like improper care, unhygienic environment, extreme climatic condition, and clump distribution of animals predispose these animals to GIPs [6]. also, small ruminants such as sheep (mostly females) are highly susceptible to GIPs due to lower innate immune response against specific helminths [15,25,10]. Commonly occurring important gastrointestinal parasitic diseases in sheep include haemonchosis, ostertagiasis, strongyloidosis, oesophagostomiasis, bunostomiasis and trichostrongylosis [24,9]. Among the parasites, *Haemonchus contortus*, found in the abomasum of the sheep is the most important as it causes significant blood loss [24,9]. Gastrointestinal parasites epidemics associated with small ruminants (sheep) are prevalent during wet season than dry seasons. The infective larvae of these parasites are ingested by grazing animals (sheep), which then developed into adult parasites in the animal abomasum and lay eggs, which are excreted by the animals, then the eggs hatch and larvae develop on pasture for next cycle [3]. The prevalence of gastrointestinal helminthes is related to the agro-climatic conditions like quantity and quality of pasture, temperature, humidity and grazing behaviour of the host [21]. Signs and symptoms of gastrointestinal parasitism ranges from weight loss, diarrhea, anaemia with pale mucous membranes of the eyes and mouth, “bottle jaw” (edematous swelling under the jaw), generalized weakness and eventually death [4]. Most of these parasites can be prevented by providing clean environment, avoid pasturing in damp areas and during early morning and evening hours, when there is dew on the pasture, and ensure adequate balanced diet so as to build their immunity against GIPs [4]. Infected animals can be treated with anthelminthic drugs such as ivermectine, albendazole and any other effective worm expellers [4]

* Corresponding author: Jane Chinaza Okoro

2. Material and methods

2.1. The study area

The study was carried out in Imo state Nigeria, lying within latitude $4^{0}45^{1}$N and $7^{0}15^{1}$ N and longitude $6^{0}50^{1}$ E and $7^{0}25^{1}$ E [28]. It has a total area of 5,100 square kilometres and a population of 4.8 million persons. The capital city is Owerri. Imo has three geopolitical zones namely; Owerri, Orlu, and Okigwe and 27 local government areas [28]. There are two distinct seasons within these area, namely; rainy seasons, which begins in the month of April and lasts until October, with annual rainfall varying from 1,500-2,200mm (60-80 inches), while the dry seasons is ushered in by harmattan period and are characterized by hot weather and low humidity [28]. The rainy season is associated with very high humidity of about 80-85% with very heavy rainfall. Temperature varies according to season between 25^{0}c to 32^{0}c in sunny days. The forest/vegetation in Owerri is a rain forest with lots of plants diversity, growing under the described climatic conditions. The population is predominantly Igbos and Christians [28].

2.2. Study samples

The study samples for this research work are feacal samples of sheep (male and female).

2.3. Sample Collection

The methodology of Poddar et al., (2017) [23] and Odogu and Okaka, (2016) [19] was adopted. The faecal samples of sheep were collected from Obinze abattoir, in Owerri zone; Modern Orieagu abattoir, in Okigwe; and Osina abattoir, in Orlu zone, early in the morning, between 6am and 9am. Hand gloves were used to collect the samples from the rectum of the animals and dropped into a sterilized plastic vials containing 10% formalin and were quickly transported under 4°C to the laboratory for gastrointestinal parasite examination. Each sample was labeled, noting the sex of the sampled animals.

2.4. Sample Preparation and Parasitological Examination

The rectal faecal samples were processed according to the methodology of Karaye et al., (2018) [11] and Adegbelu et al., (2015) [1]. Preliminary macroscopic examination of the samples was carried out to determine the consistency or the texture as well as the presence of blood, mucus, pus and or worms in the samples. Two types of qualitative tests, namely; concentration flotation, and concentration sedimentation techniques were used to examine the faecal samples. In concentration sedimentation, 3gram each of sheep feaces with 100ml of water was thoroughly mixed in a 250ml beaker and the suspension was filtered through a tea strainer or double-layer of cheese cloth and was poured into a second beaker. This was allowed for 30 minutes and the supernatant was carefully removed with pipette and the sediment was thoroughly mixed 100mls of water. These steps were repeated three times until the supernatant was thoroughly removed and the sediments were transferred to petri dishes [11]. A drop of methylene blue was added and was examined for eggs and parasites using dissecting microscope.

