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Gastrointestinal parasites infection among sheep in Bokkos local government area of Plateau state, Nigeria

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Target Audience: *Scientist, researchers and livestock keepers*

Abstract

Gastrointestinal parasitic infections affect the health and production of animals leading to lowered nutritional value and economic losses to farmers. This study was carried out to determine the gastrointestinal parasites among sheep in Bokkos local government area, Plateau State. A total of 200 faecal samples were examined using floatation and sedimentation techniques. Of the 200 samples, 138 (69%) were infected with eight parasite genera; four Nematodes, Trichostrongylus, Oesophagustomum, Haemonchus and Nematodirus; two trematodes, Paramphistomum and Fasciola; one Cestode, Moniezia and one protozoan, Eimeria. The highest prevalence (58.5%) was recorded for Eimeria spp. followed by Haemonchus spp (32.5%). Female sheep were at higher risk (OR =1.5) of infection with Nematodirus spp. than the male. Paramphistomum and Trichostrongylus infections were associated with age of animals and sampling location. The risk of infection with Moniezia spp was higher in young than adult animals (OR=3.5) and in females than males (OR =2.5). The study revealed a high prevalence of gastrointestinal parasites in sheep in the study area. Therefore, proper understanding of the epidemiology of the parasites is a prerequisite for the design of effective preventive and control programmes to boost livestock production, alleviate poverty, and increase source of animal protein to humans.

Key words: *Gastro intestinal parasites, sheep, Bokkos, Plateau, floatation, sedimentation*

Description of Problem

Ruminants especially cattle, goats and sheep represent an important source of animal protein in many countries of the world, supplying a good percentage of the daily meat and dairy products in cities and villages in such countries including Nigeria (1). Apart from providing the much-needed animal protein they also play a crucial role in the economy of most nations including Nigeria. However, parasitism presents a major constraint limiting livestock production in most developing countries (2).

Gastrointestinal parasites (GIPs) are usually classified into nematodes, trematodes and cestodes which are the three major types of parasitic helminthes of economic importance in sheep production (3). Nematode causes the most pathologies and production loss in sheep (4).

GIPs are considered significant diseases causing organisms of small ruminants (sheep and goats) in Nigeria. Helminths parasite infections in sheep and goats are of the major importance in many agro-ecological zones and a primary factor in the reduction of productivity of livestock (5; 6; 7). Sheep and goats of all ages are parasitized by a host of

helminthic parasites. Species found within nematodes occupy several niches within their mammalian host ranging from intestinal lumen to intravascular or even intracellular sites. Depending on the site of infections GIPs cause diseases, reduced growth rate, substantial loss of productivity, distention, weight loss, abortion, infertility, anorexia, anaemia or death in severe cases (8).

Sheep are highly susceptible to GIPs due to their lower innate immune response against specific helminths as a result of their evolution (9; 10). This is further exacerbated by the nomadic nature of sheep husbandry in Nigeria. The challenge is, however, much more severe in tropical countries due to favorable environmental conditions for GIP transmission (11;12), poor nutrition of the host animals (13), and poor sanitation in rural areas (14). This makes controlling GIPs the most important health issue in sheep of all ages (15; 16). The prevalence of GIP infection in livestock varies according to their existing management practices (17), season of the year (18; 19), age of animal (20; 21) and sex (22). Several epidemiological studies have been carried out elsewhere on GIPs among sheep in Nigeria (23; 24; 2; 25) but not in this sheep farming community where eighty five percent of the farmers use sheep as one of their sources of livelihood, income, children's school fees and procurement of crop farming implement. This study was designed to identify and estimate the gastrointestinal parasites of communal sheep and risk factors for their transmission in Bokkos LGA, Plateau state, Nigeria. Information generated from the study will assist in updating the existing knowledge of the epidemiology of GIP infections in Plateau state, for the design of effective preventive and control programs to boost livestock production in the country.

Materials and Methods

Study location

The research was conducted in Bokkos Local Government Area (LGA), Plateau State, Nigeria. The headquarter is in the town of Bokkos at 9°18′00″N 9°00′00″E. It has an area of 1,682 km² and a population of 178,454. Ron language is the indigenous language spoken in Bokkos. It is a livestock and crop producing community where local chickens, sheep, goats and dogs are found in almost all houses and the crops grown include potatoes, maize, millet, cocoyam, etc (2).

Sample size

The sample size was determined using the following equation:

$$\frac{\text{Sample size}}{L^2} = 1.96^2 pq$$

Where, n = sample size, p = expected prevalence, q = 1-p, and L = limits of error on the prevalence. The reported prevalence of 64% in sheep (20) was used with a 5% limit of error of the prevalence. The required sample size was calculated to be 200 sheep (26).