In floatation technique, a standard qualitative swinging head centrifuge was used for parasites/eggs in feaces. 3grams of feaces was mixed with 10mls of sugar solution and was poured through a tea strainer into a beaker. The solutions from beaker were poured into 15ml test tube and were placed into the centrifuge. Tubes were filled sugar solution into a slight positive meniscus and covered with slips. There were small bubbles under the cover slips showing correct amount of floatation solution that was added. These were centrifuged at 1200rpm for 5 minutes [1]. Cover slips were removed from the tubes and placed on slide and examined using x40 magnification to identify parasites or eggs relying on their morphological characteristics [14].

2.5. Data analysis

Data generated was subjected to Statistical Analysis System, using SAS package version 21.0 and means were separated using Duncan Multiple Range Test (DMRT). Results were presented in percentages and charts. Chi square analysis was used to determine the prevalent rate in gender and the difference in the ruminants studied, at $P<0.05$ level significant.

3. Results

3.1. Gastrointestinal parasitic load in feacal sample collected from sheep in Obinze abattoir

In Obinze abattoir, a total of 120 sheep (male and female) were examined. Out of 10 parasites identified; *Fasciola spp.* has the most parasitic load with the females being most infected, (4.66%). The female sheep has the highest percentage of parasitic load (Table 1).

Table 1 Gastrointestinal parasitic load in feacal sample collected from sheep in Obinze abattoir

parasites identified	Number of sample examined		Sheep				
			Number of sample positive (%)		Parasitic load (% infectivity)		Total
	Male	Female	Male	Female	Male	Female	
Fasciola spp.	12	12	4(1.17)	7(2.04)	12(3.50)	16(4.66)	28(8.16)
Strongyle spp	12	12	3(0.87)	6(1.75)	8(2.33)	13(3.97)	21(6.12)
Strongyloides spp.	12	12	4(1.17)	7(2.04)	6(1.75)	9(2.62)	15(4.37)
Moniezia benedini	12	12	2(0.58)	2(0.58)	3(0.87)	2(0.58)	6(1.75)
Schistosoma bovis	12	12	2(0.58)	2(0.58)	2(0.58)	3(0.87)	4(1.17)
Ascaris spp.	12	12	1(0.03)	2(0.58)	1(0.03)	2(0.58)	5(1.46)
Trichuris spp	12	12	3(0.87)	0(0.0)	3(0.87)	4(1.17)	6(1.75)
Balantidium coli cyst	12	12	4(1.17)	2(0.58)	5(1.46)	3(0.87)	11(3.21)
Entermeoba spp.	12	12	2(0.58)	2(0.58)	3(0.87)	6(1.17)	7(2.04)
Haemonchus contortus	12	12	3(0.87)	4(1.17)	3(0.87)	5(1.46)	8(2.33)
Total	120	120	28(8.16)	34(9.91)	46(13.41)	65(18.95)	111(32.36)

$X^2 = 5.43$ at $P < 0.05$

3.2. Gastrointestinal parasitic load in feacal sample collected from sheep in Osina abattoir

In Osina abattoir, 120 male and female fecal samples of sheep were examined. 10 parasites were also identified. *Strongyloides spp.* is significantly higher in female 6(1.75) than in male 5(1.46) respectively (Table 2).

Table 2 Gastrointestinal parasitic load in feacal sample collected from sheep in Osina abattoir

Species of gastrointestinal parasites identified	Osina abattoir						
	Number of sample examined		Sheep				
			Number of sample positive (%)		Parasitic load (% infectivity)		Total
	Male	Female	Male	Female	Male	Female	
Fasciola spp.	12	12	3(0.87)	4(1.17)	4(1.17)	5(1.46)	9(2.62)
Strongyle spp	12	12	2(0.58)	3(0.87)	2(0.58)	4(1.17)	6(1.75)
Strongyloides spp.	12	12	3(0.87)	3(0.87)	5(1.46)	6(1.75)	11(3.21)
Moniezia benedini	12	12	2(0.58)	2(0.58)	3(0.87)	4(1.17)	7(2.04)
Schistosoma bovis	12	12	1(0.03)	1(0.03)	1(0.03)	1(0.03)	2(0.58)
Ascaris spp.	12	12	2(0.58)	2(0.58)	2(0.58)	3(0.87)	5(1.46)

Trichuris spp	12	12	0(0.0)	1(0.03)	0(0.0)	1(0.03)	1(0.03)
Balantidium coli cyst	12	12	3(0.87)	4(1.17)	3(0.87)	4(1.17)	7(2.04)
Entermeoba spp.	12	12	1(0.03)	2(0.58)	1(0.01)	3(0.03)	4(1.17)
Haemonchus contortus	12	12	0(0.0)	1(0.03)	0(0.87)	2(0.58)	2(0.58)
Total	120	120	17(4..96)	23(6.71)	21(6.12)	33(9.62)	54(15.74)

X^2= 3.56 at P < 0.05

3.3. Gastrointestinal parasitic load in fecal sample collected from sheep in Modern Orieagu Abattoir

A total of 120 sheep samples were examined respectively.