Sampling was carried out using simple random sampling method. A total of 200 sheep were randomly selected from five districts (Bokkos, Mushere, Daffo, Manguna and Toff) of Bokkos local government area (LGA) of Plateau State.

Sample collection and handling

A total of 200 sheep were used for the research work. About 10 g of fecal sample was collected directly from the rectum using disposable hand gloves and placed in a labelled sample container. The samples were kept on ice and transported to the Parasitology Laboratory, National Veterinary Research Institute, Vom for analyses.

Sample processing

Fecal sample obtained were examined using saturated sodium chloride floatation and sedimentation techniques according to standard procedures (27; 19). Processed samples were examined under a light microscope at X40 objective. Parasite eggs and oocysts were identified base on morphological keys (27; 8).

Data analysis

The data was analyzed using chi square (chi x^2) with p values equal to or less than ($p \geq 0.05$) regarded as significant and the Graph Pad prism version 4.0 window, was used to analyzed the distribution of gastrointestinal parasites.

Results

Overall, eight genera of gastrointestinal parasites, Nematoda (n=4), Trematoda (n=2) and Protozoa (n=1), Cestoda (n=1) were detected in sheep examined in this study. GIPs were detected in sheep in all the study locations. The most prevalent parasite group was *Eimeria* species, 58.5% followed by *Haemonchus* spp, *Oesophagostomum* spp, and *Fasciola* spp. with 32.5, 25.5 and 22.5% respectively. Other genera detected are T*richostrongylus*, 21%, *Paramphistomum*, 8.5%, *Nematodirus*, 4% and *Moniezia* 2% as shown on Table 1.

Table 1: Prevalence of intestinal parasites of sheep in Bokkos LGA, Plateau state (%).

Species	Number positive	% prevalence
***Oesophagustomum* spp**	51	25.5
***Trichostrongylus* spp**	42	21
***Haemonchus* spp**	65	32.5
***Nematodirus* spp**	8	4
***Paramphistomum* spp**	17	8.5
***Fasciola* spp**	45	22.5
***Moniezia* spp**	4	2
***Eimeria* spp**	117	58.5

Female sheep were at higher risk of *Nematodirus* (OR =1.5) and *Moniezia* (OR =2.5) infection than the male. Similarly, *Paramphistomum* and *Trichostrongylus* infections were associated with age of animal and sampling location. The risk of infection with Moniezia spp was higher in young than adult animals (OR=3.5). However, *Eimeria* species infection was not associated with any of the factors investigated in the study. All the nematodes apart from *Nematodirus* had a statistically significant difference ($p<0.05$) with location as shown on Table 2.

All the twenty farmers interviewed (100%) kept their sheep on extensive system of grazing, and 55% of them regularly dewormed their sheep with either ivermectin or albendazole by themselves. About 85% of the farmers kept sheep for their children's school fees, fertilizer, sales and consumption at festive periods (celebration), sources of income and use the manure for crop farming. In respect of diseases observed, about 75% of the farmers reported that when their sheep have diarrhea ivermectin was the commonly used dewormer. All these are indicated on table 3.

Table 2: Prevalence and risk factor of gastrointestinal parasite infection in sheep in Bokkos LGA, Plateau state

Variables	Endoparasite type/No. positive (%)							
	Nematodes				Trematodes		Cestode	Protozoa
Sex	*Oesphagostomum*	*Trichostrongylus*	*Haemonchus*	*Nematodirus*	*Paramphistomum*	*Fasciola*	*Moniezia*	*Eimeria*
Female	47(92)	50(93)	50(94)	5(83)	16(94)	40(89)	3(75)	106(91)
Male	4(8)	4(7)	3(6)	1(17)	1(6)	5(11)	1(25)	11(9)
Total	51(26)	54(27)	53(27)	6(3)	17(9)	45(23)	4(2)	117(59)
χ2	1.1	1.5	2.7	0.13	0.66	0.43	0.65	1.80
P	0.33	0.33	0.13	1	0.5	1	0.40	0.19
OR	0.5	0.5	0.3	1.5*	0.43	0.89	2.51*	0.56
Age								
Adult	25(49)	21(39)	27(51)	2(33)	8(47)	24(53)	1(25)	66(56)
Young	26(51)	33(61)	26(49)	4(67)	9(53)	21(47)	3(75)	51(44)
Total	51(26)	54(27)	53(27)	6(3)	17(9)	45(23)	4(2)	117(59)
χ2	0.44	0.59	0.12	0.96	0.26	0.00	1.29	1.32
P	0.52	0.02*	0.75	0.42	0.62	1.0	0.34	0.31
OR	1.24*	2.2*	1.12*	2.31*	1.3*	0.98	3.46*	0.72
Location								
Bokkos	16(31)	15(28)	16(30)	3(50)	1(6)	4(9)	0(0)	17(15)
Mushere	14(27)	14(26)	14(26)	2(33)	9(53)	8(18)	2(50)	30(26)
Daffo	17(33)	15(28)	17(32)	1(17)	3(18)	11(24)	2(50)	32(27)
Richa	4(8)	8(15)	6(11)	0(0)	2(12)	10(22)	0(0)	27(23)
Sha	0(0)	2(4)	0(0)	0(0)	2(12)	12(27)	0(0)	11(9)
Total	51(26)	54(27)	53(27)	6(3)	17(9)	45(23)	4(2)	117(59)
χ2	31.2	16.6	31.2	5.8	13.2	5.7	6.12	33.5
P	0	0.002*	0	0.31	0.01*	0.23	0.22	0