Result revealed that 10 parasites were identified viz: *Fasciola spp, Strongyle spp, Strongyloides spp., Schisitosoma bovis, Ascaris spp., Trichuris spp., Balantidium coli, Entermoeba spp., Haemonchus contortus.*

Fasciola spp. is significantly higher in sheep (4.08%). The female sheep has the highest percentage of parasitic load (2.62%) than the male (1.46%) .

Four parasites namely; *Schistosoma bovis, Ascaris spp., Entermoeba spp.* and *Haemonchus contortus* were not significant on the feacal samples examined at Orieagu abattoir.

In general, the female sheep has the highest percentage of parasitic load (8.45%) in all the parasites identified (Table 3).

Table 3 Gastrointestinal parasitic load in fecal sample collected from sheep in Modern Orieagu Abattoir

Species of gastrointestinal parasites identified	**Modern Orieagu abattoir**						
	Number of sample examined		**Sheep**				
			Number of sample positive (%)		**Parasitic load (% infectivity)**		**Total**
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	
Fasciola spp.	12	12	4(1.17)	6(1.75)	5(1.46)	9(2.62)	14(4.08)
Strongyle spp	12	12	3(0.87)	4(1.17)	3(0.87)	4(1.17)	7(2.04)
Strongyloides spp.	12	12	2(0.58)	3(0.87)	2(0.58)	2(0.58)	4(1.17)
Moniezia benedini	12	12	2(0.58)	3(0.87)	2(0.87)	3(0.87)	5(1.46)
Schistosoma bovis	12	12	0(0.0)	1(0.03)	0(0.0)	1(0.03)	1(0.03)
Ascaris spp.	12	12	2(0.58)	1(0.03)	2(0.03)	2(0.58)	4(1.17)
Trichuris spp	12	12	3(0.87)	2(0.58)	3(0.87)	3(0.87)	6(1.75)
Balantidium coli cyst	12	12	0(0.0)	1(0.03)	0(0.0)	1(0.03)	1(0.03)
Entermeoba spp.	12	12	1(0.03)	1(0.03)	1(0.03)	2(0.58)	3(0.87)
Haemonchus contortus	12	12	1(0.03)	1(0.03)	1(0.03)	2(0.58)	3(0.87)
Total	120	120	18(5.25)	23(6.71)	19(5.54)	29(8.45)	48(13.99)

X^2= 2.93 at P < 0.05

3.4. Overall gastrointestinal parasite percentage infection in sheep in the study area

The feacal samples were collected from abattoirs in three geopolitical zones in Imo state. Owerri (Obinze abattoir), Orlu (Osina abattoir) and Okigwe (Modern Orieagu abattoir).

In Obinze abattoir, sheep has 111(32.36%) parasitic load. Osina abattoir has 54(15.74%) parasitic load in sheep. In Modern Orieagu abattoir, the sheep sampled has 48(13.99).

In conclusion, Obinze has the highest number of parasitic load of gastrointestinal parasites while the female sheep has the most significant parasitic infection in the three study area (Table 4).

Table 4 Overall gastrointestinal parasites percentage infection in goats and sheep in the study area

Abattoirs	**Gastrointestinal parasites (%)**
	Sheep
Obinze	111(32.36)
Osina	54(15.74)
Orieagu	48(13.99)
Total	213(62.10)

$X^2 = 17.12$ at $P < 0.05$

4. Discussion

The findings of this study revealed that the presence of large varieties of GIPs. These parasites affect the animals in this study area, thus indicating and providing valuable information and statistics on the burden and economic losses arising from these parasites in animals in Nigeria.

Ten gastrointestinal parasite species (*Fasciola spp*., *Strongyle spp*., *Strongyloides spp*., *Moniezia benedini*, *Schistosoma bovis*., *Ascaris spp*., *Trichuris spp*., *Balantidium coli* cyst., *Enternoeba spp*., *Haemonchus contortus*) were identified from this study. These species have been previously reported in Nigeria [11] This study revealed that *Fasciola spp*., *Strongyle spp*. and *Moniezia benedini* were the most positive gastrointestinal parasites with the highest percentage of parasitic loads.

Karaye *et al*., 2018 [11], reported *Strongyle spp*. *Trichostrongylus spp*., *Trichuris spp*., and *Moniezia spp*. to be the most prevalent gastrointestinal parasites affecting sheep in their respective works conducted in Jos, Plateau State (North Central Nigeria).

The high prevalence of these helminths may be associated to the lifecycle of these parasites as they do not need intermediate host in their lifecycle and transmission. From this study, *Fasciola spp*., *Strongyle spp*., *Strongyloides spp*., *Moniezia benedini*, *Schistosoma bovis*., *Ascaris spp*., *Trichuris spp*., *Balantidium coli* cyst., *Enternoeba spp*., *Haemonchus contortus* were the gastrointestinal parasites detected in sheep. These parasites have been reported to affect sheep in Nigeria [20]. Infection with *Fasciola spp. Strongyle spp*. was found to be associated with the gender of the sheep in this study. It can be concluded that females are exposed than male sheep due to increased physiological demand for feed which sometimes leads to pica, hence exposing them to gastrointestinal parasites associated with the sex of the ruminants [12].

The high prevalence of helminthes infection observed in sheep (62.10%) could be looked to free range grazing management which increases their chances of picking up the cyst, ova, larvae or the intermediate host of this gastrointestinal parasites that were attached to these pastures.

The overall prevalence of gastrointestinal parasites sheep in this present study was 62.10%. Similar infection rate was observed in small ruminants in the previous researches [13,8,17,26,22,5]. In the present study, infection rate was higher in Obinze and the least region is Modern Orieagu abattoir Okigwe. The reason for these differences may be related to risk factors, including feeding environment, sampling season. In this study, both *Fasciola spp.* and *Trichuris spp.* eggs were detected with a significantly high parasitic load. The parasitic load of *Fasciola* was 14.86% in sheep, and those of *Trichuris spp.* was 3.53%. The results from this study were not consistent with the previous reports in Qinghai and Xinjiang of China [27,29]. In addition to this study, *Strongyloides spp* eggs and *Moniezia benedeni* eggs were detected, the parasitic load was significantly lower; the parasitic load of *Strongyloides spp.* was 8.75% and those of *Moniezia benedeni* were 5.52%, which was lower than that (28%) in fat tailed sheep in Bangladesh reported by Islam et al. (2019) [30].

However, the data herein presented are important for understanding the factors that influence the occurrence of the infection by these gastrointestinal parasites and for the development of prophylactic strategies suitable for the different conditions. For example, the breeding pattern of sheep could be changed from raising on ground to raising on high beds, and the sheep should be routinely treated with antihelmintic drugs. These methods will minimize the economic losses for small ruminant production and reduce the risk of zoonotic parasite infection in humans.

5. Conclusion

The female sheep is the most infected as it has the highest gastrointestinal parasitic load. The GI parasites that affect sheep mostly are; *Fasciola spp*, *Strongyle spp* and *Monieza spp*. Also, Obinze abattoir has the highest percentage number of parasites identified.

Gastrointestinal parasitic load is a significant concern in sheep productivity, causing economic losses and animal suffering. Understanding the prevalence, risk factors, impact, control and management strategies is essential for developing effective control programs.

Recommendation

- Further research should be carried out with regards to using bio-anthelmimthic drug in treatment of gastrointestinal parasites in ruminant animals, as most of them have developed resistance to synthetic anthelminthic.
- Improved grazing management, including rotational grazing and avoiding overgrazing will reduce the rate of gastrointestinal parasitic infection.
- Also, nutrition supplementation, including protein and energy supplementation will enhance growth and production of these ruminants and also reduce parasitic infection.

Contribution to knowledge

The research has shown that the female sheep are more susceptible to gastrointestinal parasitic diseases, hence developing an effective control and management practices is a right step to eliminate/reduce gastrointestinal parasites.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval for this study was gotten from the research committee, School of Biological Sciences, Federal University of Technology Owerri.

Statement of informed consent

The written consent was obtained from local authorities in charge of the abattoir.

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