*=Statistically significant, P= prevalence, OR=Odd ratio, χ2= chi square

Discussion

Gastrointestinal parasites were detected in 138 out of 200 (69%) fecal samples examined in this study. This result is in consonance with the reported prevalence of 64% and 67.2% in small ruminants from Riyom and Jammu provinces, respectively (28; 25). Also, according to previous reports, about 58.7% and 53.3% of sheep were infested with single or multiple gastrointestinal parasites, respectively (28; 29). This study detected eight parasite genera, *Trichostrongylus*, *Oesophagustomum* *Haemonchus* *Nematodirus*, *Paramphistomum*, *Fasciola*, *Monienzia* and *Eimeria* infecting sheep in the study area. These parasite genera are important causes of disease in animals. This implies that sheep in Bokkos LGA are exposed to deleterious effects of gastrointestinal parasite infections.

Infections due to nematodes accounted for most of the animals examined followed by trematodes and cestodes. This is in accordance with report of (30) who stated that the commonly encountered and prevalent helminth parasites of veterinary importance are nematodes.

Infection with *Monezia* or *Nematodirus* was found to be associated with the gender of the sheep in this study. It can be surmised that females are more exposed than male sheep due to increased physiological demand for feed which sometimes leads to pica, hence exposing them to gastrointestinal parasite infection. So far, the general consensus is the lack of gastrointestinal parasites association with the sex of sheep (31; 32).

Although both young and adult animals

were infected, the association between the prevalence of infection with age of the sheep in this study might suggests that young animals were more susceptible to infection. This is in agreement with reports of studies conducted in Abeokuta and Jos (33; 24). However, it is contrary to a report from Cameroun where no association was found with age of animals (34). *Trichostrongylus* spp. infection differed significantly ($P<0.05$) between the study locations and age of animals, which could be attributed to the extensive grazing being practiced in the study area. This helminth is one of the most important helminth of grazing small ruminants (35), therefore more attention should be given to control the infection.

Table 3: Practices of livestock (sheep) farmers in Bokkos LGA, Plateau state

Variable	Frequency	Percentage
Inherited/hubby	3	15
School fees, fertilizer, sales at festive periods, income, manure	17	85
Total	20	100
Source of water		
Well	2	10
River	16	80
Borehole	2	10
Total	20	100
Clinical signs observed in sheep		
Diarrhea	15	75
Diarrhea and nasal discharge	2	10
Diarrhea and rough hair coat	3	15
Total	20	100
Name of drug vets give your sheep		
Ivermectin	12	60
Albendazole bolus	8	40
Total	20	100
Preventive measures against worm infestation practiced by farmer		
Potash	9	45
Regular deworming with mentioned drug	11	55
Total	20	100
Extensive method of farming	20	100

Multiple gastrointestinal parasite infections was recorded in the animals examined, implying a complex interaction between several factors in the study area. The result being many of the animals were diarrheic at the time of sampling. More so, the farmers usually treat the animals by themselves without consulting veterinarians or qualified personnel. Invariably the animals are either under-dosed or administered inappropriate drugs leading to the development of drug resistance.

Eimeria parasite was detected in samples from all study locations, in all age groups and sexes suggesting its wide distribution in extensively managed sheep in Nigeria. This finding is in line with the report of (36) and (37) who reported that coccidia species are frequently observed in sheep fecal sample. Clinical infections leading to diarrhea,

weight loss, anorexia and death has been reported in sheep in severe cases (personal communication). Therefore, the detection of *Eimeria* oocysts in sheep requires urgent attention to ameliorate the effects.

Generally, the climatic conditions prevalent in the study area is supportive to the perpetuation of life cycles of these parasites. This is compounded by lack of veterinary services, poor water supply and extensive communal grazing which facilitate the proliferation of helminths or their intermediate hosts.

Conclusion and Applications

1. The high prevalence of gastrointestinal parasites underscores their importance in sheep production in the study area.
2. As such, gastrointestinal parasites are a constant threat to food security and poverty eradication.
3. Therefore, there is the need to educate and encourage livestock farmers in the study area to adopt the routine and responsible use of anthelmintic to safeguard animal health for improved productivity.

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